Atherosclerotic Cardiovascular Disease Screening in Adults

American College of Preventive Medicine Position Statement on Preventive Practice

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Context: Atherosclerotic cardiovascular diseases, including coronary heart disease (CHD), carotid artery stenosis (CAS), peripheral artery disease (PAD), and abdominal aortic aneurysm (AAA), affect millions of U.S. adults and are leading causes of morbidity and mortality. There is some uncertainty regarding the utility of certain screening tests for prevention of cardiovascular morbidity and mortality.

Evidence acquisition: Current guidelines and studies pertaining to CHD, CAS, PAD, and AAA screening in the adult population were reviewed.

Evidence synthesis: CHD risk can be estimated by the Framingham Risk Score (FRS), which is valuable in identifying high-risk asymptomatic adults who may benefit from preventive treatments. There is moderate certainty that the benefits of screening do not outweigh the harms for individuals with asymptomatic CAS. The potential harms associated with routine PAD screening in asymptomatic adults are also likely to exceed benefits. Ultrasonography is a safe, noninvasive, and reliable screening test used to identify AAAs for treatment in men aged >65 years who have ever smoked.

Conclusions: American College of Preventive Medicine (ACPM) recommends CHD risk assessment using the FRS to guide risk-based therapy. ACPM does not recommend routine screening of the general adult population using electrocardiogram, exercise-stress testing, computed tomography scanning, ankle–brachial index, carotid intima medial thickness, or emerging risk factors, including high-sensitivity C-reactive protein (hs-CRP). ACPM does not recommend routine screening of the general adult population for CAS or PAD. ACPM recommends one-time AAA screening in men aged 65–75 years who have ever smoked. Routine AAA screening in women is not recommended.
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Supplemental Material

The information here is the expanded version of the position statement above.

The American College of Preventive Medicine (ACPM) Prevention Practice Committee coordinates the development of practice policy statements on preventive health care to provide guidance to clinicians and healthcare organizations. These position statements are brief summaries of ACPM viewpoints on important topics that have already been the focus of an evidence review, analysis, and recommendations by one or more entities outside of ACPM. For example, particular subjects for which the U.S. Preventive Services Task Force has developed recommendations are typically suitable topics for position statements (www.ahrq.gov/clinic/uspstfix.htm). The purpose of the position statements is to outline the ACPM's perspective on critical preventive medicine issues, in a timely fashion, in order to exert a positive influence on policy, practice, and research dealing with the subject of the statement. This paper addresses the ACPM position statement and rationale for the screening of coronary heart disease (CHD), carotid artery stenosis (CAS), peripheral artery disease (PAD), and abdominal aortic aneurysm (AAA) screening in the adult population.

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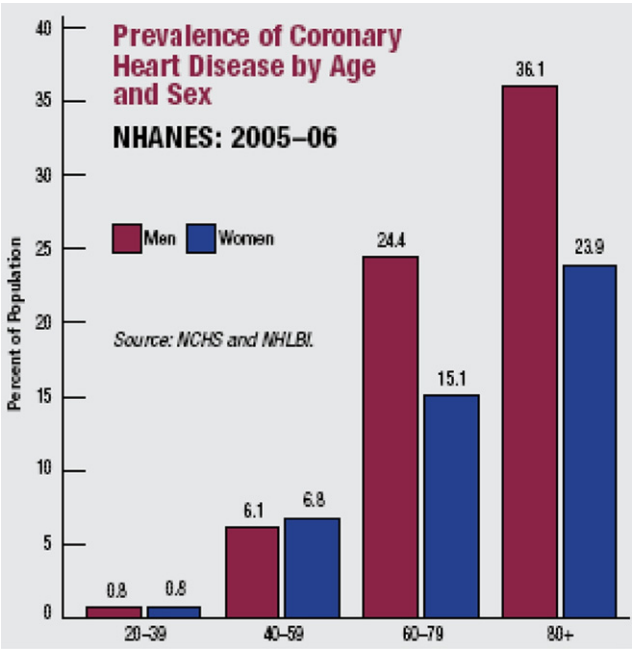

Figure 1. Prevalence of coronary heart disease by age and gender

Screening for Coronary Heart Disease

Burden of Suffering

Almost 17 million adults in the U.S. have CHD.[1] The prevalence of CHD increases with age, and men are disproportionately affected (Figure 1). The annual incidence of new and recurrent heart attacks is estimated to be 610,000 and 325,000, respectively. One in five deaths in the U.S. is caused by CHD. It is the largest single cause of death in the adult U.S. population. The estimated cost of CHD in the U.S. is $165 billion annually.[1]

Risk Factors and Screening

An individual's 10-year risk of CHD can be determined based on one's age, gender, and conventional risk factors, including smoking, diabetes, hypertension, and hyperlipidemia. Risk calculators, such as the Framingham Risk Score (FRS), are available to estimate the 10-year risk of CHD (hp2010.nhlbihin.net/atpiii/calculator.asp)[2] Individuals with a 10-year CHD risk of less than 10% are considered to be at "low" risk, whereas those with a 10-year CHD risk of greater than 20% are considered to be at "high" risk. Individuals with a 10-year risk of CHD between 10% and 20% are considered to be at "intermediate" risk.

Screening tests used to provide further information regarding CHD risk include noninvasive and serum-based markers of CHD risk (also known as nontraditional or emerging risk factors). These tests may be helpful in reclassifying individuals at intermediate risk for CHD as having high or low risk, thereby enabling more-intensive risk-factor modification for those who fall within the high-risk category.

Current noninvasive screening tests for subclinical CHD include electrocardiogram (ECG), exercise treadmill testing (ETT), electron-beam computed tomography (CBCT), ankle–brachial index (ABI), and carotid intima medial thickness (IMT). Studies examining the effect of screening asymptomatic individuals with resting ECG, ETT, or EBCT on CHD outcomes are currently lacking.[3] ECG, ETT, and EBCT can provide prognostic information independent of conventional cardiovascular risk factors about the risk of future CHD events. However, the implications for clinical decision making in asymptomatic patients are unclear given the lack of outcome data. For individuals with a low pretest risk of CHD events, the positive results from these tests are mostly false-positives that could potentially lead to further unnecessary testing. An updated review[4] concluded that coronary artery calcium (CAC) scores in EBCT predicted CHD events independent of Framingham risk factors. However, there is a lack of evidence that CAC scores improve the prediction of CHD in populations at intermediate risk of CHD. More population-based studies pertinent to intermediate-CHD-risk individuals are needed to facilitate its general use in routine clinical practice. Although both ABI and CIMT can also predict cardiovascular events independent of Framingham risk factors, the value of using ABI and CIMT for cardiac risk assessment in asymptomatic intermediate-risk people remains unclear because of insufficient evidence.[4,5]

Emerging Risk Factors

Emerging CHD risk factors include elevations in lipoprotein (a), homocysteine, leukocyte count, fasting blood glucose, and high-sensitivity C-reactive protein (hs-CRP). Although elevated levels of lipoprotein (a) and homocysteine can predict CHD events independent of some Framingham risk factors, studies demonstrating the predictive value beyond that of calculating the Framingham risk score, or its use in intermediate-risk populations are lacking.[6,7] The evidence for the use of leukocyte count and fasting blood glucose for predicting CHD risk independent of Framingham risk factors is inconclusive at this time.[5]

An elevated hs-CRP level has been shown to predict CHD events independent of Framingham risk factors.[8] Among intermediate-risk people, subgroups with high hs-CRP levels have a higher risk of CHD events compared to those with average or low hs-CRP levels. The Justification for the Use of Statins in Prevention: an Intervention Trial Evaluating Rosuvastatin (JUPITER) study[9] showed that aggressive lipid-lowering therapy

with rosuvastatin among men and women with elevated hs-CRP levels (>2 mg/L) and LDL-cholesterol levels less than 130 mg/dL led to fewer initial cardiovascular events compared to placebo. As a result of this study, rosuvastatin was approved by the U.S. Food and Drug Administration for use as primary prevention in men aged ≥50 years and women aged ≥60 years who have elevated hs-CRP levels (>2 mg/L) and at least one additional cardiovascular risk factor (e.g., low HDL cholesterol or high blood pressure).[10] However, the results of the JUPITER study have been questioned in light of a recent reappraisal[11] that raised methodologic and epidemiologic concerns in the study design. Another analysis[12] incorporating results from the Controlled Rosuvastatin Multinational Trial in Heart Failure (CORONA) with the JUPITER study showed a more modest effect of rosuvastatin with respect to all-cause mortality and cardiovascular outcomes, suggesting that the beneficial results seen in the JUPITER study were overestimated. However, a stratified analysis performed by the JUPITER investigators on the effect of rosuvastatin by baseline CHD risk confirmed that participants at intermediate risk as defined by Framingham or Reynolds Risk Score benefited from statin treatment.[13] The study showed that participants with a 10-year risk of CHD of 5%–10% achieved similar risk reduction in cardiovascular events compared with those with a 10-year CHD risk of 11%–20%. This together with the finding that the majority of women participants with elevated hs-CRP level were in the 5%–10% risk group (10-year) call into question whether individuals with a 10-year CHD risk of 5%–10% should also be considered as intermediate risk for CHD.

Benefits and Harms of Screening

A recent review[4] of CHD screening tests concluded that hs-CRP is the only risk marker for which the magnitude of benefit could be estimated by modeling based on information about predictive value and prevalence among people at intermediate risk. The model predicts that 11% of men who were initially classified as intermediate-risk would be reclassified as high-risk.[8] It is estimated that intensive risk-reduction therapy in this reclassified group could avert 47.8 CHD events per 1000 men aged 40–79 years over a 10-year period. However, the net benefit of hs-CRP testing is uncertain because of insufficient information regarding the harms associated with testing (e.g., invasive diagnostic procedures stemming from a false-positive result), and the unknown effect of intensive therapy on those who are defined as high-risk by hs-CRP.

Potential harms associated with using CHD screening tests include the risk of radiation exposure through the use of EBCT; potential for false positives and labeling, which may result in unnecessary psychological distress and invasive testing (e.g., coronary angiography) with its associated morbidity and mortality; and side effects of aggressive risk-reduction therapies (e.g., lipid-lowering agents).[4]

Recommendations of Other Groups

The U.S. Preventive Services Task Force (USPSTF) had previously recommended against routine screening with ECG, ETT, or EBCT in adults at low risk (10-year CHD risk <10%) for CHD events.[14] With respect to adults at intermediate risk for CHD events, they found insufficient evidence to recommend for or against routine screening with ECG, ETT, or EBCT for the prediction of CHD events. They concluded that decisions about screening in adults at increased risk should be made on a case-by-case basis after careful discussion with the patient about the risks and benefits of screening. In their latest recommendations, the USPSTF concluded that there was insufficient evidence to assess the balance of benefits and harms associated with using nontraditional risk factors to screen asymptomatic adults without a history of CHD to prevent CHD events.[4]

The American College of Cardiology Foundation/American Heart Association (ACCF/AHA) support the use of CHD risk assessment using tools (e.g., FRS) to estimate the 10-year risk of CHD events in people with two or more risk factors.[11] ACCF/AHA advises against the use of CT scanning (including EBCT) in people at low (10-year risk of <10%) or high (10-year >20%) risk for CHD events. They do not recommend screening the general population using CT scanning. However, they determined that the use of CT scanning in asymptomatic people at intermediate CHD risk (10-year risk between 10% and 20%) may be reasonable based on the possibility that this group may be reclassified into a higher risk status based on CAC, which could affect subsequent patient management.

A joint statement from the American Heart Association (AHA) and the CDC recommends against the use of inflammatory markers (including hs-CRP) in screening the general population for cardiovascular risk.[12] However, they endorse the optional use of hs-CRP in patients preclassified at intermediate risk (10-year risk between 10% and 20%) of CHD who may be at a higher absolute risk than estimated by major risk factors.

The third report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults, known as the Adult Treatment Panel III (ATP III), encourages the use of Framingham predictors of 10-year risk of CHD in people with multiple risk factors to identify individuals who may benefit from more-intensive treatment.[13] LDL-cholesterol goals achieved by thera-

Table 1. LDL-cholesterol goals and cutpoints for therapeutic lifestyle changes and drug therapy in different risk categories.[13]

Risk category	LDL goal	LDL level at which to initiate therapeutic lifestyle changes	LDL level at which to consider drug therapy
CHD or CHD risk equivalents (10-year risk >20%)	<100 mg/dL	≥100 mg/dL	≥130 mg/dL (100–129 mg/dL: drug optional)[a]
≥2 risk factors (10-year risk ≥20%)	<130 mg/dL	≥130 mg/dL	10-year risk 10%–20%: ≥130 mg/dL; 10-year risk <10%: ≥160 mg/dL
0–1 risk factor[b]	<160 mg/dL	≥160 mg/dL	≥190 mg/dL (160–189 mg/dL: LDL-lowering drug optional)

[a]Some authorities recommend use of LDL-lowering drugs in this category if an LDL cholesterol <100 mg/dL cannot be achieved by therapeutic lifestyle changes. Others prefer use of drugs that primarily modify triglycerides and HDL (e.g., nicotinic acid or fibrate). Clinical judgment also may call for deferring drug therapy in this subcategory.
[b]Almost all people with 0–1 risk factor have a 10-year risk <10%; thus 10-year risk assessment in people with 0–1 risk factor is not necessary.

peutic lifestyle changes with or without pharmacotherapy are recommended based on risk category (Table 1). ATP III recognizes that although emerging risk factors and tests that detect subclinical atherosclerotic disease do not modify LDL-cholesterol goals, they appear to contribute to CHD risk in varying degrees and can have utility to guide intensity of risk-reducing therapies in selected people.[13]

The Screening for Heart Attack Prevention and Education (SHAPE) task force endorses screening of asymptomatic middle-aged adults (men aged 45–75 years and women aged 55–75 years) with atherosclerotic screening tests such as CAC or carotid IMT.[15] They propose that detection of subclinical atherosclerotic disease can more accurately identify and inform the treatment of patients at high risk for acute ischemic events, as well as to identify patients at lower risk who may be treated more conservatively.

ACPM Recommendation and Rationale for Coronary Heart Disease Screening

For asymptomatic men and women with no history of CHD or CHD risk equivalents (established forms of atherosclerotic diseases including AAA, PAD, and symptomatic carotid artery disease), ACPM recommends the use of a CHD risk assessment tool such as the FRS to assess CHD risk and to guide risk-based therapy. Individuals with a high (>20% for 10-year) risk of CHD benefit from intensive risk factor modification (e.g., lipid-lowering, blood pressure–lowering therapies), and appropriate chemoprophylaxis (e.g., aspirin, statin therapy).

ACPM does not recommend routine screening of the general adult population using ECG, ETT, EBCT, ABI, carotid IMT, or emerging risk factors including hs-CRP. However, ACPM recognizes that hs-CRP appears to contribute to CHD risk assessment independent of traditional risk factors and has the potential to guide intensity of risk-reducing therapies in selected people. Therefore, clinicians who identify patients having an intermediate (10%–20% over 10 years) risk of CHD should consider hs-CRP testing to determine the need for intensification of therapy or pharmacotherapy (e.g., statins). However, the net benefit of such therapy based on this strategy is unclear because of lack of data.

Screening for Carotid Artery Stenosis

Burden of Suffering

Cerebrovascular disease or stroke is the third leading cause of death in U.S., behind heart disease and cancer.[16] In the U.S., 6.5 million adults suffered from a stroke in 2005.[1] Mortality from acute stroke is 20%, and only 50% of patients survive beyond 5 years after the initial event.[17] Approximately 25% of the survivors will have a second neurologic event, leading to death in more than one half. The mean lifetime cost of ischemic stroke is about $140,000 (converted to 1999 dollars using the medical component of the consumer price index).[17] This includes inpatient care, rehabilitation, and follow-up care necessary for lasting deficits.

Risk Factors and Screening

Carotid artery stenosis is a risk factor for acute ischemic stroke. The prevalence of significant (greater than 50%) CAS among older adults is 8%.[18] In patients with asymptomatic CAS, carotid endarterectomy (CEA) reduces the risk of stroke by approximately 30% over 3 years.[19] However, the risk of perioperative stroke or death ranges from 1.6% to 3.7%.[20] There is also a small risk of nonfatal myocardial infarctions. Among older asymptomatic individuals with CAS, the benefit of CEA is very small (0.07 quality-adjusted life- years for 70-year-old, normal-risk

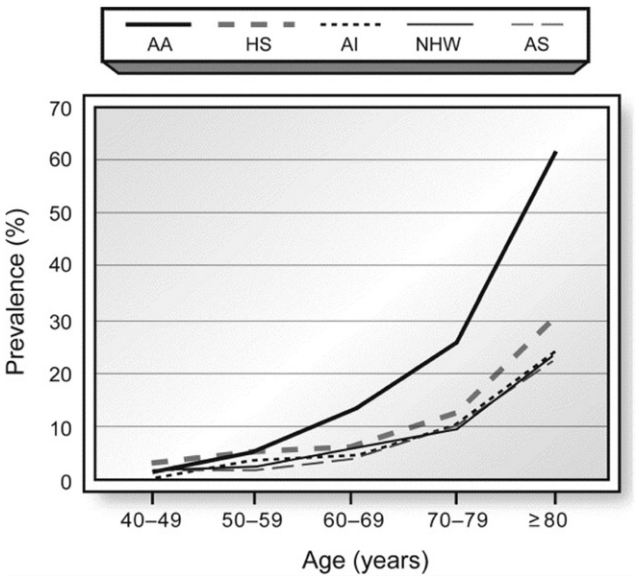

Figure 2. Ethnicity-specific prevalence of peripheral arterial disease in men

CEA candidates).[21] Further, benefits decrease and harms increase with advancing age, surgical risk of stroke and death, and comorbidities. Cost effectiveness of CEA in older adults with asymptomatic CAS has also not been proven.[22]

The lack of standardized treatment received in the nonsurgical group is a major limitation of existing RCTs of CEA in asymptomatic individuals. Medical therapy is often poorly defined and probably does not include current standards of intensive blood pressure and lipid control. It is difficult to determine what effect current standard medical therapy would have in determining the overall risk– benefit ratio of CEA. The net benefit for CEA largely depends on people surviving the perioperative period without complications and living for 5 years. However, the actual risk reduction for CEA over 5–10 years remains uncertain.

Recommendations of Other Groups

The USPSTF recommends against screening for asymptomatic CAS in the general adult population.[23] AHA also recommends against ultrasound screening for CAS.[24] The American Academy of Neurology does not make any recommendations for CAS screening.[25] They conclude that the degree of benefit of CEA in stable men with severe asymptomatic CAS was modest, and not as great as it is for symptomatic carotid stenosis. The Society of Vascular Surgery (SVS) recommends that high-risk individuals (aged >55 years with cardiovascular risk factors such as a history of hypertension, diabetes mellitus, smoking, hypercholesterolemia, or known cardiovascular disease) undergo carotid artery ultrasound to assess stroke risk.[26]

ACPM Recommendation and Rationale

ACPM does not recommend routine screening of the adult population for asymptomatic CAS. Although stroke is a leading cause of mortality and morbidity, a relatively small proportion of disabling and unheralded strokes is due to CAS. Duplex ultrasonography has moderate sensitivity and specificity for detecting severe CAS but may yield false-positive results that could lead to unnecessary and potentially invasive testing (e.g., angiography) with adverse consequences. Although CEA decreases the risk of stroke among study participants with asymptomatic CAS, the effect of treating CAS in populations screened for CAS is uncertain because of lack of studies. Further, the benefits of CEA are expected to be less among asymptomatic individuals in the general population compared to study participants. We agree with the USPSTF that for individuals with asymptomatic CAS there is moderate certainty that the benefits of screening do not outweigh the harms.

Screening for Peripheral Artery Disease

Burden of Suffering

Approximately 8 million Americans are affected by PAD.[27] An average of $5955 is spent per patient with PAD annually in the U.S.[28] About one in 16 U.S. individuals aged ≥40 years have PAD (Figures 2 and 3).[29] The prevalence of PAD increases with age. Among individuals aged ≥85 years without a history of heart disease or stroke, about 30% of men and 40% of women have PAD.[30] PAD confers a two- to three-fold increased risk of

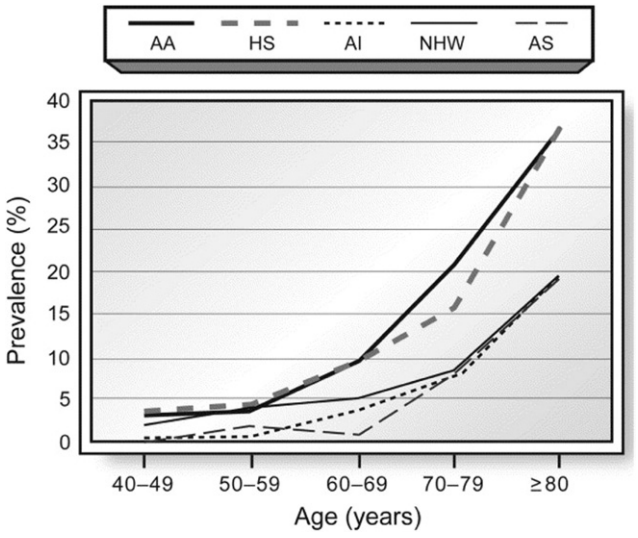

Figure 3. Ethnicity-specific prevalence of peripheral arterial disease in women

cardiovascular disease mortality and mortality. Compared with people without PAD, those with PAD have increased prevalence of functional decline and functional impairment.[31,32]

Screening. Ankle–Brachial Index (Abi) Measurement is Recognized As a Simple, Accurate, Inexpensive, and Noninvasive Method Used for Diagnosing Pad, and Has Been Shown to Be Predictive of Cardiovascular Events and Mortality.[33–37] ABI has a sensitivity of 97% and a specificity of 100% compared to angiography.[38] However, studies addressing the potential harms and benefits of screening the adult population for PAD are currently lacking. There is a theoretic risk that false-positive results from ABI may lead to labeling, psychological distress, further testing, and unnecessary treatment for PAD.

Recommendations of Other Groups

The ACC/AHA recommends that individuals with asymptomatic lower-extremity PAD should be identified by examination, including ABI, so that therapeutic interventions to diminish the risk of myocardial infarction, stroke, and death may be offered.[39] The AHA concludes that the use of ABI is an appropriate screening tool for detecting PAD based on its low cost, high yield, and strong prognostic significance.[24] However, they recognize that randomized trials for population screening are currently lacking, and they recommend further cost-effectiveness analysis as a high priority. The USPSTF recommends against routine screening for PAD because the harms of routine screening exceed the benefits.[40]

The American Diabetes Association makes no recommendation for screening the general population for PAD but recommends annual screening for PAD in people with diabetes.[41] They mention that ABI should be considered in screening diabetic patients for asymptomatic PAD.

The Society of Interventional Radiology recommends that all patients being evaluated for peripheral vascular disease should have their ABI measured.[42] SVS recommends PAD screening in high-risk individuals (aged ≥55 years with cardiovascular risk factors or known cardiovascular disease) by obtaining blood pressure measurements in the legs.[26]

ACPM Recommendation and Rationale

We agree with the USPSTF that screening for PAD among asymptomatic adults in the general population is expected to have few or no benefits because of the low prevalence of PAD in this group. There is also little evidence that treatment of PAD at this asymptomatic stage of disease, beyond treatment based on standard cardiovascular risk assessment, improves health outcomes. Most of the literature on PAD pertains to treatment of symptomatic patients, and there is little data directly examining the efficacy of PAD screening among asymptomatic adults in the general population or in higher-risk adults.

Existing evidence supports the use of increased physical activity and smoking cessation to improve outcomes among people with early PAD. However, these interventions should be offered to all patients to encourage healthy lifestyles, and do not necessarily offer additional benefit for people with screen-identified PAD. Finally, screening asymptomatic adults with the ABI could potentially lead to some small degree of harm, including false-positive results and unnecessary workups. Therefore, the potential harms associated with routine PAD screening in asymptomatic adults would exceed the potential benefits.

ACPM does not recommend routine screening for asymptomatic PAD in the general adult population. However, clinicians should be alert to symptoms of PAD in people at increased risk (e.g., people aged >50 years, smokers, and individuals with diabetes) and evaluate patients who have clinical evidence of vascular disease. Therapeutic lifestyle changes including a heart-healthy diet, regular exercise, and smoking cessation should be encouraged in addition to other pharmacologic risk reduction strategies for individuals at risk for PAD.

Screening for Abdominal Aortic Aneurysms

Burden of Suffering

According to U.S. vital statistics data,[43] approximately 15,000 deaths in the year 2000 were due to aortic aneurysms, 9000 of which were attributed to AAA. of all deaths in men aged >65 years, 1%–2% are caused by ruptured AAAs.[44] In individuals aged >55 years, it is the tenth most common cause of death.[45] The mortality rate associated with rupture of a previously unknown AAA is 50%–80%.[46]

Risk Factors and Screening. Major risk factors include smoking, older age, male gender, and family history. There is a two to four times greater risk of AAAs in first-degree male relatives of patients with AAAs.[47] The risk appears to be similar for first-degree female relatives, but the data are not as clear. AAAs disproportionately affect men, with an estimated prevalence of 4.3% in men and 1.0% in women.[48]

The screening test of choice for AAAs is abdominal ultrasonography, which is performed to detect rupture-prone aneurysms. These AAAs can be repaired surgically prior to a potentially catastrophic event, thereby decreasing AAA-specific mortality. Abdominal ultrasonography

possesses the characteristics of an excellent screening test in that it is noninvasive, relatively inexpensive, and safe, with a sensitivity of 95% and a specificity approaching 100%.[49]

A Cochrane review of four RCTs of population screening for AAAs including 127,981 men and 9342 women showed a significant decrease in AAA-related mortality in men (OR=0.60, 95% CI=0.47, 0.78). No significant decrease in mortality from AAAs was seen in women (OR=1.99, 95% CI=0.36, 10.88). A decreased incidence of ruptured aneurysms was noted in men (OR=0.45, 95% CI=0.21, 0.99). This decrease was not seen in women (OR=1.49, 95% CI=0.25, 8.94).[50]

The benefit of identifying AAAs results from the ability to intervene and surgically repair AAAs, thereby substantially reducing the probability of rupture. The benefit of repairing aneurysms outweighs the risk when the maximal diameter of the aneurysm exceeds 5.5 cm.[51] According to a 2007 study by Kim et al., at 7-year follow-up, the cost effectiveness of AAA screening was estimated to be $19,500 per life-year gained based on mortality related to AAAs and $7600 per life-year gained based on mortality from all causes.[52] Potential harm from screening is minimal from ultrasonography, which has no known risks. Other potential harms include psychological distress and possible complications or adverse outcomes from AAA management once it has been identified. However, there is a 43% relative risk reduction for deaths from AAA with screening.[53]

Recommendations of Other Groups

In 2006 the ACC/AHA published guidelines for managing patients with PAD, including recommendations for AAA screening.[54] They recommended screening in men aged 65–75 years who have ever smoked and in men aged ≥60 years who are the sibling or offspring of someone with an AAA. SVS and the Society for Vascular Medicine and Biology, recommended screening for AAAs using ultrasound in all men aged 60–85 years, women aged 60–95 years with cardiovascular risk factors, and all individuals aged >50 years with a family history of AAA.[55]

The USPSTF recommends a one-time screening using ultrasonography for men aged 65–75 years who have ever smoked. They did not make any recommendations for screening in men who never smoked and recommended against routinely screening for AAAs in women.[53] Although there is recognition by the USPSTF that family history is a risk factor, it is a lesser risk factor than age, male gender, and history of smoking, so they do not recommend routine screening based on family history. However, the USPSTF guidelines discuss the importance of physicians individualizing care for each patient and assessing each individual's risk factors, including family history, and potential to benefit from screening.

ACPM Recommendation and Rationale

AAAs are an important medical issue especially in groups in which the prevalence is high, namely, men aged >65 years who have ever smoked. Ruptured AAAs are often catastrophic events. Ultrasonography is a safe, noninvasive, reliable screening test that can identify AAAs and allow clinicians to take the necessary steps to substantially decrease the morbidity and mortality associated with AAAs.

The ACPM agrees with the recommendations of the USPSTF for one-time screening in men aged 65–75 years who have ever smoked. The College does not currently recommend routine screening in women because it has not been shown to provide any benefit in relation to AAA-related mortality or in decreasing the incidence of ruptured AAAs.

Conclusion

Table 2 provides an overview of recommendations by ACPM and other organizations mentioned in this manuscript. In summary, ACPM does not recommend routine screening of the general adult population using ECG, ETT, EBCT, ABI, carotid IMT, or emerging risk factors including hs-CRP. The College recommends that clinicians use a CHD risk assessment tool such as the FRS to assess CHD risk and to guide risk-based therapy. Although hs-CRP testing should be considered in patients with intermediate (10-year between 10% and 20%) risk of CHD, future studies are need to examine the net benefit of therapy intensification based on this strategy.

ACPM does not recommend routine screening of the general adult population for asymptomatic CAS as the benefits do not outweigh the harms of screening individuals with asymptomatic CAS. ACPM also does not recommend routine screening of the general adult population for asymptomatic PAD. However, clinicians should be alert to symptoms of PAD in people at increased risk and evaluate patients who have clinical evidence of vascular disease. ACPM recommends one-time screening for AAA using ultrasonography in men aged 65–75 years who have ever smoked. However, the College does not recommend routine screening in women because benefit in relation to AAA-related mortality or morbidity has not been proven. Finally, therapeutic lifestyle changes including a heart-healthy diet, regular physical activity, and smoking cessation should be encouraged in addition to

Table 2. Summary of atherosclerotic cardiovascular disease screening recommendations by organizations

Cardiovascular disease	Recommendations by organizations				
	ACPM	USPSTF	ACC/AHA	SVS	Others
CHD	Recommends using CHD risk assessment tool (e.g., FRS) to assess CHD risk Does not recommend routine screening of the general adult population using ECG, exercise-stress testing, CT scanning, ABI, carotid IMT, or emerging risk factors Recommends considering hs-CRP testing in individuals at intermediate (10-year risk of 10%–20%) risk of CHD	Recommends against routine screening with ECG, ETT, or EBCT in low-risk (10-year of <10%) adults[14] Insufficient evidence to recommend for or against routine screening with ECG, ETT, or EBCT in intermediate (10-year risk 10%–20%) risk adults[14] Recommends discussion about the risks and benefits of screening in adults at increased risk[14] Current evidence is insufficient to assess the balance of benefits and harms associated with using nontraditional risk factors to screen asymptomatic adults without a history of CHD to prevent CHD events[4]	Recommends CHD risk assessment using tools (e.g., FRS) to estimate the 10-year risk of CHD events in people with 2 or more risk factors[11] Recommends against screening the general population using CT scanning[11] Recommends against the use of CT scanning (including EBCT) in people at low (<10% for 10-year risk) or high (>20% for 10-year) risk for CHD events[11] However, CT scanning in asymptomatic people at intermediate (10%–20% for 10-year) CHD risk may be reasonable. Recommends against the use of inflammatory markers (including hs-CRP) in screening the general population for cardiovascular risk Recommends the (optional) use of hs-CRP in patients preclassified at intermediate (10%–20% for 10-year) risk of CHD[12]	—	ATP III[13]: Recommends the use of Framingham predictors of 10-year risk of CHD in people with multiple risk factors to identify individuals who may benefit from more intensive treatment Recognizes that emerging risk factors and tests that detect subclinical atherosclerotic disease appear to contribute to CHD risk to varying degrees and can have utility to guide intensity of risk-reducing therapies in selected people SHAPE[15]: Recommends screening of asymptomatic middle-aged adults (men aged 45–75 years and women aged 55–75 years) with atherosclerotic screening tests such as CAC or carotid IMT
CAS	Routine screening not recommended	Recommends against screening[23]	Recommends against ultrasound screening for carotid artery stenosis[24]	Recommends carotid artery ultrasound to assess stroke risk in high-risk individuals[a26]	—
PAD	Routine screening not recommended	Recommends against screening[40]	Recommends the use of ABI for screening in appropriately targeted populations, but further cost-effectiveness analysis needed.[24] Individuals with asymptomatic lower-extremity PAD should be identified by examination, including ABI[39]	Recommends PAD screening in high-risk individuals[a] by obtaining blood pressure measurements in the legs[26]	ADA[41]: Recommends annual screening for PAD in people with diabetes. ABI should be considered in screening diabetic patients for asymptomatic PAD SIR[42]: Recommends that all patients being evaluated for peripheral vascular disease should have their ABI measured
AAA	Recommends AAA screening in men aged 65–75 years who have ever smoked Routine AAA screening in women not recommended	Recommends a one-time screening using ultrasonography for men aged 65–75 years who have ever smoked[53] Recommends against routinely screening for AAAs in women[53]	Recommend screening in men aged 65–75 years who have ever smoked and in men aged ≥60 years who are the sibling or offspring of someone with an AAA[54]	Recommends screening for AAAs using ultrasound in all men aged 60–85 years, women aged 60 –95 years with cardiovascular risk factors, and all individuals aged >50 years with a family history of AAA[55]	—

[a]High-risk individuals include those aged ≥55 years with cardiovascular risk factors such as a history of hypertension, diabetes mellitus, smoking, hypercholesterolemia, or known cardiovascular disease.
AAA, abdominal aortic aneurysm; ABI, ankle–brachial index; ACC, American College of Cardiology; ACPM, American College of Preventive Medicine; ADA, American Diabetes Association; AHA, American Heart Association; ATP, Adult Treatment Panel; CAC, coronary artery calcium; CAS, carotid artery stenosis; CHD, coronary heart disease; CT, computed tomography; EBCT, electron beam computed tomography; ECG, electrocardiogram; ETT, exercise treadmill testing; FRS, Framingham Risk Score; Hs-CRP, highly sensitive C-reactive protein; IMT, intima media thickness; PAD, peripheral artery disease; SHAPE, Screening for Heart Attack Prevention and Education; SIR, The Society of Interventional Radiology; SVS, The Society for Vascular Surgery; USPSTF, U.S. Preventive Services Task Force

other pharmacologic risk reduction strategies for individuals at risk for any ASCVD.

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