Screening for Coronary Heart Disease: Recommendation Statement

U.S. Preventive Services Task Force

This statement summarizes the current U.S. Preventive Services Task Force (USPSTF) recommendations on screening for coronary heart disease and the supporting scientific evidence, and updates the 1996 recommendations contained in the *Guide to Clinical Preventive Services, Second Edition: Periodic Updates*.[1] Explanations of the ratings and of the strength of overall evidence are given in Appendix A and in Appendix B, respectively. The complete information on which this statement is based, including evidence tables and references, is available in the summary summary of the evidence [2] and the systematic evidence review[3] on this topic, available through the USPSTF Web site (www.preventiveservices.ahrq.gov) and through the National Guideline Clearinghouse™ (www.guideline.gov). The summary summary of the evidence and the recommendation statement are also available from the Agency for Healthcare Research and Quality (AHRQ) Publications Clearinghouse in print through subscription to *the Guide to Clinical Preventive Services, Third Edition: Periodic Updates*. To order, contact the clearinghouse at 1-800-358-9295 or e-mail ahrqpubs@ahrq.gov.

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This recommendation first appeared in *Ann Intern Med*. 2004;140:570-3.

Summary of Recommendations

The U.S. Preventive Services Task Force (USPSTF) recommends against routine screening with resting electrocardiography (ECG), exercise treadmill test (ETT), or electron-beam computerized tomography (EBCT) scanning for coronary calcium for

either the presence of severe coronary artery stenosis (CAS) or the prediction of coronary heart disease (CHD) events in adults at low risk for CHD events. **D recommendation.**

*The USPSTF found at least fair evidence that ECG or ETT can detect some asymptomatic adults at increased risk for CHD events independent of conventional CHD risk factors (*see Clinical Considerations*), and that ETT can detect severe CAS in a small number of asymptomatic adults. Similar evidence for EBCT is very limited. In the absence of evidence that such detection by ECG, ETT or EBCT among adults at low risk for CHD events ultimately results in improved health outcomes, and because false-positive tests are likely to cause harm, including unnecessary invasive procedures, over-treatment, and labeling, the USPSTF concluded that the potential harms of routine screening for CHD in this population exceed the potential benefits.*

The USPSTF found insufficient evidence to recommend for or against routine screening with ECG, ETT, or EBCT screening for coronary calcium for either the presence of severe CAS or the prediction of CHD events in adults at increased risk for CHD events. **I recommendation.**

The USPSTF found inadequate evidence to determine the extent to which the added detection offered by ECG, ETT, or EBCT (beyond that obtained by ascertainment of conventional CHD risk factors;, see Clinical Considerations) *would result in interventions that lead to improved CHD-related health outcomes among adults at increased risk for future CHD events. Although there is limited evidence to determine the magnitude of harms from screening in this population, harms from false-positive tests (ie, unnecessary invasive procedures, over-treatment, and labeling) are likely to occur. As a result, the USPSTF could not determine the balance between benefits and harms of screening this population for CHD.*

Clinical Considerations

- Several factors are associated with a higher risk for CHD events (the major ones are nonfatal myocardial infarction and coronary death), including older age, male gender, high blood pressure, smoking, abnormal lipid levels, diabetes, obesity, and sedentary lifestyle. A person's risk for CHD events can be estimated based on the presence of these factors. Calculators are available to ascertain a person's risk for having a CHD event; for example, a calculator to estimate a person's risk for a CHD event in the next 10 years can be accessed at

http://hin.nhlbi.nih.gov/atpiii/calculator.asp?usertype=prof. Although exact risk factors that constitute each of these categories (low or increased risk) have not been established, younger adults (ie, men < 50 years and women < 60 years) who have no other risk factors for CHD (< 5%-10% 10-year risk) are considered to be at low risk. Older adults, or younger adults with 1 or more risk factors (>15%-20% 10-year risk), are considered to be at increased risk.

- Screening with ECG, ETT, and EBCT could potentially reduce CHD events in 2 ways: either by detecting people at high risk for CHD events who could benefit from more aggressive risk factor modification, or by detecting people with existing severe CAS whose life can be prolonged by coronary artery bypass grafting (CABG) surgery. However, the evidence is inadequate to determine the extent to which people detected through screening in either situation would benefit from either type of intervention.
- Even if there is benefit from screening, the consequences of false-positive tests may potentially outweigh any benefit. False-positive tests are common in asymptomatic adults, especially among women, and may lead to unnecessary diagnostic testing, over-treatment, and labeling.
- Because the sensitivity of these tests is limited, screening would also result in many false-negative results. A negative test does not rule out the presence of severe CAS or a future CHD event.
- For people in certain occupations, such as pilots and heavy equipment operators (for whom sudden incapacitation or sudden death may endanger the safety of others), considerations other than the health benefit to the individual patient may influence the decision to screen for CHD.
- Although some exercise programs initially screen asymptomatic participants with ETT, there is not enough evidence to determine the balance of benefits and harms of this practice.

Discussion

CHD is the leading cause of death in the United States; more than 700,000 of the deaths in 2000 were due to heart disease.[4] The overall estimated costs of CHD and stroke were about $300 on in 2001.[5]

Many clinicians ascertain a person's overall risk for CHD events by screening for cardiac risk factors and incorporating that information into risk prediction equations derived from the Framingham or other cohort studies.[3, 6] Asymptomatic adults clearly benefit from risk factor modification proportional to their degree of CHD risk (ie, more intensive risk factor modification for people at higher risk).[7] Since those at high risk for CHD may already be receiving interventions to maximally reduce their risk for CHD events, screening may potentially be of greatest benefit to those presumed to be at intermediate risk for CHD who could be reclassified as being at high risk (and thus treated more aggressively) after additional testing. In addition, symptomatic people with severe CAS (ie, triple vessel or left main coronary artery atherosclerotic disease with poor left ventricular function) clearly benefit from CABG or percutaneous transluminal coronary angioplasty (PTCA) .[8-10] Among those who are asymptomatic, people with higher CHD risk have a higher prevalence of severe CAS;; thus, the yield of screening is expected to be greater in this population. However, it is uncertain whether this increased yield increases the detection of people with severe CAS to an important degree, and whether invasive revascularization procedures would benefit those who are asymptomatic as much as those who have symptoms of CAS.

The USPSTF reviewed the evidence as to whether supplementing the conventional CHD risk ascertainment strategy with additional screening using ECG, ETT, or EBCT, or using these 3 tests to identify people with severe CAS earlier, would lead to improved health outcomes in asymptomatic persons. The USPSTF found no randomized controlled trials (RCTs) with health outcomes that examined the extent to which ECG, ETT, or EBCT nning for coronary calcium provided additional prognostic information beyond the currently used risk factor calculations. The Task Force further found that the 3 screening tests – ECG, ETT and EBCT – have poor to fair accuracy in predicting CHD events.

Systematic reviews have reported that the sensitivity of resting ECG abnormalities for CHD events is low.[3, 11] The prevalence of the most common ECG abnormalities (Q waves, left ventricular hypertrophy, bundle-branch blocks, and ST-segment depression) ranges from 1% to 10%.[3] Only a few studies have examined ECG abnormalities in the black population. Although major ECG abnormalities may be more prevalent in black men than in white men, these abnormalities may not confer the same risk for CHD death in black men (relative risk [RR], 1.95; 95% confidence interval [CI], 0.93-4.11) as in white men (RR, 2.72; 95% CI, 1.47-5.04).[12]

The sensitivity of ETT for the prediction of CHD events 3 to12 years in the future ranges from 40% to 62%; the positive predictive value (PPV) ranges from 6% to 48%. The higher sensitivity of ETT reported in older studies may not be accurate because of the possibility of spectrum bias.[13, 14] The prevalence of an abnormal ETT (ST-segment depression of ≥ 1 mm) reportedly ranges from 5% to 25%.[3] The yield of ETT in detecting severe CAS in asymptomatic middle-aged men is estimated to be 0.5%.[3, 15] The PPV for future CHD in recent cohort studies (most of them conducted with asymptomatic men) is low (range, 6%-48%).[3] Adding nuclear perfusion to ECG analysis may increase sensitivity somewhat; however, the low PPV of ETT is due mainly to the low prevalence of CHD in asymptomatic persons and cannot be corrected by simply improving test accuracy.

For patients with symptoms of CHD, EBCT has a sensitivity of 80% and a specificity of 40% for detecting angiographically demonstrated CAS[16]; similar data for those who have no symptoms are lacking. A systematic review reported that higher calcium scores on EBCT were associated with higher risk for CHD events.[3] This review concluded that EBCT may have a role in better defining risk for CHD events in those who have been identified as being at intermediate risk based on traditional risk factors, but no study has examined the effect of EBCT data on clinical decision-making.[3]

Potential harms of screening asymptomatic patients for CHD include unnecessary invasive testing (eg, coronary angiography) and “labeling” of those who have had false-

positive test results. In low-risk asymptomatic populations, most positive ECG test results occur in those who will not have a CHD event in the next 5 to 10 years.[3] One study reported that 71% of those without symptoms who had an abnormal ETT had no angiographically demonstrable CAS.[17] While the yield of screening is low in those at low risk for CHD, the potential for harm from false-positive tests is high. The USPSTF judged that the benefits of screening people at low risk for CHD would not outweigh the potential harms.

Due to the limited sensitivity of resting ECG and the low prevalence of CHD in asymptomatic adults, a majority of CHD events will occur among those with an initially normal ECG (ie, those who test false negative).[18] ETT can be normal or non-diagnostic in a large proportion of patients who will go on to have a CHD event, which may be explained partly by the fact that many acute CHD events result from sudden occlusion of a previously unobstructed artery segment.[19]

A large study, the Multi-Ethnic Study of Atherosclerosis (MESA), is ongoing.  a from this study will help to examine the independent prognostic information  ved from EBCT in the context of accurate measurement of traditional risk factors and extended follow-up.[20] In the absence of such data for ECG, ETT, or EBCT, the USPSTF concluded that there is insufficient evidence to recommend for or against screening for CHD.

Recommendations of Others

The American College of Cardiology/American Heart Association (ACC/AHA) gave a class III recommendation for routine screening with exercise testing in asymptomatic persons without known coronary artery disease (CAD). For the evaluation of those with multiple risk factors as a guide to risk-reduction therapy, and for the evaluation of asymptomatic men older than 45 and women older than 55 who a) plan to start vigorous exercise, b) are involved in occupations in which impairment might impact public safety, or c) are at high risk for CAD due to other diseases, the ACC/AHA gave a class IIb

recommendation. For the evaluation of asymptomatic persons with diabetes who plan to start vigorous exercise, the ACC/AHA gave a class IIa recommendation.[21] The ACC/AHA Writing Group does not recommend EBCT to diagnose obstructive CAD.[16] The American Academy of Family Physicians does not recommend use of routine ECG as part of a periodic health or a pre-participation physical exam in either asymptomatic children or adults.[22]

References

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