

U.S. Preventive Services Task Force

Screening for Cardiovascular Disease Risk with Electrocardiography: Recommendation Statement

Summary of Recommendations and Evidence

The USPSTF recommends against screening with resting or exercise electrocardiography (ECG) to prevent cardiovascular disease (CVD) events in asymptomatic adults at low risk of CVD events (Table 1). (**D recommendation**)

The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of screening with resting or exercise ECG to prevent CVD events in asymptomatic adults at intermediate or high risk of CVD events. (**I statement**)

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

Rationale

IMPORTANCE

CVD, which encompasses atherosclerotic conditions such as coronary heart disease, cerebrovascular disease, and peripheral arterial disease, is the most common cause of death among adults in the United States. Treatment to prevent CVD events by modifying risk factors is currently informed by CVD risk assessment with tools such as the Framingham Risk Score or the Pooled Cohort Equations, which stratify individual risk

to inform treatment decisions. If existing CVD risk assessment tools could be improved, treatment might be better targeted, thereby maximizing the benefits of and minimizing the harms of screening.

DETECTION

The USPSTF found inadequate evidence to determine whether adding resting or exercise ECG to conventional risk factor assessment leads to improved risk stratification of persons to inform treatment decisions.

BENEFITS OF EARLY DETECTION AND INTERVENTION AND TREATMENT

The USPSTF found inadequate evidence to determine whether the incremental information offered by resting or exercise ECG (beyond that obtained with traditional CVD risk factors) can be used to guide treatment decisions and ultimately reduce CVD events.

Based on the epidemiology and natural history of CVD and established treatment strategies based on risk stratification, it is unlikely that the benefits of screening with resting or exercise ECG in asymptomatic adults at low risk of CVD events are greater than small.

See the Clinical Considerations section for definition of risk categories and assessment of risk.

HARMS OF EARLY DETECTION AND INTERVENTION AND TREATMENT

The USPSTF found adequate evidence that screening with resting or exercise ECG in asymptomatic adults leads to harms that are at least small and may be moderate, including unnecessary invasive procedures, overtreatment, and labeling.

USPSTF ASSESSMENT

The USPSTF concludes with moderate certainty that the potential harms of screening with resting

See related Putting Prevention into Practice on page 375.

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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 <https://www.uspreventiveservicestaskforce.org/>.

This series is coordinated by Kenny Lin, MD, Deputy Editor.

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

TABLE 1

Screening for CVD Risk with ECG: Clinical Summary of the USPSTF Recommendations

Population	Adults at low risk of CVD events	Adults at intermediate or high risk of CVD events
Recommendations	Do not screen with resting or exercise ECG. Grade: D	No recommendation. Grade: I (insufficient evidence)
Risk assessment	Risk factors for CVD events include older age, male sex, high blood pressure, current smoking, abnormal lipid levels, diabetes, obesity, and physical inactivity. Several calculators and models are available to quantify a person's 10-year risk of CVD events; the USPSTF recommends that clinicians use the Pooled Cohort Equations to assess CVD risk.	
Screening tests	Resting ECG records cardiac electrical activity while the patient is at rest, over a short period. Exercise ECG records cardiac electrical activity during physical exertion, often at a prespecified intensity level. The most common method of exercise ECG is the treadmill test. Both resting and exercise ECG look for markers of previous myocardial infarction, myocardial ischemia, and other cardiac abnormalities (such as left ventricular hypertrophy, bundle branch block, or arrhythmia) that may be associated with CVD or predict future CVD events.	
Treatments	Asymptomatic adults at increased risk of CVD events are usually treated with a combination of diet and exercise modifications, lipid-lowering medications, aspirin, hypertension management, and interventions to encourage tobacco cessation.	
Other relevant USPSTF recommendations	The USPSTF has made recommendations on many factors related to CVD prevention, including screening for high blood pressure, use of statins, counseling on smoking cessation, and counseling to promote healthful diet and physical activity. In addition, the USPSTF recommends low-dose aspirin use in certain persons at increased risk of CVD events.	

Note: For a summary of the evidence systematically reviewed in making this recommendation, the full recommendation statement, and supporting documents, go to <https://www.uspreventiveservicestaskforce.org/>.

CVD = cardiovascular disease; ECG = electrocardiography; USPSTF = U.S. Preventive Services Task Force.

or exercise ECG to prevent CVD events equal or exceed the potential benefits in asymptomatic adults at low risk of CVD events.

The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of screening with resting or exercise ECG to prevent CVD events in asymptomatic adults at intermediate or high risk of CVD events.

Clinical Considerations

PATIENT POPULATION UNDER CONSIDERATION

This recommendation applies to adults without symptoms of or a diagnosis of CVD.

SUGGESTIONS FOR PRACTICE REGARDING THE I STATEMENT

In deciding whether to screen with resting or exercise ECG in asymptomatic adults at intermediate or high risk of CVD events, clinicians should consider the following information.

Potential Preventable Burden. Although evidence is insufficient to determine whether screening with ECG in adults is beneficial, those who may be at increased risk of CVD events might have the greatest potential for net benefit. Reclassification into a higher risk category might lead to more intensive medical management that could lower the risk of CVD events but might also result in harms, including adverse medication effects such as gastrointestinal bleeding and hepatic injury. Regardless of ECG findings, persons who are already at high risk of CVD events should receive intensive risk factor modification. Persons who are classified as low risk are unlikely to benefit from screening with ECG.

For persons in certain occupations, such as pilots and operators of heavy equipment, for whom sudden incapacitation or death may endanger the safety of others, considerations other than the health benefit to the patient may influence the decision to screen with ECG to prevent CVD events.

Potential Harms. In all risk groups, an abnormal ECG finding (a true-positive or false-positive result) can lead to invasive confirmatory testing and treatment that have the potential for serious harm, including unnecessary radiation exposure. Two studies of asymptomatic adults with diabetes reported that 6% and 12% of patients who were screened with exercise ECG subsequently underwent angiography, and 3% to 5% underwent revascularization, without evidence of benefit to the study patients.^{1,2} Angiography and revascularization are associated with harms, including bleeding, contrast-induced nephropathy, cardiac arrhythmia, stroke, myocardial infarction, coronary artery dissection, allergic reaction to the contrast agent, and death.

Current Practice. Although many guideline groups recommend cardiovascular risk assessment, there are few data on how this is applied in clinical practice. Only 41% of respondents in a survey of more than 900 U.S. clinicians reported using cardiovascular risk prediction equations in practice.³ There are few data on the use of ECG to assess CVD risk in asymptomatic patients in the United States. A Canadian retrospective cohort study from 2010 to 2015 found that 21.5% of low-risk primary care patients had an ECG within 30 days of an annual health examination, and the proportion of patients who had an ECG ranged across clinics from 1.8% to 76.1%.⁴

ASSESSMENT OF RISK

Accurate identification of persons at high risk of CVD events provides the opportunity for more intensive risk factor management to reduce the likelihood of such an event. In addition, identifying persons at low risk may allow for a reduction in interventions among patients not likely to benefit from them.

Several factors are associated with an increased risk of CVD events, including older age, male sex, high blood pressure, current smoking, abnormal lipid levels, diabetes, obesity, and physical inactivity. Risk factors are combined in many ways to estimate a person's risk of a CVD event. Several calculators and models are available to quantify a person's 10-year risk of CVD events. The Framingham Risk Score,⁵ based on data from the Framingham Heart Study, was one of the first widely used CVD risk assessment tools. Persons with a 10-year CVD event risk greater than 20% are generally considered high risk, those with a 10-year CVD event risk less than 10% are

considered low risk, and those with a 10-year CVD event risk of 10% to 20% are considered intermediate risk. The Pooled Cohort Equations, introduced by the American College of Cardiology and American Heart Association in 2013, include the same variables as the Framingham Risk Score as well as race/ethnicity and diabetes. Persons with a 10-year CVD event risk less than 7.5% are considered at low risk, and those with a 10-year CVD event risk of 7.5% or greater are considered at elevated risk.⁶ The USPSTF recommends that clinicians use the Pooled Cohort Equations to assess CVD risk.

SCREENING TESTS

Both resting and exercise ECG are used for the diagnostic evaluation of suspected CVD, which has led to the suggestion that ECG could also be used to screen asymptomatic persons to identify those who would benefit from earlier, more intensive management of modifiable risk factors, preventive interventions, or both. Resting ECG records cardiac electrical activity while the patient is at rest, over a short period of time. Standard ECG testing is performed with 12 leads, although some tests use fewer leads. More recently, ECG leads have been built into blood pressure cuffs, smartphones, and other devices. Exercise ECG records cardiac electrical activity during physical exertion, often at a prespecified intensity level. The most common method of exercise ECG is the treadmill test, but other methods, such as those using bicycles and ergometers, have also been used. Both resting and exercise ECG look for markers of previous myocardial infarction, myocardial ischemia, and other cardiac abnormalities (such as left ventricular hypertrophy, bundle branch block, or arrhythmia) that may be associated with CVD or predict future CVD events.

TREATMENT AND INTERVENTIONS

Asymptomatic adults at increased risk of CVD events are usually treated with a combination of diet and exercise modifications, lipid-lowering medications, aspirin, hypertension management, and interventions to encourage tobacco cessation. Recommendations for diet and exercise modifications, lipid-lowering medications, and aspirin are based on level of cardiovascular risk. Recent guidelines also recommend risk stratification of hypertension treatment⁷; the recommendation for tobacco cessation applies to all persons regardless of CVD risk.

USEFUL RESOURCES

The USPSTF has made recommendations on many factors related to CVD prevention, including screening for high blood pressure,⁸ use of statins,⁹ counseling on smoking cessation,¹⁰ and counseling to promote healthful diet and physical activity.¹¹ In addition, the USPSTF recommends low-dose aspirin use in certain persons at increased risk of CVD events.¹²

Other resources are also available from the National Heart, Lung, and Blood Institute¹³; Centers for Disease Control and Prevention¹⁴; and Healthy People 2020.¹⁵

This recommendation statement was first published in *JAMA*. 2018;319(22):2308-2314.

The “Other Considerations,” “Discussion,” “Update of Previous USPSTF Recommendation,” and “Recommendations of Others” sections of this recommendation statement are available at <https://www.uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementFinal/cardiovascular-disease-risk-screening-with-electrocardiography>.

The USPSTF recommendations are independent of the U.S. government. They do not represent the views of the Agency for Healthcare Research and Quality, the U.S. Department of Health and Human Services, or the U.S. Public Health Service.

References

- Lièvre MM, Moulin P, Thivolet C, et al.; DYNAMIT Investigators. Detection of silent myocardial ischemia in asymptomatic patients with diabetes: results of a randomized trial and meta-analysis assessing the effectiveness of systematic screening. *Trials*. 2011;12:23.
- Turrini F, Scarlini S, Mannucci C, et al. Does coronary atherosclerosis deserve to be diagnosed early in diabetic patients? The DADDY-D trial. Screening diabetic patients for unknown coronary disease. *Eur J Intern Med*. 2015; 26(6):407-413.
- National Heart, Lung, and Blood Institute. Assessing cardiovascular risk: systematic evidence review from the Risk Assessment Work Group. November 2013. <https://www.nhlbi.nih.gov/health-topics/assessing-cardiovascular-risk>. Accessed April 24, 2018.
- Bhatia RS, Bouck Z, Ivers NM, et al. Electrocardiograms in low-risk patients undergoing an annual health examination. *JAMA Intern Med*. 2017;177(9):1326-1333.
- Framingham Heart Study. Cardiovascular disease (10-year risk). 2018. <https://www.framinghamheartstudy.org/fhs-risk-functions/cardiovascular-disease-10-year-risk/>. Accessed April 24, 2018.
- Goff DC Jr., Lloyd-Jones DM, Bennett G, et al. 2013 ACC/AHA guideline on the assessment of cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines [published correction appears in *J Am Coll Cardiol*. 2014; 63(25 pt B):3026]. *J Am Coll Cardiol*. 2014;63(25 pt B): 2935-2959.
- Whelton PK, Carey RM, Aronow WS, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines [published correction appears in *J Am Coll Cardiol*. 2018;71(19):2275-2279]. *J Am Coll Cardiol*. 2018;71(19): e127-e248.
- U.S. Preventive Services Task Force. Screening for high blood pressure in adults: U.S. Preventive Services Task Force recommendation statement. *Ann Intern Med*. 2015; 163(10):778-786.
- Bibbins-Domingo K, Grossman DC, Curry SJ, et al.; US Preventive Services Task Force. Statin use for the primary prevention of cardiovascular disease in adults: US Preventive Services Task Force recommendation statement. *JAMA*. 2016;316(19):1997-2007.
- U.S. Preventive Services Task Force. Behavioral and pharmacotherapy interventions for tobacco smoking cessation in adults, including pregnant women: U.S. Preventive Services Task Force recommendation statement. *Ann Intern Med*. 2015;163(8):622-634.
- U.S. Preventive Services Task Force. Behavioral counseling to promote a healthful diet and physical activity for cardiovascular disease prevention in adults with cardiovascular risk factors: U.S. Preventive Services Task Force recommendation statement. *Ann Intern Med*. 2014;161(8): 587-593.
- Bibbins-Domingo K; U.S. Preventive Services Task Force. Aspirin use for the primary prevention of cardiovascular disease and colorectal cancer: U.S. Preventive Services Task Force recommendation statement. *Ann Intern Med*. 2016;164(12):836-845.
- National Heart, Lung, and Blood Institute. NHLBI publications and resources. <https://catalog.nhlbi.nih.gov/>. Accessed April 24, 2018.
- Centers for Disease Control and Prevention. Prevention works: CDC strategies for a heart-healthy and stroke-free America. July 23, 2013. https://www.cdc.gov/dhdsp/prevention_works.htm. Accessed April 24, 2018.
- Healthy People 2020. Evidence-based resources. <https://www.healthypeople.gov/2020/tools-resources/Evidence-Based-Resources>. Accessed April 24, 2018. ■