Chest pain is a leading cause of visits to the emergency department (ED), accounting for 5% of the 115 million ED visits in the United States in 2005. A key concern in evaluating chest pain is ruling out CAD as the cause. Alternative etiologies are numerous, including aortic stenosis, hypertrophic cardiomyopathy, hypertensive urgency, and esophageal, lung, and chest wall conditions. In addition, coronary artery angiography can reveal Kawasaki disease, coronary artery spasm, coronary artery anomaly, or dissection. The approach to excluding CAD in a patient with chest pain begins with a pertinent history, physical examination, and electrocardiogram (ECG). Findings on these initial assessments dictate further evaluation, which can include serum cardiac enzyme assay, chest radiographs, and cardiac stress tests (Table 1). Physicians should be familiar with the various stress testing modalities and be able to select an appropriate test based on a patient’s risk profile and other factors. This article discusses the use of stress tests for diagnosis and risk stratification of patients with suspected CAD, with a focus on test methods and test selection.

STRESS TEST MODALITIES AND METHODS
Tests to evaluate for the presence of CAD assess either cardiac function or anatomy. Stress tests are functional tests that demonstrate the consequence of inducible myocardial ischemia on ECG or imaging (Figure 1 and Figure 2). Stress on the heart in a patient with CAD initiates a cascade of events in which inadequate myocardial oxygen delivery precedes left ventricular diastolic and systolic dysfunction by 10 to 20 seconds, which manifests on ECG as nonspecific ST-T wave abnormalities and clinically as angina pectoris. Hemodynamically significant lesions in the coronary arteries must be present for functional tests to be abnormal.

TAKE HOME POINTS
- Deciding whether to perform a cardiac stress test to assess for coronary artery disease (CAD) in an adult with chest pain as well as the selection of a specific test begins with determining the patient’s pretest probability of CAD.
- For patients with low pretest probability of CAD, attention is focused on identifying noncardiac causes of chest pain. Exercise stress testing (EST) without imaging is a reasonable screening test if desired.
- EST is recommended by American College of Cardiology/American Heart Association guidelines as the initial test in patients with intermediate pretest probability of CAD.
- Imaging as an adjunct to EST incrementally improves the insight of CAD testing when chosen for the proper patient populations, which include those with an abnormal EST, intermediate and high pretest probability of CAD, or depressed ST segment on baseline electrocardiogram.
- Choosing among stress echocardiography and nuclear imaging depends on a patient’s risk for CAD, electrocardiographic findings, and comorbidities as well as local expertise in the modalities.

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The basic cardiac stress test is the exercise stress test with ECG monitoring, or EST. This test monitors symptoms and ECG changes associated with ischemia. In addition to EST evaluation for CAD, imaging of the heart can be performed. Cardiac imaging reveals reversible defects in cardiac function or blood supply. Stress echocardiogram measures wall motion and dilation before and after stressing, and changes in wall motion function are considered positive for possible CAD. Nuclear studies, such as single photon emission computed tomography (SPECT) myocardial perfusion imaging, measure blood flow to the heart before and after stress. Changes in blood flow are considered positive for possible CAD. There are reversible and fixed blood flow defects, the latter of which is considered consistent with an infarct. If a patient has an abnormal result on a stress test, coronary artery catheterization may be performed. Patients at high risk for mortality from CAD may proceed directly to coronary angiography in order to avoid the possibility of a false-negative stress test.6

In cases where exercise is not possible, pharmacologic agents can be used to stress the heart.7–9 However, a normal exercise stress test is more reassuring than a normal pharmacologic stress test.8 Pharmacologic agents used for stress testing include adenosine, dipyridamole, and dobutamine. Adenosine and dipyridamole are perfusion agents most frequently used with nuclear imaging of the heart, although they can be used with all types of stress tests. The agents are administered over a course of minutes.10 Usually myocardial ischemia is not induced, but patients with severe lesions may have ischemia.11 Aminophylline can reverse the side effects of ischemia induced by dipyridamole. Undesirable effects of pharmacologic agents include atrioventricular nodal block, peripheral vasodilation, and bronchospasm.11 Hypotension, uncontrolled asthma, severe chronic obstructive pulmonary disease, second- or third-degree heart block, and use of oral dipyridamole are contraindications to their use.10,11

Dipyridamole increases arterial levels of adenosine, which in turn induces vasodilation of coronary arteries, resulting in a fourfold increase in myocardial blood flow.9,11 Arteries with arteriosclerosis do not respond to the vasodilating effects of dipyridamole, and a relative perfusion difference can be imaged.9 Blood flows to the path of least resistance, thus bypassing an area of stenosis and creating a perfusion defect on imaging.

Dobutamine stimulates cardiac β receptors, causing increased heart rate, blood pressure, and contractility in a dose-related fashion.11 These effects cause increased blood flow to myocardium supplied by normal arteries, while flow is increased to a lesser extent in areas supplied by stenotic vessels.7–9,11 This flow differential is significantly less than that obtained with adenosine or dipyridamole because the tachycardia induced by dobutamine abbreviates diastolic filling time.11 Patients with recent myocardial infarction, unstable angina, uncontrolled hypertension, tachyarrhythmias, severe aortic stenosis, or aneurysm should not receive dobutamine.11 Also, recent β-blocker use can attenuate response.

### Exercise Stress Testing

EST is a cardiovascular test in which exercise on a treadmill or cycle ergometer is used to increase cardiac effort while the patient undergoes electrocardiographic and blood pressure monitoring.10 The advantages of EST include low cost, ease of testing in ambulatory settings, ability to be performed by credentialed noncardiologists, and low risk for complications. Risk of infarction or death during EST is estimated at 1 event per 2500
The test is considered abnormal if (1) ischemic chest pain occurs, and/or (2) horizontal or down sloping ST depression of 1 mm or greater occurs, or (3) ST elevation of 1 mm or greater occurs. A blunted blood pressure response or hypotension may suggest multivessel or a high-grade coronary artery lesion, such as in the left main artery. EST should not be used in patients with abnormalities of the ST segment in lead V₅, which make interpretation unreliable. Full EST standards are available from the American Heart Association (AHA).

Patients referred for EST must be able to walk briskly on a treadmill to achieve a goal heart rate of 85% to 100% of the age-predicted maximum calculated from the formula: 220 – age. Obstacles to the use of exercise include musculoskeletal problems, lung disease, vascular disease, or lack of motivation. In these instances, a pharmacologic stress is an alternative. A report of the EST is made that includes the patient’s symptoms, exercise capacity, blood pressure pattern, ECG changes, and overall risk assessment for CAD.

Studies comparing EST with the gold standard of coronary angiography in groups that excluded post–myocardial infarction patients and other biases found a sensitivity of 50% and specificity of 90% for detecting coronary lesions that obstruct over 50% of the lumen diameter. Meta-analysis of more inclusive studies revealed a sensitivity of 67% and specificity of 72% for CAD (Table 2). A number of prediction equations for use in conjunction with EST have been proven valid for patients without established CAD over a 5-year follow-up. The Duke treadmill score categorizes patients as low, intermediate or high risk using exercise time, exercise capacity (as metabolic equivalents), and whether exercise angina occurred to predict posttest probability of CAD. Others have developed and validated a treadmill score that incorporates maximum heart rate, exercise ST depression, age, angina history, smoking, diabetes, estrogen status, and whether angina stopped the test.

**Stress Echocardiogram**

Two-dimensional echocardiography can provide information about the anatomy of the myocardium, cardiac valves, and great vessels as well as information about the function of the right and left ventricles of the heart at a relatively low cost. Echocardiography can show left ventricular systolic or diastolic dysfunction, the extent of wall-motion abnormalities from myocardial infarction, and the presence of stress-induced ischemia. Stress echocardiography can be accomplished with the same exercise or chemical agents used for EST and nuclear cardiac studies. In performing this test, a baseline resting image of heart function is first obtained by a technician using a handheld ultrasound transducer, and then blood pressure and ECG monitoring is started while the patient’s heart is stressed. The test is stopped if there are concerning ECG changes, if limiting chest pain occurs, or once the goal heart rate is obtained. Repeat imaging of the stressed heart is then obtained. The patient’s body habitus can be a limiting factor in obtaining useful images.

Stress echocardiography with pharmacologic agents may have a lower sensitivity for detecting single-vessel...
disease than for multivessel disease.\textsuperscript{9} Reported sensitivities range from 75% to 93% and specificities range from 79% to 92% (Table 2).\textsuperscript{9,18,19}

\textbf{Nuclear Stress Testing}

SPECT myocardial perfusion imaging (SPECT MPI) is a nuclear medicine study that uses a gamma camera to obtain images of the heart in 2 dimensions from multiple angles. These data are then reconstructed by computer software into 3 dimensional data which can be viewed in slices on different axes. The camera is rotated around the patient similar to a conventional computed tomography (CT) scan; however, image acquisition time with SPECT is longer (15–20 min) than that of CT scan. Multiheaded cameras can shorten imaging time. SPECT imaging can be triggered by ECG monitoring to obtain images at a specific point in the cardiac cycle, a technique called gating.\textsuperscript{24} Gated SPECT allows consideration of wall motion and thickening in the interpretation of the images, which can increase specificity by helping to differentiate true perfusion abnormalities from artifacts such as breast and diaphragm attenuation.\textsuperscript{25} Left ventricular ejection fractions are also computed with the use of cardiac gating.\textsuperscript{25}

The radiotracers routinely used in MPI are thallium and the technetium (Tc 99m) tracers sestamibi, tetrofosmin, and teboroxime.\textsuperscript{10,11,26} Thallium 201 (Tl-201) is an analogue of potassium that is renally excreted. The Tc 99m tracers are lipid soluble, extracted by the hepatobiliary system, and excreted through the gastrointestinal tract. The imaging procedure is performed with 1-day and 2-day protocols. In the ideal scenario, stress and rest images are obtained on separate days to avoid residual activity from the initial radiotracer interfering with subsequent images.\textsuperscript{11} This protocol is preferable in large or overweight individuals (> 250 lb or body mass index > 30 kg/m$^2$) or in women in whom breast attenuation is anticipated.\textsuperscript{11} Although the lower initial dose used in the 1-day protocol may result in suboptimal images, the

\begin{table}[h]
\centering
\begin{tabular}{|l|c|c|}
\hline
\textbf{Test} & \textbf{Sensitivity, \%} & \textbf{Specificity, \%} \\
\hline
Exercise stress test & 67 & 72 \\
Exercise stress echo & 81 & 86 \\
Dobutamine stress echo & 75–93 & 79–92 \\
Adenosine stress echo & 62–79 & 88–93 \\
Dipyridamole stress echo & 66–74 & 90–95 \\
Dobutamine SPECT & 77–87 & 70–79 \\
Adenosine SPECT & 89–92 & 70–79 \\
Dipyridamole SPECT & 84–93 & 54–74 \\
Coronary artery calcium score & 87–91 & 91–96 \\
MRI angiography & 72 & 86 \\
\hline
\end{tabular}
\caption{Sensitivities and Specificities of Tests for Coronary Artery Disease}
\end{table}

Data from references 4, 9, 16–20.

Echo = echocardiogram; MRI = magnetic resonance imaging; SPECT = single photon emission computed tomography.
CT angiography uses a fast, thin-slice CT scanner to measure coronary artery atherosclerosis. It is sensitive and specific in detecting calcified and noncalcified stenoses that exceed 50% of artery diameter.\(^3\,\text{31}\) CT angiography has the potential to provide a single test to assess for pulmonary embolus, aortic dissection, and acute coronary syndrome as the cause of chest pain in the acute setting.\(^3\) Some authors are proponents for its further evolution to complement or even replace the more familiar imaging studies such as nuclear SPECT.\(^3\) Patients with elevated creatinine or contraindications to exposure to contrast dye have been excluded from studies of CT angiography.\(^3\,\text{31}\,\text{32}\)

**SELECTING A STRESS TEST**

Risk Stratification for CAD

Estimating the pretest probability of CAD as low, intermediate, or high is a necessary first step in selecting a diagnostic test for CAD. The various definitions of risk focus on timeframes ranging from 1 day to 10 years as well as focus differently on the probabilities of CAD, myocardial infarction, or mortality from CAD (Table 3).\(^2\,\text{6}\,\text{24}\,\text{28}\,\text{33}\) Nonetheless, the basic determinants of pretest probability for CAD in a patient with chest pain are age, gender, and the type of chest pain (ie, typical angina, atypical chest pain, and nonanginal pain).\(^3\,\text{41}\) In this method devised by Diamond and Forrester,\(^3\) **typical angina** is defined as chest pain that is (1) substernal, (2) brought on by exertion or emotional distress, and (3) relieved by rest or nitroglycerin; **atypical chest pain** lacks 1 of these 3 features, and **nonanginal pain** has 1 or none of the features of typical chest pain. Men and older patients have higher rates of CAD. The pretest probability of CAD estimated based on these factors (Table 4) is then used to make recommendations for CAD testing and is the starting point for risk stratification.\(^3\,\text{5}\) Using the Diamond and Forrester classification of angina as a building block for more complex risk stratification, an abnormal exercise stress electrocardiogram (EST) in high-risk patients can have a positive predictive value for CAD as high as 92%.\(^6\) For those at intermediate and low risk, an abnormal EST can have a positive predictive value of 62% and 21% for CAD, respectively.\(^6\)

The well-known Framingham risk score classifies patients as at low, intermediate, or high risk for myocardial infarction or death from CAD over 10 years. Using the 6 patient characteristics of age, gender, total cholesterol, high-density lipoprotein cholesterol level, smoking status, and systolic blood pressure, a patient’s predicted 10-year risk can be categorized as less than 10% (low risk), 10% to 20% (intermediate risk), or over 20% (high risk).\(^6\) This risk assessment tool can be
Additional risk factors that predict the possibility of CAD are the presence of diabetes mellitus, peripheral vascular disease, and cerebral vascular disease.\(^{17}\)

Because atherosclerosis is a systemic process, the presence of arterial disease elsewhere often implies its presence within the coronary arteries.

### Other Assessments

In addition to pretest probability for CAD, factors that must be considered when deciding whether to order a stress test include the patient’s interest in invasive interventions, comorbid conditions, ability to exercise, and ability to comply with long-term antithrombotic medication. It is necessary to assess preferences about revascularization since the results of stress testing may lead to a recommendation for invasive testing and revascularization. However, invasive tests for CAD offer little benefit to patients who choose to avoid revascularization or who are poor candidates. These patients are best served by medical management alone if testing will not change the treatment plan. Once pretest probability and the patient’s interest in interventions have been determined, the selection of a screening test for CAD depends on a patient’s ECG findings and exercise capacity. Several patterns seen on ECG may dictate which test to pursue (Table 5).\(^2\)

### Low-Risk Patients

For adults with a low pretest probability for CAD, management focuses on diagnosing and treating noncardiac symptoms.

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**Table 3. Risk Stratification Systems with Testing Recommendations for Detecting Coronary Artery Disease (CAD) in Patients with Chest Pain**

<table>
<thead>
<tr>
<th>Author (yr)</th>
<th>Stratification Method</th>
<th>Risk Level with Basis of Classification and Testing Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garber and Solomon (1999)(^{24})</td>
<td>Diamond and Forrester</td>
<td>Pretest probability of CAD &lt; 25% Recommendation not specified</td>
</tr>
<tr>
<td>Morise (2000)(^{6})</td>
<td>Modified Diamond and Forrester</td>
<td>PPV of positive EST 21% for current CAD No testing or EST without imaging</td>
</tr>
<tr>
<td>Williams et al (2001)(^{2})</td>
<td>Risk of CAD mortality by Duke treadmill score</td>
<td>Risk &lt; 1% Stress without imaging</td>
</tr>
<tr>
<td>Smith (2006)(^{18})</td>
<td>10-yr risk for CAD/annual risk for CAD</td>
<td>10-yr risk &lt; 10%, annual risk &gt; 0.6% Periodic reassessment of risk</td>
</tr>
<tr>
<td>Mieres et al (2007)(^{13})</td>
<td>Framingham study 10-yr risk for CAD/annual risk for MI</td>
<td>10-yr risk &lt; 10%, annual risk &gt; 0.6% EST without imaging</td>
</tr>
</tbody>
</table>

**Table 4. Pretest Probability of Coronary Artery Disease (CAD) Based on Age, Sex, and Symptoms**

<table>
<thead>
<tr>
<th>Age, yr</th>
<th>Sex</th>
<th>Nonanginal Chest Pain</th>
<th>Atypical Angina</th>
<th>Typical Angina</th>
</tr>
</thead>
<tbody>
<tr>
<td>30–39</td>
<td>Male</td>
<td>Low</td>
<td>Intermediate</td>
<td>Intermediate</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>Very low</td>
<td>Very low</td>
<td>Intermediate</td>
</tr>
<tr>
<td>40–49</td>
<td>Male</td>
<td>Intermediate</td>
<td>Intermediate</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>Very low</td>
<td>Low</td>
<td>Intermediate</td>
</tr>
<tr>
<td>50–59</td>
<td>Male</td>
<td>Intermediate</td>
<td>Intermediate</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>Low</td>
<td>Intermediate</td>
<td>High</td>
</tr>
<tr>
<td>60–69</td>
<td>Male</td>
<td>Intermediate</td>
<td>Intermediate</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>Intermediate</td>
<td>Intermediate</td>
<td>High</td>
</tr>
</tbody>
</table>

NOTE: Probability levels are defined as follows: high, > 90% pretest probability of CAD; intermediate = 10%–90% pretest probability of CAD; low = < 10% pretest probability of CAD; very low = < 5% pretest probability of CAD.


Additional risk factors that predict the possibility of CAD are the presence of diabetes mellitus, peripheral vascular disease, and cerebral vascular disease.\(^{17}\) Because atherosclerosis is a systemic process, the presence of arterial disease elsewhere often implies its presence within the coronary arteries.
causes of chest pain.\textsuperscript{2} Testing is not usually recommended as these patients have a greater likelihood of false-positive tests, which may lead to invasive testing and additional risk.\textsuperscript{6} Normal EST results are reassuring, but positive EST results are likely falsely positive in patients with low pretest probabilities.\textsuperscript{6} If diagnostic testing is desired in low-risk individuals, EST is a reasonable choice since it is low cost and noninvasive (Table 5).\textsuperscript{6,13} ACC/AHA guidelines state that there is no compelling evidence that imaging provides additional useful information for patients at low risk by history and treadmill score.\textsuperscript{13} These patients can be managed medically with risk factor modification and search for noncardiac causes of chest pain.\textsuperscript{2} Patients with low pretest probability but an intermediate risk treadmill score may benefit from stress testing with imaging for further risk stratification.\textsuperscript{2} If imaging results are normal, these patients can be managed medically.

### Intermediate- and High-Risk Patients

EST is most useful for diagnosing obstructive CAD in adults with an intermediate pretest probability, and is recommended by ACC/AHA guidelines as the initial test in patients with intermediate pretest probability of CAD.\textsuperscript{15} Adults with intermediate pretest probability will have a greater change between pre- and posttest probability as compared with patients having low or high pretest probability, and this change is useful to guide future care. Adults with high pretest probabilities (eg, men aged $\geq 40$ yr with typical angina) or known CAD will still

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**Table 5.** Indications and Contraindications for Coronary Artery Disease (CAD) Testing by Method

<table>
<thead>
<tr>
<th>Type of Stress Test</th>
<th>Mechanism of Action</th>
<th>Indications</th>
<th>Contraindications</th>
</tr>
</thead>
<tbody>
<tr>
<td>All types</td>
<td>—</td>
<td>Symptomatic patients with intermediate risk for CAD</td>
<td>Patient disinterest in invasive interventions; acute myocardial infarction; unstable angina; hypotension; severe hypertension; pulmonary embolus; myocarditis; pericarditis; left main vessel disease; electrolyte imbalance</td>
</tr>
<tr>
<td>EST</td>
<td>Detects symptoms and ECG changes of ischemia</td>
<td>Symptomatic patients with intermediate risk for CAD</td>
<td>High pretest probability of CAD; ST-segment abnormality at $V_5$; ST depression $&gt;1$ mm at baseline ECG; T-wave inversion consistent with strain pattern; left bundle branch block; preexcitation syndrome; uncontrolled heart failure</td>
</tr>
<tr>
<td>Stress echocardiography</td>
<td>Detects functional changes in heart wall motion</td>
<td>Symptomatic patients with abnormal EST</td>
<td>Limiting habitus such as obesity or emphysematous changes; low risk for CAD; severe aortic stenosis or outflow obstruction such as hypertrophic cardiomyopathy</td>
</tr>
<tr>
<td>SPECT MPI</td>
<td>Detects perfusion changes after stress</td>
<td>Symptomatic patients with intermediate risk for CAD</td>
<td>Low risk for CAD; ST-segment elevation</td>
</tr>
</tbody>
</table>

- **Exercise:** Increases cardiac activity, oxygen delivery demand, and ischemia
- **Vasodilator** (dipyridamole or adenosine): Induces “steal” from atherosclerotic areas
- **Dobutamine:** Inotrope and chronotrope that increases oxygen demand, inducing ischemia
- **Coronary artery angiography:** Fluoroscopic imaging of the coronary arteries with left ventriculography

COPD = chronic obstructive pulmonary disease; ECG = electrocardiogram; EST = exercise stress testing; SPECT MPI = single photon emission computed tomography myocardial perfusion imaging.
have high posttest probability with a negative EST, making the test less useful in this population.\textsuperscript{6}

Imaging as an adjunct to EST incrementally improves the insight of CAD testing when chosen for the proper patient populations.\textsuperscript{33,37} Indications for imaging include abnormal EST, intermediate and high pretest probability for CAD, history of intervention for CAD, left bundle branch block, depressed ST segment on baseline ECG, a paced rhythm, or a preexcitation syndrome (Table 5).\textsuperscript{2,4,35} In symptomatic patients with normal cardiac enzyme testing and no ST-segment elevation, SPECT MPI and stress echocardiography have been shown to be an insightful method of detecting CAD.\textsuperscript{36,38–42} If imaging results are normal, these patients can be managed medically.

When choosing between nuclear imaging and echocardiography, the abilities of local expert providers in performing and interpreting these tests should help guide selection of a technique. An exercise or dobutamine stress echocardiogram is often cited as a “good compromise” of sensitivity and specificity for CAD, and is cost-effective by usual medical economic analysis.\textsuperscript{9,24} Contraindications to stress echocardiography include inability to hold β-blocker use, left bundle branch block, and left ventricular outflow obstruction such as hypertrophic cardiomyopathy or aortic stenosis.\textsuperscript{43} Nuclear stress testing may be safer or more accurate in these instances. According to appropriateness criteria for SPECT MPI developed by the ACC in conjunction with the ASNC,\textsuperscript{44} SPECT MPI is appropriate for symptomatic patients with chest pain syndrome who have intermediate or high pretest probability of CAD with interpretable ECG and the ability to exercise, for patients with intermediate or high pretest probability with interpretable ECG, and for patients unable to exercise. For patients with acute chest pain, SPECT MPI is appropriate for those at intermediate risk with normal cardiac enzyme testing and no ST-segment elevation. It is inappropriate to use SPECT MPI for patients with low probability of CAD. It can be considered in those with unstable angina or non-ST-segment elevation myocardial infarction but is not appropriate in patients with ST elevation.

Consideration of coronary artery angiography versus stress testing with imaging can be made for patients with high pretest probability of CAD given the possibility of a false-negative result with stress testing.\textsuperscript{2,6,35} Other indications for coronary angiography include symptomatic known systolic heart failure and serious ventricular arrhythmia.\textsuperscript{2}

**COST AND WARRANTY OF RESULTS**

The cost of stress testing is an important consideration. In 1996 US dollars, echocardiogram cost an additional $5000 per quality-adjusted life-year saved (QALY) compared with EST alone for patients with intermediate probability of CAD.\textsuperscript{24} Use of nuclear studies cost an additional $78,000 per QALY compared with stress echocardiogram.\textsuperscript{24} The abilities of local expert providers in nuclear imaging and echocardiography should help guide selection of a technique for noninvasive cardiac evaluation.

The “warranty” of a normal stress result may be 1 to 2 years for those who can perform an exercise test with imaging. Studies have shown that patients with normal exercise stress tests have a 0% to 1.8% occurrence of myocardial infarction per year after normal results.\textsuperscript{8,37} Those who cannot exercise, those with diabetes, and those who are older may have higher risks for events after a normal stress test.\textsuperscript{8,37}

**SUMMARY**

The best screening test for CAD depends on a patient’s probability for CAD, ECG findings, and exercise capacity.\textsuperscript{2} Patients with low probability of CAD can be managed by diagnosing and treating noncardiac causes of chest pain. If diagnostic testing is desired in low-risk individuals, EST is a reasonable choice since it is cost-effective and noninvasive. ACC/AHA guidelines recommend EST as the initial test in patients with intermediate pretest probability of CAD.\textsuperscript{13} The addition of cardiac imaging lends incremental insight for detection of CAD, most markedly for patients at intermediate probability for CAD. Exercise or dobutamine stress echocardiography may be a good compromise of sensitivity and specificity for CAD, and is cost-effective by usual medical economic analysis.\textsuperscript{9,24} A normal exercise stress test is more reassuring than a normal pharmacologic stress test. For those with high probability of CAD, consideration of coronary artery angiography versus stress imaging can be made.

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**REFERENCES**


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