

EXTENSIONS OF THE PHYSICAL EXAMINATION

1. Transthoracic echocardiography is the initial diagnostic test for suspected or known structural heart disease: *any diastolic murmur, systolic murmur grade 3/6 or louder, murmur of any grade if associated with cardiac symptoms or history of cardiac disease.*
2. Hand-held echocardiographic instruments may be helpful for triage when used by an appropriately trained and experienced individual.
3. Transesophageal echocardiography is appropriate when transthoracic images are nondiagnostic and as the initial imaging test in some clinical situations, such as detection of left atrial thrombus, evaluation of prosthetic mitral valve dysfunction, evaluation of suspected aortic dissection, and in patients with a moderate to high pretest probability of endocarditis.
4. The appropriate diagnostic test for coronary artery disease is based on symptoms and an estimate of cardiovascular risk.
5. The standard diagnostic approach in patients with suspected or known coronary artery disease continues to be history and physical examination followed by stress testing when appropriate.
6. Exercise stress testing is preferred because it provides an objective measure of functional status in addition to detection of ischemia. In patients who cannot exercise, stress testing with pharmacologic agents that increase the heart rate–blood pressure product (such as dobutamine) or result in relative inequality in myocardial blood flow (such as adenosine or dipyridamole) are appropriate.
7. Exercise ECG stress testing alone is not useful with conditions such as pre-excitation (Wolff-Parkinson-White syndrome), greater than 1-mm ST-segment depression, and left bundle branch block. Following an abnormal resting ECG or with pharmacologic stress testing, echocardiographic or nuclear imaging is needed.
8. Coronary angiography provides a definitive diagnosis of coronary artery disease severity and allows simultaneous intervention. It is appropriate when the stress test is consistent with CAD, particularly if there is a large area of myocardium at risk. In patients with a very high pretest probability of disease, coronary angiography is an appropriate initial diagnostic test.
9. Newer diagnostic approaches for coronary disease include CT imaging, CMR imaging, and positron emission tomography (PET). CT can be used for measuring coronary artery calcium (CAC) and for noninvasive coronary angiographic imaging.

10. The risks in diagnostic evaluation for CAD include exposure to radiation (angiography, CT, and nuclear imaging) and to radiocontrast agents (angiography and CT imaging). The major risk of radiocontrast exposure is acute renal failure, which occurs in approximately 3% of patients undergoing coronary interventions but up to 25% of those with a baseline serum creatinine concentration greater than 2.0 mg/dL.
11. The key to diagnosis of a cardiac arrhythmia is an ECG recorded during the event.
12. Event monitors allow recording of infrequent but symptomatic arrhythmias.
13. Syncope due to a cardiac arrhythmia is best evaluated with a loop recorder.
14. Asymptomatic arrhythmias are best evaluated with a continuously monitored ECG, such as a 24-hour ambulatory ECG (frequent arrhythmias) or an implanted recorder (infrequent arrhythmias).

DIAGNOSTIC TESTS FOR SUSPECTED OR KNOWN CARDIAC ARRHYTHMIAS

Diagnostic Test	Utility	Advantages	Limitations
Resting ECG	Initial diagnostic test in all patients	12-lead ECG recorded during the arrhythmia often identifies the specific arrhythmia	Most arrhythmias are intermittent and not recorded on a resting ECG
Ambulatory (24-hour) ECG	Frequent (at least daily) asymptomatic or symptomatic arrhythmias	Records every heart beat during a 24-hour period for later analysis Patient log allows correlation with symptoms	Not helpful when arrhythmia occurs less frequently ECG leads limit patient activities
Exercise ECG	Arrhythmias provoked by exercise	Allows diagnosis of exercise-related arrhythmias Allows correlation with exercise response	Physician supervision needed in case a serious arrhythmia occurs Most arrhythmias are not exercise related
Event monitor	Infrequent symptomatic arrhythmias that last more than 1-2 minutes	Small, pocket-sized recorder is held to the chest when symptoms are present Recorded data are sent by phone to physician's office	Only useful for symptomatic arrhythmias that persist long enough for patient to activate the device Arrhythmia onset not recorded Not useful for syncope
Implanted recorder	Infrequent asymptomatic or symptomatic arrhythmias	Long-term continuous ECG monitoring Specific heart rate or QRS parameters can be set to initiate recording of data	Invasive procedure with some risk Device must be explanted later
Electrophysiology study	Primarily used for treatment (e.g. catheter ablation), not for diagnosis	The origin and mechanism of an arrhythmia can be precisely defined	Invasive procedure with some risk Time consuming and expensive