Anthem

Clinical UM Guideline

Subject: Cardiac Stress Testing with Electrocardiogram
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Description

This document addresses the diagnostic indications for cardiac stress testing with electrocardiogram (also known as an ECG or EKG), which is a noninvasive diagnostic evaluation of the heart performed to assess suspected or known coronary artery disease (CAD). A cardiac stress test, also called a stress test, exercise electrocardiogram, treadmill test, graded exercise test, exercise electrocardiography, or stress ECG, is a test used to provide information about how the heart responds to exertion or induced stress. It usually involves walking on a treadmill or pedaling a stationary bike at increasing levels of difficulty, while cardiac parameters are monitored, including ECG, heart rate, and blood pressure. For individuals who are unable to tolerate exercise, pharmacologic stress testing can be performed where medications, such as dobutamine or adenosine, are injected to induce cardiac stress.

Clinical Indications

Medically Necessary:

Cardiac stress testing with electrocardiogram is considered **medically necessary** as part of a coronary evaluation for **ANY** of the following indications (A through G):

A. To diagnose obstructive coronary artery disease when either of the following are present (1 or 2):
   1. In adults with intermediate pretest probability of coronary artery disease on the basis of gender, age, and symptoms (see Table 1); **or**
   2. With vasospastic angina; **or**

B. For risk assessment and prognosis in symptomatic individuals **or** those with a prior history of coronary artery disease who meet any of the following (1 through 5):
   1. As part of initial evaluation of individuals with suspected or known coronary artery disease; **or**
   2. In individuals previously evaluated with stress testing with suspected or known coronary artery disease, now with significant change in clinical status; **or**
   3. Individuals with low risk unstable angina 8 to 12 hours after presentation who have been free of active ischemic or heart failure symptoms; **or**
   4. Individuals with intermediate risk unstable angina 2 to 3 days after presentation who have been free of active ischemic or heart failure symptoms; **or**
   5. Individuals with intermediate risk unstable angina who have initial cardiac markers that are normal, a repeat electrocardiogram without significant change, and cardiac markers 6 to 12 hours after the onset of symptoms that are normal and no other evidence of ischemia; **or**

C. Following a myocardial infarction for any of the following (1 through 4):
   1. Before discharge for prognostic assessment, activity prescription, and evaluation of medical therapy; **or**
   2. Early after discharge for prognostic assessment, activity prescription, evaluation of medical therapy, and cardiac rehabilitation if the pre-discharge exercise test was not done; **or**
   3. Late after discharge for prognostic assessment, activity prescription, evaluation of medical therapy, and cardiac rehabilitation if the early exercise test was submaximal (symptom limited; about 3 to 6 weeks); **or**
   4. After discharge for activity counseling and/or exercise training as part of cardiac rehabilitation following a coronary revascularization procedure; **or**

D. With ventilatory gas analysis for any of the following (1, 2 or 3):
   1. Evaluation of exercise capacity and response to therapy in individuals with heart failure who are being considered for heart transplantation; **or**
   2. Assistance in the differentiation of cardiac versus pulmonary limitations as a cause of exercise-induced dyspnea or impaired exercise capacity; **or**
   3. Evaluation of exercise capacity when indicated for medical reasons in individuals in whom the estimates of exercise capacity from exercise test time or work rate are unreliable; **or**

E. In valvular heart disease with chronic aortic regurgitation, aortic valve stenosis or mitral valve regurgitation, for any of the following (1, 2, or 3):
   1. For assessment of functional capacity and symptomatic responses when there is a history of equivocal symptoms; **or**
   2. For evaluation of symptoms and functional capacity before participation in athletic activities; **or**
   3. For prognostic assessment before aortic valve or mitral valve replacement in asymptomatic or minimally symptomatic subjects with left ventricular dysfunction; **or**

F. Before and after a revascularization procedure for any of the following (1, 2, or 3):
   1. When there is demonstration of ischemia before revascularization; **or**
   2. For evaluation of recurrent symptoms that suggest ischemia after revascularization; **or**
   3. After discharge for activity counseling and/or exercise training as part of cardiac rehabilitation following coronary revascularization; **or**

G. For evaluation of heart rhythm disorders for any of the following (1, 2, or 3):
   1. For programming of rate-adaptive pacemakers; **or**
   2. For evaluation of known or suspected exercise-induced arrhythmias; **or**
   3. For evaluation of medical, surgical, or ablative therapy in individuals with exercise-induced arrhythmias, including atrial fibrillation.

Not Medically Necessary:

Cardiac stress testing with electrocardiogram is considered **not medically necessary** when the criteria are not met and for all other applications including, but not limited to, screening in individuals with low risk pretest probability of disease and in the absence of symptoms suspicious for cardiovascular disease.

Coding

The following codes for treatments and procedures applicable to this guideline are included below for informational purposes. Inclusion or exclusion of a procedure, diagnosis or device code(s) does not constitute or imply member coverage or provider reimbursement policy. Please refer to the member's contract benefits in effect at the time of service to determine coverage or non-coverage of these services as it applies to an individual member.

When services may be Medically Necessary when criteria are met:

CPT

93015	Cardiovascular stress test using maximal or submaximal treadmill or bicycle exercise, continuous electrocardiographic monitoring, and/or pharmacological stress; with supervision, interpretation and report
93016	Cardiovascular stress test using maximal or submaximal treadmill or bicycle exercise, continuous electrocardiographic monitoring, and/or pharmacological stress; supervision only, without interpretation and report
93017	Cardiovascular stress test using maximal or submaximal treadmill or bicycle exercise, continuous electrocardiographic monitoring, and/or pharmacological stress; tracing only, without interpretation and report
93018	Cardiovascular stress test using maximal or submaximal treadmill or bicycle exercise, continuous electrocardiographic monitoring, and/or pharmacological stress; interpretation and report only

ICD-10 Diagnosis

All diagnoses

When services are Not Medically Necessary:
For the procedure codes listed above when criteria are not met or for situations designated in the Clinical Indications section as not medically necessary.

Discussion/General Information

Cardiac stress testing with ECG is a well-established procedure that has been in widespread clinical use for many years and is considered the standard of care in the diagnosis and management of various cardiac conditions. The medically necessary criteria within this document are based on a review of the following evidence-based guidelines and specialty society guidance documents:

- ACC/AHA 2002 guideline update for exercise testing: summary article: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Update the 1997 Exercise Testing Guidelines) (Gibbons 2002);
- Exercise testing in asymptomatic adults: a statement for professionals from the American Heart Association Council on Clinical Cardiology, Subcommittee on Exercise, Cardiac Rehabilitation, and Prevention (Lauer, 2005).

The following specialty society guidance documents were also reviewed in the development of this document:

- American College of Cardiology/American Heart Association (ACC/AHA) Guidelines for Coronary Angiography (Scanlon, 1999);
- American College of Cardiology Foundation/American Heart Association (ACCF/AHA) Guideline for the Management of ST-elevation Myocardial Infarction (O'Gara, 2013);
- ACC/AHA Guidelines for the Management of Adults with Congenital Heart Disease (Warnes, 2008);
- AHA/ACC Guidelines for the Management of Patients with Valvular Heart Disease (Nishimura, 2014);
- ACCF/AHA Guidelines for the Management of Heart Failure (Yancy, 2013);
- ACCF/AHA Focused update of the Guidelines for the Management of Patients with Unstable Angina/Non-ST-Elevation Myocardial Infarction (Wright, 2011);
- ACCF/AHA focused update incorporated into the ACCF/AHA 2007 Guidelines for the Management of patients with Unstable Angina/non–ST-elevation Myocardial Infarction (Anderson, 2013);
- ACCF/AHA/ACP/AATS/PCNA/SCAI/STS Guideline for the Diagnosis and Management of Patients with Stable Ischemic Heart Disease (Fihn, 2012);
- ACCF/SCAI/AATS/AHA/ASE/ASNC/HFSA/HRS/SCCM/SCCT/SCMR/STS Appropriate Use Criteria for Diagnostic Catheterization (Patel, 2012);
- The International Society of Heart and Lung Transplantation (ISHLT) Guidelines for the Care of Heart Transplant Recipients (Costanzo, 2010);
- ACCF/AHA/ASE/ASNC/HFSA/HRS/SCAI/SCCT/SCMR/STS 2013 multimodality Appropriate Use Criteria for the Detection and Risk Assessment of Stable Ischemic Heart Disease (Wolk, 2014).

The following tables assist in the assessment of risk and pretest probability of CAD:

Table 1: Pre-Test Probability of Coronary Artery Disease by Age, Gender and Symptoms*:

Age (yr)	Gender	Typical/Definite Angina Pectoris	Atypical/Probable Angina Pectoris	Non-Anginal Chest Pain	Asymptomatic
30-39	Men	Intermediate	Intermediate	Low	Very Low
	Women	Intermediate	Very Low	Very Low	Very Low
40-49	Men	High	Intermediate	Intermediate	Low
	Women	Intermediate	Low	Very Low	Very Low
50-59	Men	High	Intermediate	Intermediate	Low
	Women	Intermediate	Intermediate	Low	Very Low
60-69	Men	High	Intermediate	Intermediate	Low
	Women	High	Intermediate	Intermediate	Low

*Excerpted from the ACCF/SCAI/AATS/AHA/ASE/ASNC/HFSA/HRS/SCCM/SCCT/SCMR/STS Appropriate Use Criteria for Diagnostic Catheterization (Patel, 2012) and the ACC/AHA 2002 Guideline update for Exercising Testing (Gibbons, 2002).

Table 2: Classification of EKG Treadmill test results (performed without imaging):**

Low risk EKG test result	Duke treadmill score > or = +5
Intermediate EKG risk treadmill test result	Duke treadmill score -10 to +4
High risk EKG treadmill test result	Duke treadmill score < = -11; OR ST segment elevation; OR Hypotension with exercise; OR Ventricular tachycardia; OR Prolonged ST segment depression

**Excerpted from the ACCF/SCAI/AATS/AHA/ASE/ASNC/HFSA/HRS/SCCM/SCCT/SCMR/STS Appropriate Use Criteria for Diagnostic Catheterization (Patel, 2012).

Table 3: Classification of results of stress tests performed with imaging*:**

	SPECT MPI+ or Stress PET	Stress Echo
Low risk	<5% ischemic myocardium	No stress induced WMA++
Intermediate risk	5-10% ischemic myocardium	Stress induced WMA in a single segment
High risk	>10% ischemic myocardium	Stress-induced WMA in > or =2 segment; OR Transient ischemic LV dilation; OR Significant induced LV dysfunction.

+MPI = myocardial perfusion imaging; ++WMA = wall motion abnormality
***Excerpted from American College of Cardiology/American Heart Association (ACC/AHA) Guidelines for Coronary Angiography (Scanlon, 1999).

The United States Preventive Services Task Force (USPSTF, 2016) does not recommend the use of resting or exercise ECG in asymptomatic adults at low risk of cardiovascular disease (Grade D). For asymptomatic adults at intermediate or high risk for cardiovascular disease, the USPSTF found insufficient evidence and made no recommendations for the use/non-use of resting or exercise ECG (Grade I). In 2018, the USPSTF issued another evidence report and systematic review: Screening for cardiovascular disease risk with resting or exercise electrocardiography with the following recommendations:

> 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. (Grade D*)
>
> 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 (Grade I**) (Jonas, 2018).

USPSTF Grading System:
Grade A: The USPSTF recommends the service. There is high certainty that the net benefit is substantial.
Suggestions for practice: Offer or provide this service.

Grade B: The USPSTF recommends the service. There is high certainty that the net benefit is moderate, or that there is moderate certainty that the net benefit is moderate to substantial.
Suggestions for practice: Offer or provide this service.

Grade C: The USPSTF recommends selectively offering or providing this service to individual patients based on professional judgment and patient preferences. There is at least moderate certainty that the net benefit is small.
Suggestions for practice: Offer or provide this service for selected patients depending on individual circumstances.

*Grade D: The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits.
Suggestions for practice: Discourage use of this service.

**Grade I: The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of the service. Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be determined.
Suggestions for practice: Read the clinical considerations section of USPSTF Recommendation Statement. If the service is offered, patients should understand the uncertainty about the balance of benefits and harms.

In 2005, an American Heart Association (AHA) scientific statement was issued regarding exercise testing in asymptomatic adults which provided the following conclusions:

> Although current data suggest that in patients who have an estimated intermediate risk of developing disease, there may be value in additional noninvasive screening tests, including exercise testing, we agree with the recent recommendations of the US Preventive Services Task Force that there is insufficient evidence at this time to recommend exercise testing as a routine screening modality in asymptomatic adults. Although non-electrocardiographic measures, including functional capacity, chronotropic response, HR recovery, and ventricular ectopy, have been shown to predict adverse events in asymptomatic subjects, and although exercise testing measures have been shown to improve the prediction of coronary heart disease events over and above the Framingham Risk Score, there is no evidence that gaining this knowledge improves outcomes (Lauer, 2005).

Definitions

Acute coronary syndrome (ACS): This term primarily refers to ST elevation myocardial infarction (30%), non ST-elevation myocardial infarction (25%), or unstable angina (38%), attributed to obstruction of the coronary arteries, with chest pain being the most common symptom.

Angina pectoris: This term refers to chest pain or discomfort that is typically characterized by the presence of ALL three of the following:

1. Centrally located or substernal; and
2. Provoked by exertion or emotional stress; and
3. Relieved by rest or nitroglycerin. Chest pain with all three characteristics is considered Definite or typical angina.

Unstable angina: Angina that occurs at rest and is often referred to as crescendo angina, which is characterized by worsening or changing angina and is usually not relieved by nitroglycerin.

Grading of Angina Pectoris by the Canadian Cardiovascular Society Classification System:

Class I:	Ordinary physical activity does not cause angina, such as walking, climbing stairs. Angina (occurs) with strenuous, rapid, or prolonged exertion at work or recreation.
Class II:	Slight limitation of ordinary activity. Angina occurs on walking or climbing stairs rapidly, walking uphill, walking or stair climbing after meals or in cold, or in wind, or under emotional stress, or only during the few hours after awakening. Angina occurs on walking more than 2 blocks on the level and climbing more than one flight of ordinary stairs at a normal pace and in normal condition.
Class III:	Marked limitations of ordinary physical activity. Angina occurs on walking one to two blocks on the level and climbing one flight of stairs in normal conditions and at a normal pace.
Class IV:	Inability to carry on any physical activity without discomfort — anginal symptoms may be present at rest.

Cardiac catheterization: A general term describing the use of a thin catheter that is advanced into the bloodstream through an artery at the groin, arm or neck, followed by injection of a contrast agent (dye) that visualizes the coronary arteries and chambers of the heart. Cardiac catheterization, which can be done for diagnostic or therapeutic/interventional purposes or both, can be used to describe imaging of the coronary arteries, (also referred to as coronary angiography), or the heart chambers.

Chest pain (non-anginal): Chest pain or discomfort that meets one or none of the typical angina characteristics.

Congenital heart disease: A general term describing abnormalities in the structure of the heart that are present at birth. The abnormalities can include abnormal heart valves or abnormal communications between the different chambers of the heart.

Congestive heart failure (CHF) or heart failure: A condition in which the heart no longer adequately functions as a pump. As blood flow out of the heart slows, blood returning to the heart through the veins backs up, causing congestion in the lungs and other organs.

Coronary angiography: A cardiac catheterization procedure (see definition above) that is used to visualize the coronary arteries.

Coronary angioplasty: A therapeutic catheterization procedure that often follows the initial diagnostic imaging procedure. A small balloon placed at the site of the blockage in the coronary artery is inflated, in order to reopen the artery. Frequently a stent is also placed in the artery to maintain the opening.

Guideline-directed medical therapy (GDMT): *For context within this document,* this terminology, which was formerly referred to as “Optimal medical therapy,” is defined as the use of at least 2 classes of medication to reduce angina symptoms (for example, beta blockers, calcium channel blockers, nitrate preparations, ranolazine). In the event that an individual is unable to tolerate 2 anti-angina medications, the maximum tolerated level of medical therapy will be considered to be GDMT.

Imaging procedure: This is a general term describing a technique to provide an image of a structure; in this case, a picture of the heart or coronary arteries. Angiography and right and left heart catheterization produce images by injecting dye into the heart chambers or coronary arteries, respectively. Other types of cardiac imaging procedures include echocardiography, CT or MRI scans.

Left heart: Describes the two chambers on the left side of the heart; the left atrium, which receives oxygenated blood from the lungs, and the left ventricle, which pumps the blood through the circulation.

Left ventricular ejection fraction (LVEF): The measurement of the heart's ability to pump blood through the body. Normal LVEF readings would be in the 58-70% range.

Myocardial infarction (MI): The medical term for heart attack. A heart attack occurs when the blood supply to part of the heart muscle (the myocardium) is severely reduced or blocked.

New York Heart Association (NYHA) definitions:
The NYHA classification of heart failure is a 4-tier system that categorizes subjects based on subjective impression of the degree of functional compromise; the four NYHA functional classes are as follows:

- Class I - patients with cardiac disease but without resulting limitation of physical activity; ordinary physical activity does not cause undue fatigue, palpitation, dyspnea, or anginal pain; symptoms only occur on severe exertion.
- Class II - patients with cardiac disease resulting in slight limitation of physical activity; they are comfortable at rest; ordinary physical activity (e.g., moderate physical exertion such as carrying shopping bags up several flights of stairs) results in fatigue, palpitation, dyspnea, or anginal pain.
- Class III - patients with cardiac disease resulting in marked limitation of physical activity; they are comfortable at rest; less than ordinary activity causes fatigue, palpitation, dyspnea or anginal pain.
- Class IV - patients with cardiac disease resulting in inability to carry on any physical activity without discomfort; symptoms of heart failure or the anginal syndrome may be present even at rest; if any physical activity is undertaken, discomfort is increased.

Percutaneous coronary intervention (PCI): A general term describing a therapeutic procedure that is done at the same time as cardiac catheterization. The most common PCI is a coronary angioplasty with or without stent placement to treat the coronary artery disease identified in the immediately previous coronary angiography.

Pericardial tamponade: An acute condition where pressure builds up around the heart, impairing cardiac function, due to fluid accumulation in the pericardial sac, which is referred to as pericardial effusion.

Pericarditis (restrictive): Refers to inflammation of the pericardial sac, which is termed restrictive or constrictive when the inflammatory process results in diminished ability of the heart to beat normally. This condition is usually due to an infection but it may also occur following an MI or cardiac surgery.

Pulmonary hypertension: A rare lung condition where increased pressure in the pulmonary artery compromises cardiopulmonary function.

Right heart: Describes the two chambers on the right side of the heart; the right atrium, which receives the blood returning from the rest of the body, and the right ventricle that pumps this blood to the lungs.

Structural heart disease: A general term describing abnormalities in the structure of the heart, which includes diseases of the valves or congenital heart disease (present at birth). A cardiac catheterization procedure can evaluate the structure and function of the heart by assessing the left ventricular ejection fraction (see definition above), as well as the movement of the valves of the heart and of the chamber walls.

Valvular heart disease (VHD): Valvular heart disease is characterized by damage to, or a defect in, one of the four heart valves: the mitral, aortic, tricuspid or pulmonary. The severity of symptoms does not necessarily correlate with the severity of VHD which is defined in stages (See Table 4) based on valve anatomy, valve hemodynamics, severity of LV dilation and LV systolic function, as

well as by the presence of symptoms. The symptoms are related to the underlying cause of the VHD, which may be aortic stenosis (blockage), aortic regurgitation (valve leakage), bicuspid aortic valve, mitral stenosis, mitral regurgitation, tricuspid stenosis, tricuspid regurgitation, pulmonic stenosis, and pulmonic regurgitation, but may include:

- Shortness of breath or wheezing after limited physical exertion;
- Edema of the feet, ankles, hands or abdomen;
- Palpitations;
- Angina;
- Fatigue;
- Syncope or presyncope;
- Rapid weight gain;
- Pulmonary hypertension;
- LV dysfunction;
- Decompensating heart failure (HF).

Vasculopathy: A term that refers to any disorder or disease process affecting the blood vessels.

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Websites for Additional Information

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The use of specific product names is illustrative only. It is not intended to be a recommendation of one product over another, and is not intended to represent a complete listing of all products available.

History

Status	Date	Action
Reviewed	05/11/2023	Medical Policy & Technology Assessment Committee (MPTAC) review. Updated References and Website sections.
Reviewed	05/12/2022	MPTAC review. References were updated.
Revised	05/13/2021	MPTAC review. Minor grammatical edit to Clinical Indications in valvular disease and before or after revascularization for clarification. Updated References section. Reformatted Coding section.
Reviewed	05/14/2020	MPTAC review. Updated References section.
Revised	06/06/2019	MPTAC review. Clarified terminology and removed acronym (ECG) in the Clinical Indications section. Updated References section.
Revised	07/26/2018	MPTAC review. Removed acronyms from Title and Clinical Indications section. Updated Description, Discussion and References sections.
	05/03/2018	The document header wording updated from "Current Effective Date" to "Publish Date."
New	08/03/2017	MPTAC review. Initial document development.

Alternatively, commercial or FEP plans or lines of business which determine there is not a need to adopt the guideline to review services generally across all providers delivering services to Plan's or line of business's members may instead use the clinical guideline for provider education and/or to review the medical necessity of services for any provider who has been notified that his/her/its claims will be reviewed for medical necessity due to billing practices or claims that are not consistent with other providers, in terms of frequency or in some other manner.