Evolent Clinical Guideline ~~024~~7312 for Myocardial Perfusion Imaging (MPI)

Guideline ~~or Policy~~ Number: Evolent_CG_~~024~~7312	Applicable Codes	
"Evolent" refers to Evolent Health LLC and Evolent Specialty Services, Inc. 		
Original Date: January 2026	**Last Revised Date:** July 2025	**Implementation Date:** January 2026

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STATEMENT

General Information

- *It is an expectation that all patients receive care/services from a licensed clinician. All appropriate supporting documentation, including recent pertinent office visit notes, laboratory data, and results of any special testing must be provided. If applicable: All prior relevant imaging results and the reason that alternative imaging cannot be performed must be included in the documentation submitted.*
- *Where a specific clinical indication is not directly addressed in this guideline, medical necessity determination will be made based on widely accepted standard of care criteria. These criteria are supported by evidence-based or peer-reviewed sources such as medical literature, societal guidelines and state/national recommendations.*
- *The guideline criteria in the following sections were developed utilizing evidence-based and peer-reviewed resources from medical publications and societal organization guidelines as well as from widely accepted standard of care, best practice recommendations.*

Special Note

Medical necessity for myocardial perfusion imaging (MPI) will consider the preference for appropriate alternatives, such as stress echocardiography (SE), when deemed more suitable, unless contraindications are present (see **DEFINITIONS** section). Preference toward stress echocardiography will be denoted by ~~SE~~ SE

See ~~**Legislative Requirements**~~legislative language for specific mandates in ~~Washington~~**Washington** State.

When a noncardiac explanation is provided for symptoms, no testing is required **(AUC Score 8)** (1)

Clinical Reasoning

All criteria are substantiated by the latest evidence-based medical literature. To enhance transparency and reference, Appropriate Use (AUC) scores, when available, are diligently listed alongside the criteria.

This guideline first defaults to AUC scores established by published, evidence-based guidance endorsed by professional medical organizations. In the absence of those scores, we adhere to a standardized practice of assigning an AUC score of 6. This score is determined by considering variables that ensure the delivery of patient-centered care in line with current guidelines, with a focus on achieving benefits that outweigh associated risks. This approach aims to maintain a robust foundation for decision-making and underscores our commitment to upholding the highest standards of care. ~~(1,~~(2–6)~~,3,4,5)~~

INDICATIONS FOR MPI ~~(6~~(1,7–10)

Suspected Coronary Artery Disease (CAD)

- **Symptomatic patients without known CAD. No imaging stress test within the last 12 months.** *The terms "typical," "atypical," and "non-anginal symptoms" can still be observed in medical records (consult the **Diamond Forrester table** in the **Definitions** section). However, the American College of Cardiology (ACC) has simplified its terminology to "Less likely anginal symptoms" and "Likely anginal symptoms" (refer to definitions) and utilized below.*
  - Less ~~-~~likely anginal symptoms **(AUC ~~4-~~ Score 6)** (1)
    - When a patient cannot walk a treadmill
    - When baseline EKG makes standard exercise test inaccurate (see **Definitions** section).~~SE~~ SE
    - ~~When a noncardiac explanation is provided for symptoms, no testing is required (AUC 8)~~
  - Likely Anginal Symptoms (typical angina) (1)
    - < 50 years old with ≤ one risk factor if an ECG treadmill test cannot be done. **AUC scores for this bullet point are identical for MPI, stress echo, and ETT **(AUC ~~=~~Score 7)**. Although the ACC guideline does not specify youth and gender, decisions should be guided by best medical judgment, considering factors such as safety and radiation exposure.
    - ≥ 50 years old **(AUC Score 8)** (1)
  - Repeat testing in a patient with new or worsening symptoms **AND** negative result at least one year prior **AND** meets one of the criteria above.~~SE~~ SE
- **Asymptomatic patients without known CAD (AUC Score ~~=~~ 7)** (1)
  - A pharmacologic MPI is indicated for those unable to exercise with previously unevaluated ECG evidence of possible myocardial ischemia including ischemic ST segment or T wave abnormalities (see **DEFINITIONS** section).
  - Previously unevaluated pathologic Q waves (see **DEFINITIONS** section)
  - Previously unevaluated complete left bundle branch block

Abnormal Calcium Scores ~~(9~~(1,11–14)

~~**AUC Score = 7**~~

- STABLE SYMPTOMS with a prior Coronary Calcium Agatston Score of >100. No prior stress imaging done within the last 12 months~~(6)~~ ~~SE~~ **(AUC Score 7)** (1) SE
- ASYMPTOMATIC high global CAD risk patient with a prior Coronary Calcium Agatston Score of >100. No prior stress imaging done within the last 12 months~~(6)~~ ~~SE~~ SE
- ASYMPTOMATIC patient with Coronary Calcium Agatston Score > 400~~.~~ (or a qualitative

assessment where 'severe' coronary artery calcification is stated in a report incidentally detected on CT imaging performed for other clinical indications). No prior stress imaging done within the last 12 months ~~SE~~(15) SE

Inconclusive CAD Evaluation and Obstructive CAD

REMAINS A CONCERN~~,~~:

- Exercise stress ECG with low-risk Duke treadmill score (≥5), (see **DEFINITIONS** section) but patient's current symptoms indicate increasing likelihood of disease **(AUC score ~~=~~ 8)** (1)
- Exercise stress ECG with an intermediate Duke treadmill score ~~SE~~ SE *(of note, SE diversion is not required* for symptoms consistent with likely anginal symptoms)
- Intermediate coronary computed tomography angiography (CCTA) (40 - 70% lesions) performed less than 90 days ago. **(AUC Score ~~=~~ 7)** (1)
- Non-diagnostic exercise stress test with inability to achieve target heart rate (THR) defined as greater than 85% age predicted maximal heart rate by physiologic exercise~~). AUC Score = 8~~
- An indeterminate (equivocal, borderline, or discordant) evaluation by prior stress imaging (SE or CMR) within the last 12 months
- Coronary stenosis of unclear significance on previous coronary angiography not previously evaluated ~~(9)~~(1)

Follow-Up of Patient's Post Coronary Revascularization (PCI or CABG) ~~(9)~~(1)

Any ONE of the following:

- **Asymptomatic follow-up stress imaging** at a minimum of 2 years post coronary artery bypass grafting (CABG) or percutaneous coronary intervention (PCI) (whichever is later) is appropriate for patients with: **(AUC =Score 6)** ~~SE~~(1) SE *(of note, SE diversion is not required* for post CABG patients)
  - **High risk:** diabetes with accelerated progression of CAD, chronic kidney disease (CKD~~,~~), peripheral artery disease (PAD~~,~~), prior brachytherapy, in-stent restenosis (ISR~~,~~), or saphenous venous graft (SVG) intervention.
  - A history of silent ischemia or
  - A history of a prior left main stent

~~OR~~

- For patients with high occupational risk, associated with public safety, airline and boat pilots, bus and train drivers, bridge and tunnel workers/toll collectors, police officers and firefighters~~SE~~ SE (of note, *SE diversion not required for post-CABG patients~~)~~*)
- **New, recurrent, or worsening symptoms, treated medically or by revascularization**

is an indication for stress imaging, if it will alter management for typical anginal symptoms or symptoms documented to be similar to those prior to revascularization if no imaging stress test within the last 12 months. **(AUC Score 8)** ~~(6)~~ (1,16)

Follow-Up of Known CAD

- **Follow-up of asymptomatic or stable symptoms** when last invasive or non-invasive assessment of coronary disease showed hemodynamically significant CAD (ischemia on stress test or fractional flow reserve (FFR) ≤ 0.80 or significant stenosis in a major vessel (≥ 50% left main coronary artery or ≥ 70 % left-anterior descending (LAD~~,~~), left circumflex (LCX~~,~~), right coronary artery (RCA))), over two years ago, without intervening coronary revascularization is an appropriate indication for stress imaging in patients if it will alter management. ~~SE~~ SE (1)

Special Diagnostic Conditions Requiring Coronary Evaluation

~~**AUC Score = 8**~~

Unevaluated ~~ACS~~Acute Coronary Syndrome

- Prior acute coronary syndrome (with documentation in MD notes), without invasive or non-invasive coronary evaluation within last 12 months
- Has ventricular wall motion abnormality demonstrated by another imaging modality and myocardial perfusion imaging is being performed to determine if the patient has myocardial ischemia. No imaging stress test within the last 12 months

Heart Failure

- Newly diagnosed systolic heart failure or diastolic heart failure, *with reasonable suspicion of cardiac ischemia (prior events, risk factors*), unless invasive coronary angiography is immediately planned. ~~(7,15,16~~(8,17–19)~~)~~ No imaging stress test done within the last 12 months.

Viability

- ~~LVEF~~Left ventricular ejection fraction (LVEF) requiring myocardial viability assessment to assist with decisions regarding coronary revascularization **(AUC Score 9~~)~~** ~~(6,9)~~**)** (1,16)

Suboptimal Revascularization

- MPI is being done to evaluate the effectiveness of the intervention in a high-risk patient who has undergone cardiovascular re-perfusion (CABG or Percutaneous Coronary Intervention, PCI) with suboptimal and/or incomplete revascularization results. No imaging stress test has been done within the last 12 months. **(AUC Score 7)** ~~(6,9)~~ (1,16)

Arrhythmias

- Ventricular arrhythmias **(AUC Score ~~=~~ 7)** (1)

- Sustained ventricular tachycardia (VT) > 100 bpm, ventricular fibrillation (VF), or exercise-induced VT, when invasive coronary arteriography is not immediately planned ~~(18)~~(20)
- Non-sustained VT, multiple episodes, each ≥ 3 beats at ≥ 100 bpm, or frequent ~~PVCs~~premature ventricular contractions (PVC) (defined as greater than or equal to 30/hour on remote monitoring) without known cause or associated cardiac pathology, when an exercise ECG cannot be performed ~~(19)~~(21)

Anti-Arrhythmic Drug Therapy

- Class IC antiarrhythmic drug
  - In the intermediate and high global risk patient prior to initiation of Class IC antiarrhythmic drug initiation (Propafenone or Flecainide)
  - Annually in intermediate and high global risk patients taking Class IC antiarrhythmic drug (Propafenone or Flecainide) ~~(20)~~(22)

Coronary Anomaly and Aneurism

- Assessment of hemodynamic significance of one of the following documented conditions:
  - Anomalous coronary arteries ~~(21)~~(23)
  - Myocardial bridging of coronary artery (24)
- Coronary aneurysms in Kawasaki's disease ~~(22)~~(25) or due to atherosclerosis

Radiation and Chemotherapy ~~SE~~ SE

- Following radiation therapy to the anterior or left chest, at 5 years post initiation and every 5 years thereafter ~~(23)~~(26)

Sarcoidosis and Amyloidosis (PYP study)

- Cardiac sarcoidosis: as a combination study with Heart PET for the evaluation and treatment of cardiac sarcoidosis ~~(24)~~(27)
- Cardiac amyloidosis: for the diagnosis of cardiac transthyretin amyloidosis (ATTR)

***Not** to be used for the diagnosis of cardiac light chain amyloidosis (AL) ~~(25)~~(28)

Prior To Elective Non-Cardiac Surgery In Asymptomatic Patient

~~**AUC score = 8**~~

- An intermediate or high-risk surgery with of one or more risk factors (see below), AND documentation of an inability to walk (or <4 METs) AND there has not been an imaging stress test within 1 year ~~(26,27,28)~~(29–31)
  - **Risk factors:** history of ischemic heart disease, history of congestive heart failure,

history of cerebrovascular disease, preoperative treatment with insulin, and preoperative serum creatinine >2.0 mg/dL

- **Surgical Risk:**
  - **High risk surgery:** Aortic and other major vascular surgery, peripheral vascular surgery, anticipated prolonged surgical procedures associated with large fluid shifts and/or blood loss
  - **Intermediate risk surgery:** Carotid endarterectomy, head and neck surgery, intraperitoneal and intrathoracic surgery, orthopedic surgery, prostate surgery
  - **Low risk surgery**: Endoscopic procedures, superficial procedure, cataract surgery, breast surgery

- Planning for any organ or stem cell transplantation is an indication for preoperative MPI, if there has not been a conclusive stress evaluation, computed tomography angiography (CTA~~,~~), or heart catheterization within the past year, at the discretion of the transplant service~~.~~[8,29]. [32,33]

Post Cardiac Transplant (SE Diversion Not Required)

- Annually, for the first five years post cardiac transplantation, in a patient not undergoing invasive coronary arteriography

LEGISLATIVE ~~REQUIREMENTS~~LANGUAGE

~~State of~~ Washington~~(30)~~

~~*Health Technology Clinical Committee 20211105A*~~

20211105A - Noninvasive Cardiac Imaging for Coronary Artery Disease *(34)*

Number and coverage topic:

20211105A – Noninvasive Cardiac Imaging for Coronary Artery Disease

HTCC coverage determination:

Noninvasive cardiac imaging is a **covered benefit with conditions**.

HTCC reimbursement determination:

Limitations of coverage: The following noninvasive cardiac imaging technologies are **covered with conditions**:

- Stress echocardiography for:
  - Symptomatic adult patients (≥18 years of age) at intermediate or high risk of Coronary Artery Disease (CAD), or
  - Adult patients with known CAD who have new or worsening symptoms.

- Single Positron Emission Tomography (SPECT) for:
  - Patients under the same conditions as stress echocardiography when stress echocardiography is not technically feasible or clinically appropriate.
- Positron Emission Tomography (PET) for:
  - Patients under the same conditions as SPECT, when SPECT is not technically feasible or clinically appropriate.
- Coronary Computed Tomographic Angiography (CCTA) for:
  - Symptomatic adult patients (≥18 years of age) at intermediate or high risk of CAD, or
  - Adult patients with known CAD who have new or worsening symptoms.
- CCTA with Fractional Flow Reserve (FFR) for:
  - Patients under the same conditions as CCTA, when further investigation of functional significance of stenoses is clinically indicated.

Non-covered indicators:

N/A

~~**Notes:**~~

- ~~Out of scope/data not reviewed for this decision:~~
  - ~~Asymptomatic individuals, follow up of prior abnormal cardiac imaging studies, myocardial viability, preoperative evaluation~~
  - ~~Patients presenting for evaluation of cardiac pathologies other than CAD~~
- ~~This determination supersedes the following previous determinations:~~
  - ~~Coronary Computed Tomographic Angiography for detection of Coronary Artery Disease (20081114A)~~
  - ~~Cardiac Nuclear Imaging (20130920A)~~

CODING AND STANDARDS

~~Coding~~

~~CPT~~ Codes

78451, 78452, 78453, 78454, 78466, 78468, 78469, 78481, 78483, 78499, 93015, 93016, 93017, 93018, +0742T, A9500, A9502, A9505, J0153, J1245, J2785

Applicable Lines of Business

☒	CHIP (Children's Health Insurance Program)

☒	Commercial
☒	Exchange/Marketplace
☒	Medicaid
☒	Medicare Advantage

BACKGROUND

Myocardial perfusion imaging is used primarily for the evaluation of coronary artery disease and determining prognosis. Myocardial perfusion imaging is a cardiac radionuclide imaging procedure that evaluates blood flow to the cardiac muscle during rest or stress. Stress may be provided by exercise or with pharmacologic agents. A variety of radionuclides may be used, including Technetium tc-99M sestamibi, thallium201 and Technetiumtc-99M tetrofosmin.

For those patients who are unable to complete the exercise protocol without achieving >85% of predicted maximal heart rate, a pharmacological nuclear stress test is recommended. This testing method uses a drug to mimic the response of the cardiovascular system to exercise. Adenosine, Persantine, Dobutamine, or Regadenoson are vasodilators used in pharmacological nuclear stress testing. A gamma camera is used to record images in planar or tomographic (single photon emission computed tomography, SPECT) projections.

High global CAD risk is defined as 10-year CAD risk of >20%. CAD equivalents (e.g., DM, PAD) can also define high risk.

10-year CAD risk (%) is defined based on the risk factors- Sex, Age, Race, Total Cholesterol, HDL Cholesterol, Systolic Blood Pressure, and Treatment for High Blood Pressure, Diabetes Mellitus, and Smoker.

AUC Score

A reasonable diagnostic or therapeutic procedure ~~care~~ can be defined as that for which the expected clinical benefits outweigh the associated risks, enhancing patient care and health outcomes in a cost-effective manner.[3]

- Appropriate Care - Median Score 7-9
- May be Appropriate Care - Median Score 4-6
- Rarely Appropriate Care - Median Score 1-3

Definitions

- Stable patients without known CAD fall into 2 categories :[7][1,8,9]:
  - **Asymptomatic**, for whom global risk of CAD events can be determined from coronary risk factors, using calculators available online (see **Websites for Global Cardiovascular Risk Calculators** section).

- **Symptomatic,** for whom we estimate the pretest probability that their chest-related symptoms are due to clinically significant CAD (below):

- The medical record should provide enough detail to establish the type of chest pain:
  - **Likely Anginal symptoms** encompass chest/epigastric/shoulder/arm/jaw pain, chest pressure/discomfort occurring with exertion or emotional stress and relieved by rest, nitroglycerine or both.
  - **Less-Likely Anginal symptoms** include dyspnea, or fatigue not relieved by rest/nitroglycerin, as well as generalized fatigue or chest discomfort with a time course not indicative of angina (e.g., resolving spontaneously within seconds or lasting for an extended period unrelated to exertion).
- **Risk Factors for Coronary disease include (but not limited to)**: diabetes mellitus, smoking, family history of premature CAD (men age less than 55, females less than 65), hypertension, dyslipidemia.
- Beginning 2023, the classification terms for angina were updated within the ACC's Multimodality Appropriate Use Criteria for the Detection and Risk Assessment of Chronic Coronary Disease to **Less Likely Anginal Symptoms** and **Likely Anginal Symptoms** as in #2. Previously, the document referred to "Typical Angina", "Atypical Angina" and "Non-Anginal" symptoms, defined by the **Diamond Forrester Table**. We still provide this information for your reference ~~:~~ ~~(7~~(1,8,9)~~)~~:

Diamond Forrester Table ~~*(31,32)*~~*(35,36)*

Age (Years)	Gender	Typical/Definite Angina Pectoris	Atypical/Probable Angina Pectoris	Nonanginal Chest Pain
≤ 39	Men	Intermediate	Intermediate	Low
	Women	Intermediate	Very low	Very low
40-49	Men	High	Intermediate	Intermediate
	Women	Intermediate	Low	Very low
50-59	Men	High	Intermediate	Intermediate
	Women	Intermediate	Intermediate	Low
≥ 60	Men	High	Intermediate	Intermediate
	Women	High	Intermediate	Intermediate

Very low: < 5% pretest probability of CAD, usually not requiring stress evaluation; **Low:** 5 - 10% pretest probability of CAD; **Intermediate:** 10% - 90% pretest probability of CAD; **High:** > 90% pretest probability of CAD

- ~~**Low:** 5 - 10% pretest probability of CAD~~
- ~~**Intermediate:** 10% - 90% pretest probability of CAD~~
- ~~**High:** > 90% pretest probability of CAD~~

- An uninterpretable baseline ECG includes ~~:~~~~(7)~~(8):
  - ST segment depression is considered significant when there is 1 mm or more, not for non-specific ST - T wave changes
  - Ischemic looking T waves are considered significant when there are at least 2.5 mm inversions (excluding V1 and V2)
  - Bundle Branch Blocks (BBB)
  - ~~LBBB~~
  - ~~RBBB~~Left BBB
  - Right BBB or intraventricular conduction delay (IVCD), containing ST or T wave abnormalities
  - LVH with repolarization abnormalities
  - Ventricular paced rhythm
  - Digitalis use with associated ST segment abnormalities
  - Resting HR under 50 bpm on a medication, such as beta-blockers or calcium channel blockers, that is required for patient's treatment and cannot be stopped, with an anticipated suboptimal workload
- Previously unevaluated pathologic Q waves (in two contiguous leads) defined as the following:
  - 40 ms (1 mm) wide
  - 2 mm deep
  - 25% of depth of QRS complex
- ECG Stress Test Alone versus Stress Testing with Imaging
- Prominent scenarios suitable for an ECG stress test WITHOUT imaging (i.e., exercise treadmill ECG test) require that the patient can exercise for at least 3 minutes of Bruce protocol with achievement of near maximal heart rate **AND** has an interpretable ECG for ischemia during exercise ~~:~~~~(9)~~(1):
  - The (symptomatic) low or intermediate pretest probability patient who can exercise and has an interpretable ECG ~~(9)~~(1)
  - The patient who is under evaluation for exercise-induced arrhythmia
  - The patient who requires an entrance stress test ECG for a cardiac rehab program or for an exercise prescription

- For the evaluation of syncope or presyncope during exertion ~~(33)~~(37)
- When exercise cannot be performed, pharmacologic stress can be considered.

- Duke Exercise ECG Treadmill Score ~~(34)~~(38)
  - Calculates risk from ECG treadmill alone**:**
    - The equation for calculating the Duke treadmill score (DTS) is: DTS = exercise time in minutes - (5 x ST deviation in mm or 0.1 mV increments) - (4 x exercise angina score), with angina score being 0 = none, 1 = non-limiting, and 2 = exercise-limiting
    - The score typically ranges from - 25 to + 15. These values correspond to low-risk (with a score of ≥ + 5), intermediate risk (with scores ranging from - 10 to + 4), and high-risk (with a score of ≤ - 11) categories

- MPI may be performed without diversion to a SE in any of the following ~~:~~~~(9,35)~~(1,39)**:**
  - Inability to Exercise
    - Physical limitations precluding ability to exercise for at least 3 full minutes of Bruce protocol
    - Limited functional capacity (< 4 METS) **such as one** of the following:
    - Unable to take care of their ADLs or ambulate
    - Unable to walk 2 blocks on level ground
    - Unable to climb 1 flight of stairs
  - Other Comorbidities
    - Severe chronic obstructive pulmonary disease (COPD) with pulmonary function test (PFT) documentation, severe shortness of breath on minimal exertion, or requirement of home oxygen during the day
    - Poorly controlled hypertension, with systolic BP > 180 or diastolic BP > 120 (and clinical urgency not to delay MPI)
  - ECG and Echo-Related Baseline Findings
    - Prior cardiac surgery (coronary artery bypass graft or valvular)
    - Documented poor acoustic imaging window
    - Left ventricular ejection fraction ≤ 40%
    - Pacemaker or ICD
    - Persistent atrial fibrillation
    - Resting wall motion abnormalities that would make SE interpretation difficult
    - Complete left bundle branch block (LBBB)
  - Risk-Related scenarios
    - High pretest probability in suspected CAD
    - Intermediate or high global risk in patients requiring type IC antiarrhythmic drugs

(prior to initiation of therapy and annually)

- Arrhythmia risk with exercise
- Previously unevaluated pathologic Q waves (in two contiguous leads)

- Global Risk of Cardiovascular Disease
  - **Global risk** of CAD is defined as the probability of manifesting cardiovascular disease over the next 10 years and refers to **asymptomatic** patients without known cardiovascular disease. It should be determined using one of the risk calculators below. A high risk is considered greater than a 20% risk of a cardiovascular event over the ensuing 10 years.
    - **CAD Risk—Low**
      10-year absolute coronary or cardiovascular risk less than 10%.
    - **CAD Risk—Moderate**
      10-year absolute coronary or cardiovascular risk between 10% and 20%.
    - **CAD Risk—High**
      10-year absolute coronary or cardiovascular risk of greater than 20%.

*Websites for Global Cardiovascular Risk Calculators** ~~*(36,37,38,39,*~~*(40–44)*~~*)*~~

Risk Calculator	**Websites for Online Calculator**
Framingham Cardiovascular Risk	**https://reference.medscape.com/calculator/framingham-cardiovascular-disease-risk**
Reynolds Risk Score Can use if no diabetes Unique for use of family history	**http://www.reynoldsriskscore.org/**
Pooled Cohort Equation	**http://clincalc.com/Cardiology/ASCVD/PooledCohort.aspx?example**
ACC/AHA Risk Calculator	**http://tools.acc.org/ASCVD-Risk-Estimator/**
MESA Risk Calculator With addition of Coronary Artery Calcium Score, for	**https://www.mesa-nhlbi.org/MESACHDRisk/MesaRiskScore/RiskScore.aspx**

Risk Calculator	Websites for Online Calculator
CAD-only risk	

*Patients who have already manifested cardiovascular disease are already at high global risk and are not applicable to the calculators.

Definitions ~~of Coronary Artery Disease~~ ~~(7,~~(8,9,13,45)~~41)~~

- Percentage stenosis refers to the reduction in diameter stenosis when angiography is the method and can be estimated or measured using angiography or more accurately measured with intravascular ultrasound (IVUS).
- Coronary artery calcification is a marker of risk, as measured by Agatston score on coronary artery calcium imaging. Its incorporation into global risk can be achieved by using the MESA risk calculator.
- Ischemia-producing disease (also called hemodynamically or functionally significant disease, for which revascularization might be appropriate) generally implies at least one of the following:
  - Suggested by percentage diameter stenosis ≥ 70% by angiography; intermediate lesions are 50 – 69~~%~~~~(9)~~% (1)
  - For a left main artery, suggested by a percentage stenosis ≥ 50~~%~~~~(7,41,42)~~% (8,45,46)
  - FFR (fractional flow reserve) ≤ 0.80 for a major vessel ~~(41,42)~~(45,46)
  - Demonstrable ischemic findings on stress testing (ECG or stress imaging), that are at least mild in degree
- FFR (fractional flow reserve) is the distal to proximal pressure ratio across a coronary lesion. Less than or equal to 0.80 is considered a significant reduction in coronary flow.

Anginal Equivalent ~~(7,33)~~(8,37)

- Development of an anginal equivalent (e.g., shortness of breath, fatigue, or weakness) either with or without prior coronary revascularization should be based upon the documentation of reasons to suspect that symptoms other than chest discomfort are not due to other organ systems (e.g., dyspnea due to lung disease, fatigue due to anemia). This may include respiratory rate, oximetry, lung exam, etc. (as well as d-dimer, chest CT(A), and/or ~~PFTs,~~pulmonary function tests (PFT), when appropriate), and then incorporated into the evaluation of coronary artery disease as would chest discomfort. Syncope per se is not an anginal equivalent.

Acronyms / Abbreviations

ADLs: Activities of daily living

BSA: Body surface area in square meters

CABG: Coronary artery bypass grafting

CAD: Coronary artery disease

CMR: Cardiac magnetic resonance imaging

CTA: Computed tomography angiography

ECG: Electrocardiogram

FFR: Fractional flow reserve

IVUS: Intravascular ultrasound

LBBB: Left bundle-branch block

LVEF: Left ventricular ejection fraction

LVH: Left ventricular hypertrophy

MI: Myocardial infarction

MET: Estimated metabolic equivalent of exercise

MPI: Myocardial perfusion imaging

PCI: Percutaneous coronary intervention

PFT: Pulmonary function test

PVCs: Premature ventricular contractions

SE: Stress echocardiography

THR: Target heart rate

VT: Ventricular tachycardia

VF: Ventricular fibrillation

WPW: Wolf Parkinson White

SUMMARY OF EVIDENCE

2023 AHA/ACC/ACCP/ASPC/NLA/PCNA Guideline for the Management of Patients With Chronic Coronary Disease [8]

Study Design: The guideline is based on a comprehensive literature search conducted from September 2021 to May 2022. The search included clinical studies, systematic reviews, meta-analyses, and other evidence conducted on human participants. The databases used for the search included MEDLINE (through PubMed), EMBASE, the Cochrane Library, and the Agency for Healthcare Research and Quality. The guideline was developed by the American Heart Association (AHA) and the American College of Cardiology (ACC) Joint Committee on Clinical Practice Guidelines, in collaboration with and endorsed by several other professional organizations.

Target Population: The guideline is intended for clinicians in primary care and cardiology specialties who care for patients with CCD in the outpatient setting. The target population includes patients with chronic coronary disease, which encompasses a heterogeneous group of conditions such as obstructive and nonobstructive coronary artery disease (CAD) with or without previous myocardial infarction (MI) or revascularization, ischemic heart disease diagnosed only by noninvasive testing, and chronic angina syndromes with varying underlying causes.

Key Factors:

Epidemiology and General Principles: The guideline addresses the prevalence of CCD, which varies by age, sex, race, ethnicity, and geographic region. It also highlights the role of social determinants of health in both risk and outcomes from CCD.

Evaluation, Diagnosis, and Risk Stratification: The guideline recommends the use of stress testing, invasive coronary angiography, and other diagnostic tools to assess the presence and extent of myocardial ischemia and guide therapeutic decision-making.

Treatment: The guideline emphasizes a patient-centered approach to treatment, incorporating shared decision-making, social determinants of health, and team-based care. It includes recommendations for lifestyle modifications, pharmacologic therapies, and revascularization.

Special Populations: The guideline provides specific recommendations for managing CCD in special populations, including patients with heart failure, valvular heart disease, young adults, cancer, women (including pregnancy and postmenopausal hormone therapy), older adults, chronic kidney disease, HIV, autoimmune disorders, and heart transplant recipients.

Patient Follow-Up: The guideline recommends regular follow-up to assess symptoms, functional status, adherence to lifestyle and medical interventions, and monitoring for complications of CCD and its treatments.

Cost and Value Considerations: The guideline includes recommendations for discussing out-of-pocket costs with patients to preempt cost-related nonadherence and ensure access to effective therapies.

2024 ESC Guidelines for the management of chronic coronary syndromes [9]

Study Design: The guidelines were developed through a comprehensive review and evaluation of the published literature on diagnostic and therapeutic approaches for chronic coronary syndromes. The task force performed a critical review of the scientific and medical knowledge available at the time of publication. The strength of each recommendation and the level of evidence supporting them were weighed and scored according to predefined scales. The guidelines were subject to multiple rounds of double-blind peer review by external experts, including members from across the ESC region, all National Cardiac Societies of the ESC, and relevant ESC subspecialty communities.

Target Population: The guidelines are intended for use by health professionals involved in the medical care of patients with chronic coronary syndromes. The target population includes patients with various clinical presentations of coronary artery disease during stable periods, particularly those preceding or following an acute coronary syndrome. The guidelines address the management of patients with suspected or confirmed chronic coronary syndromes, including those with obstructive and non-obstructive coronary artery disease, microvascular angina, and vasospastic angina.

Key Factors:

Diagnostic Testing: Recommendations for non-invasive and invasive diagnostic tests, including coronary computed tomography angiography (CCTA), stress echocardiography, myocardial perfusion imaging (SPECT/PET), cardiac magnetic

resonance imaging (CMR), and invasive coronary angiography with coronary pressure assessment.

Risk Stratification: Assessment of clinical likelihood of obstructive coronary artery disease, estimation of adverse-event risk, and identification of high-risk patients.

Treatment: Guideline-directed medical therapy, lifestyle optimization, antianginal medication, antithrombotic therapy, lipid-lowering drugs, anti-inflammatory agents, and revascularization strategies.

Special Populations: Management of patients with heart failure, angina/ischaemia with non-obstructive coronary arteries, older adults, sex differences, high bleeding-risk patients, and patients with inflammatory rheumatic diseases, hypertension, atrial fibrillation, valvular heart disease, chronic kidney disease, cancer, and human immunodeficiency virus.

ASNC model coverage policy: 2023 cardiac positron emission tomography [7]

Study Design: The policy document is an update to the 2014 model coverage policy for cardiac PET imaging studies. It describes various clinical situations for which a cardiac PET study is currently indicated, supported by numerous references and cross-referenced with appropriate use criteria (AUC). The document includes new sections on the evaluation of coronary microvascular disease, myocardial viability, cardiac sarcoidosis, and infection.

Target Population: The target population includes patients with known or suspected ischemic heart disease (IHD), coronary artery disease (CAD), myocardial viability, cardiac sarcoidosis, and infection. The policy aims to simplify the process for payers to provide coverage for appropriate cardiac PET procedures and serves as a resource for ASNC members, the cardiology community, referring physicians, and patients.

Key Factors

Clinical Indications: The document details various indications under eight categories, justifying the medical necessity for each indication with evidence provided.

ICD-10 Codes: The policy includes ICD-10 Clinical Modification codes and how they pertain to each appropriate indication.

Evaluation of Coronary Microvascular Disease: The document highlights the importance of PET in evaluating coronary microvascular disease, myocardial viability, cardiac sarcoidosis, and infection.

Radiation Exposure: The policy discusses the radiation exposure associated with cardiovascular PET imaging and emphasizes the goal of reducing radiation exposure without affecting image quality or accuracy.

Coding Guidelines: The document provides detailed coding guidelines for ICD-10 codes, Bill Type codes, Revenue Codes, and CPT/HCPCS codes.

ANALYSIS OF EVIDENCE

Shared Conclusions [7–9]

All three articles emphasize the importance of comprehensive management strategies for chronic coronary disease (CCD) and chronic coronary syndromes (CCS). They highlight the need for a multidisciplinary approach, including lifestyle modifications, pharmacological treatments, and revascularization when necessary.

Diagnostic Approaches

- **Horgan et al 2023 JNuclCardiol**: This article focuses on the use of positron emission tomography (PET) for myocardial perfusion imaging (MPI) and metabolic imaging. It discusses the clinical indications for cardiac PET, including its diagnostic accuracy and prognostic value. (7)
- **Virani et al 2023 JACC**: This guideline provides a detailed approach to the evaluation, diagnosis, and risk stratification of patients with chronic coronary disease. It emphasizes the use of non-invasive imaging techniques such as coronary computed tomography angiography (CCTA) and stress echocardiography. (8)
- **Vrints et al 2024 EurHeartJ**: This guideline outlines a stepwise approach to the initial management of individuals with suspected chronic coronary syndrome. It includes recommendations for history taking, risk factor assessment, and the use of various diagnostic tests, including CCTA and stress echocardiography. (9)

Treatment Strategies

- **Horgan et al 2023 JNuclCardiol**: The article discusses the role of PET MPI in guiding therapeutic decision-making, including the assessment of myocardial blood flow and the evaluation of myocardial viability. (7)
- **Virani et al 2023 JACC**: This guideline provides recommendations for the management of patients with chronic coronary disease, including the use of guideline-directed management and therapy (GDMT), revascularization, and the management of special populations. (8)
- **Vrints et al 2024 EurHeartJ**: The guideline emphasizes the importance of patient education, lifestyle optimization, and exercise therapy. It also discusses the use of antianginal and anti-ischemic medications, antithrombotic therapy, and lipid-lowering drugs. (9)

POLICY HISTORY

~~*Summary*~~

Date	Summary
July 2025	● This guideline merges two Evolent guidelines with identical clinical criteria: ECG 7312-01 for Myocardial Perfusion Imaging and ECG 024 for Myocardial Perfusion Imaging into Evolent Clinical Guideline 7312 for Myocardial Perfusion Imaging (MPI) o This guideline also merges Procedure Codes from these two

Date	Summary
	Evolent guidelines ● Added new bullet-point to the General Statement section ● Added a Summary of Evidence and Analysis of Evidence ● Updated references

LEGAL AND COMPLIANCE

Guideline Approval

Committee

Reviewed / Approved by Evolent Specialty Services Clinical Guideline Review Committee

Disclaimer

Evolent Clinical Guidelines do not constitute medical advice. Treating health care professionals are solely responsible for diagnosis, treatment, and medical advice. Evolent uses Clinical Guidelines in accordance with its contractual obligations to provide utilization management. Coverage for services varies for individual members according to the terms of their health care coverage or government program. Individual members' health care coverage may not utilize some Evolent Clinical Guidelines. Evolent clinical guidelines contain guidance that requires prior authorization and service limitations. A list of procedure codes, services or drugs may not be all inclusive and does not imply that a service or drug is a covered or non-covered service or drug. Evolent reserves the right to review and update this Clinical Guideline in its sole discretion. Notice of any changes shall be provided as required by applicable provider agreements and laws or regulations. Members should contact their Plan customer service representative for specific coverage information.

Evolent Clinical Guidelines are comprehensive and inclusive of various procedural applications for each service type. Our guidelines may be used to supplement Medicare criteria when such criteria is not fully established. When Medicare criteria is determined to not be fully established, we only reference the relevant portion of the corresponding Evolent Clinical Guideline that is applicable to the specific service or item requested in order to determine medical necessity.

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Evolent Clinical Guideline 7312 for Myocardial Perfusion Imaging (MPI)

Guideline Number: Evolent_CG_7312	**Applicable Codes**	
"Evolent" refers to Evolent Health LLC and Evolent Specialty Services, Inc.		
Original Date: January 2026	**Last Revised Date:** July 2025	**Implementation Date:** January 2026

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STATEMENT

General Information

- *It is an expectation that all patients receive care/services from a licensed clinician. All appropriate supporting documentation, including recent pertinent office visit notes, laboratory data, and results of any special testing must be provided. If applicable: All prior relevant imaging results and the reason that alternative imaging cannot be performed must be included in the documentation submitted.*
- *Where a specific clinical indication is not directly addressed in this guideline, medical necessity determination will be made based on widely accepted standard of care criteria. These criteria are supported by evidence-based or peer-reviewed sources such as medical literature, societal guidelines and state/national recommendations.*
- *The guideline criteria in the following sections were developed utilizing evidence-based and peer-reviewed resources from medical publications and societal organization guidelines as well as from widely accepted standard of care, best practice recommendations.*

Special Note

Medical necessity for myocardial perfusion imaging (MPI) will consider the preference for appropriate alternatives, such as stress echocardiography (SE), when deemed more suitable, unless contraindications are present (see **DEFINITIONS** section). Preference toward stress echocardiography will be denoted by SE

See legislative language for specific mandates in **Washington** State.

When a noncardiac explanation is provided for symptoms, no testing is required **(AUC Score 8)** [1]

Clinical Reasoning

All criteria are substantiated by the latest evidence-based medical literature. To enhance transparency and reference, Appropriate Use (AUC) scores, when available, are diligently listed alongside the criteria.

This guideline first defaults to AUC scores established by published, evidence-based guidance endorsed by professional medical organizations. In the absence of those scores, we adhere to a standardized practice of assigning an AUC score of 6. This score is determined by considering variables that ensure the delivery of patient-centered care in line with current guidelines, with a focus on achieving benefits that outweigh associated risks. This approach aims to maintain a robust foundation for decision-making and underscores our commitment to upholding the highest standards of care. [2–6]

INDICATIONS FOR MPI [1,7–10]

Suspected Coronary Artery Disease (CAD)

- **Symptomatic patients without known CAD. No imaging stress test within the last 12 months.** *The terms "typical," "atypical," and "non-anginal symptoms" can still be observed in medical records (consult the **Diamond Forrester table** in the **Definitions** section). However, the American College of Cardiology (ACC) has simplified its terminology to "Less likely anginal symptoms" and "Likely anginal symptoms" (refer to definitions) and utilized below.*
  - Less likely anginal symptoms **(AUC Score 6)** [1]
    - When a patient cannot walk a treadmill
    - When baseline EKG makes standard exercise test inaccurate (see **Definitions** section).SE
  - Likely Anginal Symptoms (typical angina) [1]
    - < 50 years old with ≤ one risk factor if an ECG treadmill test cannot be done. **AUC scores for this bullet point are identical for MPI, stress echo, and ETT **(AUC Score 7)**. Although the ACC guideline does not specify youth and gender, decisions should be guided by best medical judgment, considering factors such as safety and radiation exposure.
    - ≥ 50 years old **(AUC Score 8)** [1]
  - Repeat testing in a patient with new or worsening symptoms **AND** negative result at least one year prior **AND** meets one of the criteria aboveSE
- **Asymptomatic patients without known CAD (AUC Score 7)** [1]
  - A pharmacologic MPI is indicated for those unable to exercise with previously unevaluated ECG evidence of possible myocardial ischemia including ischemic ST segment or T wave abnormalities (see **DEFINITIONS** section).
  - Previously unevaluated pathologic Q waves (see **DEFINITIONS** section)
  - Previously unevaluated complete left bundle branch block

Abnormal Calcium Scores [1,11–14]

- STABLE SYMPTOMS with a prior Coronary Calcium Agatston Score of >100. No prior stress imaging done within the last 12 months **(AUC Score 7)** [1] SE
- ASYMPTOMATIC high global CAD risk patient with a prior Coronary Calcium Agatston Score of >100. No prior stress imaging done within the last 12 months SE
- ASYMPTOMATIC patient with Coronary Calcium Agatston Score > 400 (or a qualitative assessment where 'severe' coronary artery calcification is stated in a report incidentally detected on CT imaging performed for other clinical indications). No prior stress imaging done within the last 12 months [15] SE

Inconclusive CAD Evaluation and Obstructive CAD

REMAINS A CONCERN:

- Exercise stress ECG with low-risk Duke treadmill score (≥5), (see **DEFINITIONS** section) but patient's current symptoms indicate increasing likelihood of disease (**AUC score 8)** [1]
- Exercise stress ECG with an intermediate Duke treadmill score SE *(of note, SE diversion is not required* for symptoms consistent with likely anginal symptoms)
- Intermediate coronary computed tomography angiography (CCTA) (40 - 70% lesions) performed less than 90 days ago. **(AUC Score 7)** [1]
- Non-diagnostic exercise stress test with inability to achieve target heart rate (THR) defined as greater than 85% age predicted maximal heart rate by physiologic exercise
- An indeterminate (equivocal, borderline, or discordant) evaluation by prior stress imaging (SE or CMR) within the last 12 months
- Coronary stenosis of unclear significance on previous coronary angiography not previously evaluated [1]

Follow-Up of Patient's Post Coronary Revascularization (PCI or CABG) [1]

Any ONE of the following:

- **Asymptomatic follow-up stress imaging** at a minimum of 2 years post coronary artery bypass grafting (CABG) or percutaneous coronary intervention (PCI) (whichever is later) is appropriate for patients with: **(AUC Score 6)** [1] SE *(of note, SE diversion is not required* for post CABG patients)
  - **High risk:** diabetes with accelerated progression of CAD, chronic kidney disease (CKD), peripheral artery disease (PAD), prior brachytherapy, in-stent restenosis (ISR), or saphenous venous graft (SVG) intervention.
  - A history of silent ischemia or
  - A history of a prior left main stent
- For patients with high occupational risk, associated with public safety, airline and boat pilots, bus and train drivers, bridge and tunnel workers/toll collectors, police officers and firefighters SE (of note, *SE diversion not required for post-CABG patients*)
- **New, recurrent, or worsening symptoms, treated medically or by revascularization** is an indication for stress imaging, if it will alter management for typical anginal symptoms or symptoms documented to be similar to those prior to revascularization if no imaging stress test within the last 12 months. **(AUC Score 8)** [1,16]

Follow-Up of Known CAD

- **Follow-up of asymptomatic or stable symptoms** when last invasive or non-invasive

assessment of coronary disease showed hemodynamically significant CAD (ischemia on stress test or fractional flow reserve (FFR) ≤ 0.80 or significant stenosis in a major vessel (≥ 50% left main coronary artery or ≥ 70 % left-anterior descending (LAD), left circumflex (LCX), right coronary artery (RCA))), over two years ago, without intervening coronary revascularization is an appropriate indication for stress imaging in patients if it will alter management. SE (1)

Special Diagnostic Conditions Requiring Coronary Evaluation

Unevaluated Acute Coronary Syndrome

- Prior acute coronary syndrome (with documentation in MD notes), without invasive or non-invasive coronary evaluation within last 12 months
- Has ventricular wall motion abnormality demonstrated by another imaging modality and myocardial perfusion imaging is being performed to determine if the patient has myocardial ischemia. No imaging stress test within the last 12 months

Heart Failure

- Newly diagnosed systolic heart failure or diastolic heart failure, *with reasonable suspicion of cardiac ischemia (prior events, risk factors*), unless invasive coronary angiography is immediately planned. (8,17–19) No imaging stress test done within the last 12 months.

Viability

- Left ventricular ejection fraction (LVEF) requiring myocardial viability assessment to assist with decisions regarding coronary revascularization **(AUC Score 9)** (1,16)

Suboptimal Revascularization

- MPI is being done to evaluate the effectiveness of the intervention in a high-risk patient who has undergone cardiovascular re-perfusion (CABG or Percutaneous Coronary Intervention, PCI) with suboptimal and/or incomplete revascularization results. No imaging stress test has been done within the last 12 months. **(AUC Score 7)** (1,16)

Arrhythmias

- Ventricular arrhythmias **(AUC Score 7)** (1)
    - Sustained ventricular tachycardia (VT) > 100 bpm, ventricular fibrillation (VF), or exercise-induced VT, when invasive coronary arteriography is not immediately planned (20)
    - Non-sustained VT, multiple episodes, each ≥ 3 beats at ≥ 100 bpm, or frequent premature ventricular contractions (PVC) (defined as greater than or equal to 30/hour on remote monitoring) without known cause or associated cardiac pathology, when an exercise ECG cannot be performed (21)

Anti-Arrhythmic Drug Therapy

- Class IC antiarrhythmic drug
  - In the intermediate and high global risk patient prior to initiation of Class IC antiarrhythmic drug initiation (Propafenone or Flecainide)
  - Annually in intermediate and high global risk patients taking Class IC antiarrhythmic drug (Propafenone or Flecainide) [22]

Coronary Anomaly and Aneurism

- Assessment of hemodynamic significance of one of the following documented conditions:
  - Anomalous coronary arteries [23]
  - Myocardial bridging of coronary artery [24]
- Coronary aneurysms in Kawasaki's disease [25] or due to atherosclerosis

Radiation and Chemotherapy SE

- Following radiation therapy to the anterior or left chest, at 5 years post initiation and every 5 years thereafter [26]

Sarcoidosis and Amyloidosis (PYP study)

- Cardiac sarcoidosis: as a combination study with Heart PET for the evaluation and treatment of cardiac sarcoidosis [27]
- Cardiac amyloidosis: for the diagnosis of cardiac transthyretin amyloidosis (ATTR)

***Not** to be used for the diagnosis of cardiac light chain amyloidosis (AL) [28]

Prior To Elective Non-Cardiac Surgery In Asymptomatic Patient

- An intermediate or high-risk surgery with of one or more risk factors (see below), AND documentation of an inability to walk (or <4 METs) AND there has not been an imaging stress test within 1 year [29–31]
  - **Risk factors:** history of ischemic heart disease, history of congestive heart failure, history of cerebrovascular disease, preoperative treatment with insulin, and preoperative serum creatinine >2.0 mg/dL
  - **Surgical Risk:**
    - **High risk surgery:** Aortic and other major vascular surgery, peripheral vascular surgery, anticipated prolonged surgical procedures associated with large fluid shifts and/or blood loss
    - **Intermediate risk surgery:** Carotid endarterectomy, head and neck surgery, intraperitoneal and intrathoracic surgery, orthopedic surgery, prostate surgery

- **Low risk surgery**: Endoscopic procedures, superficial procedure, cataract surgery, breast surgery

- Planning for any organ or stem cell transplantation is an indication for preoperative MPI, if there has not been a conclusive stress evaluation, computed tomography angiography (CTA), or heart catheterization within the past year, at the discretion of the transplant service. [32,33]

Post Cardiac Transplant (SE Diversion Not Required)

- Annually, for the first five years post cardiac transplantation, in a patient not undergoing invasive coronary arteriography

LEGISLATIVE LANGUAGE

Washington

20211105A - Noninvasive Cardiac Imaging for Coronary Artery Disease [34]

Number and coverage topic:

20211105A – Noninvasive Cardiac Imaging for Coronary Artery Disease

HTCC coverage determination:

Noninvasive cardiac imaging is a **covered benefit with conditions**.

HTCC reimbursement determination:

Limitations of coverage: The following noninvasive cardiac imaging technologies are **covered with conditions**:

- Stress echocardiography for:
  - Symptomatic adult patients (≥18 years of age) at intermediate or high risk of Coronary Artery Disease (CAD), or
  - Adult patients with known CAD who have new or worsening symptoms.
- Single Positron Emission Tomography (SPECT) for:
  - Patients under the same conditions as stress echocardiography when stress echocardiography is not technically feasible or clinically appropriate.
- Positron Emission Tomography (PET) for:
  - Patients under the same conditions as SPECT, when SPECT is not technically feasible or clinically appropriate.
- Coronary Computed Tomographic Angiography (CCTA) for:
  - Symptomatic adult patients (≥18 years of age) at intermediate or high risk of CAD, or
  - Adult patients with known CAD who have new or worsening symptoms.

- CCTA with Fractional Flow Reserve (FFR) for:
  - Patients under the same conditions as CCTA, when further investigation of functional significance of stenoses is clinically indicated.

Non-covered indicators:

N/A

CODING AND STANDARDS

Codes

78451, 78452, 78453, 78454, 78466, 78468, 78469, 78481, 78483, 78499, 93015, 93016, 93017, 93018, +0742T, A9500, A9502, A9505, J0153, J1245, J2785

Applicable Lines of Business

☒	CHIP (Children's Health Insurance Program)
☒	Commercial
☒	Exchange/Marketplace
☒	Medicaid
☒	Medicare Advantage

BACKGROUND

Myocardial perfusion imaging is used primarily for the evaluation of coronary artery disease and determining prognosis. Myocardial perfusion imaging is a cardiac radionuclide imaging procedure that evaluates blood flow to the cardiac muscle during rest or stress. Stress may be provided by exercise or with pharmacologic agents. A variety of radionuclides may be used, including Technetium tc-99M sestamibi, thallium201 and Technetiumtc-99M tetrofosmin.

For those patients who are unable to complete the exercise protocol without achieving >85% of predicted maximal heart rate, a pharmacological nuclear stress test is recommended. This testing method uses a drug to mimic the response of the cardiovascular system to exercise. Adenosine, Persantine, Dobutamine, or Regadenoson are vasodilators used in pharmacological nuclear stress testing. A gamma camera is used to record images in planar or tomographic (single photon emission computed tomography, SPECT) projections.

High global CAD risk is defined as 10-year CAD risk of >20%. CAD equivalents (e.g., DM, PAD) can also define high risk.

10-year CAD risk (%) is defined based on the risk factors- Sex, Age, Race, Total Cholesterol, HDL Cholesterol, Systolic Blood Pressure, and Treatment for High Blood Pressure, Diabetes Mellitus, and Smoker.

AUC Score

A reasonable diagnostic or therapeutic procedure can be defined as that for which the expected clinical benefits outweigh the associated risks, enhancing patient care and health outcomes in a cost-effective manner. [3]

- Appropriate Care - Median Score 7-9
- May be Appropriate Care - Median Score 4-6
- Rarely Appropriate Care - Median Score 1-3

Definitions

- Stable patients without known CAD fall into 2 categories [1,8,9]:
  - **Asymptomatic**, for whom global risk of CAD events can be determined from coronary risk factors, using calculators available online (see **Websites for Global Cardiovascular Risk Calculators** section).
  - **Symptomatic,** for whom we estimate the pretest probability that their chest-related symptoms are due to clinically significant CAD (below):
- The medical record should provide enough detail to establish the type of chest pain:
  - **Likely Anginal symptoms** encompass chest/epigastric/shoulder/arm/jaw pain, chest pressure/discomfort occurring with exertion or emotional stress and relieved by rest, nitroglycerine or both.
  - **Less-Likely Anginal symptoms** include dyspnea, or fatigue not relieved by rest/nitroglycerin, as well as generalized fatigue or chest discomfort with a time course not indicative of angina (e.g., resolving spontaneously within seconds or lasting for an extended period unrelated to exertion).
- **Risk Factors for Coronary disease include (but not limited to)**: diabetes mellitus, smoking, family history of premature CAD (men age less than 55, females less than 65), hypertension, dyslipidemia.
- Beginning 2023, the classification terms for angina were updated within the ACC's Multimodality Appropriate Use Criteria for the Detection and Risk Assessment of Chronic Coronary Disease to **Less Likely Anginal Symptoms** and **Likely Anginal Symptoms** as in #2. Previously, the document referred to "Typical Angina", "Atypical Angina" and "Non-Anginal" symptoms, defined by the **Diamond Forrester Table**. We still provide this information for your reference [1,8,9]:

Diamond Forrester Table [35,36]

Age (Years)	Gender	Typical/Definite Angina Pectoris	Atypical/Probable Angina Pectoris	Nonanginal Chest Pain
≤ 39	Men	Intermediate	Intermediate	Low
	Women	Intermediate	Very low	Very low
40-49	Men	High	Intermediate	Intermediate
	Women	Intermediate	Low	Very low
50-59	Men	High	Intermediate	Intermediate
	Women	Intermediate	Intermediate	Low
≥ 60	Men	High	Intermediate	Intermediate
	Women	High	Intermediate	Intermediate

Very low: < 5% pretest probability of CAD, usually not requiring stress evaluation; **Low:** 5 - 10% pretest probability of CAD; **Intermediate:** 10% - 90% pretest probability of CAD; **High:** > 90% pretest probability of CAD

- An uninterpretable baseline ECG includes [8]:
  - ST segment depression is considered significant when there is 1 mm or more, not for non-specific ST - T wave changes
  - Ischemic looking T waves are considered significant when there are at least 2.5 mm inversions (excluding V1 and V2)
  - Bundle Branch Blocks (BBB)
  - Left BBB
  - Right BBB or intraventricular conduction delay (IVCD), containing ST or T wave abnormalities
  - LVH with repolarization abnormalities
  - Ventricular paced rhythm
  - Digitalis use with associated ST segment abnormalities
  - Resting HR under 50 bpm on a medication, such as beta-blockers or calcium channel blockers, that is required for patient's treatment and cannot be stopped, with an anticipated suboptimal workload
- Previously unevaluated pathologic Q waves (in two contiguous leads) defined as the following:
  - 40 ms (1 mm) wide

- 2 mm deep
- 25% of depth of QRS complex

- ECG Stress Test Alone versus Stress Testing with Imaging
- Prominent scenarios suitable for an ECG stress test WITHOUT imaging (i.e., exercise treadmill ECG test) require that the patient can exercise for at least 3 minutes of Bruce protocol with achievement of near maximal heart rate **AND** has an interpretable ECG for ischemia during exercise [1]:
  - The (symptomatic) low or intermediate pretest probability patient who can exercise and has an interpretable ECG [1]
  - The patient who is under evaluation for exercise-induced arrhythmia
  - The patient who requires an entrance stress test ECG for a cardiac rehab program or for an exercise prescription
  - For the evaluation of syncope or presyncope during exertion [37]
  - When exercise cannot be performed, pharmacologic stress can be considered.
- Duke Exercise ECG Treadmill Score [38]
  - Calculates risk from ECG treadmill alone**:**
    - The equation for calculating the Duke treadmill score (DTS) is: DTS = exercise time in minutes - (5 x ST deviation in mm or 0.1 mV increments) - (4 x exercise angina score), with angina score being 0 = none, 1 = non-limiting, and 2 = exercise-limiting
    - The score typically ranges from - 25 to + 15. These values correspond to low-risk (with a score of ≥ + 5), intermediate risk (with scores ranging from - 10 to + 4), and high-risk (with a score of ≤ - 11) categories
- MPI may be performed without diversion to a SE in any of the following [1,39]:
  - Inability to Exercise
    - Physical limitations precluding ability to exercise for at least 3 full minutes of Bruce protocol
    - Limited functional capacity (< 4 METS) **such as one** of the following:
    - Unable to take care of their ADLs or ambulate
    - Unable to walk 2 blocks on level ground
    - Unable to climb 1 flight of stairs
  - Other Comorbidities
    - Severe chronic obstructive pulmonary disease (COPD) with pulmonary function test (PFT) documentation, severe shortness of breath on minimal exertion, or requirement of home oxygen during the day
    - Poorly controlled hypertension, with systolic BP > 180 or diastolic BP > 120 (and clinical urgency not to delay MPI)

- ECG and Echo-Related Baseline Findings
  - Prior cardiac surgery (coronary artery bypass graft or valvular)
  - Documented poor acoustic imaging window
  - Left ventricular ejection fraction ≤ 40%
  - Pacemaker or ICD
  - Persistent atrial fibrillation
  - Resting wall motion abnormalities that would make SE interpretation difficult
  - Complete left bundle branch block (LBBB)
- Risk-Related scenarios
  - High pretest probability in suspected CAD
  - Intermediate or high global risk in patients requiring type IC antiarrhythmic drugs (prior to initiation of therapy and annually)
  - Arrhythmia risk with exercise
  - Previously unevaluated pathologic Q waves (in two contiguous leads)

- Global Risk of Cardiovascular Disease
  - **Global risk** of CAD is defined as the probability of manifesting cardiovascular disease over the next 10 years and refers to **asymptomatic** patients without known cardiovascular disease. It should be determined using one of the risk calculators below. A high risk is considered greater than a 20% risk of a cardiovascular event over the ensuing 10 years.
    - **CAD Risk—Low**
      10-year absolute coronary or cardiovascular risk less than 10%.
    - **CAD Risk—Moderate**
      10-year absolute coronary or cardiovascular risk between 10% and 20%.
    - **CAD Risk—High**
      10-year absolute coronary or cardiovascular risk of greater than 20%.

*Websites for Global Cardiovascular Risk Calculators** *(40–44)*

Risk Calculator	Websites for Online Calculator
Framingham Cardiovascular Risk	**https://reference.medscape.com/calculator/framingham-cardiovascular-disease-risk**
Reynolds Risk Score Can use if no diabetes Unique for use of family history	**http://www.reynoldsriskscore.org/**

Risk Calculator	Websites for Online Calculator
Pooled Cohort Equation	**http://clincalc.com/Cardiology/ASCVD/PooledCohort.aspx?example**
ACC/AHA Risk Calculator	**http://tools.acc.org/ASCVD-Risk-Estimator/**
MESA Risk Calculator With addition of Coronary Artery Calcium Score, for CAD-only risk	**https://www.mesa-nhlbi.org/MESACHDRisk/MesaRiskScore/RiskScore.aspx**

*Patients who have already manifested cardiovascular disease are already at high global risk and are not applicable to the calculators.

Definitions [8,9,13,45]

- Percentage stenosis refers to the reduction in diameter stenosis when angiography is the method and can be estimated or measured using angiography or more accurately measured with intravascular ultrasound (IVUS).
- Coronary artery calcification is a marker of risk, as measured by Agatston score on coronary artery calcium imaging. Its incorporation into global risk can be achieved by using the MESA risk calculator.
- Ischemia-producing disease (also called hemodynamically or functionally significant disease, for which revascularization might be appropriate) generally implies at least one of the following:
    - Suggested by percentage diameter stenosis ≥ 70% by angiography; intermediate lesions are 50 – 69% [1]
    - For a left main artery, suggested by a percentage stenosis ≥ 50% [8,45,46]
    - FFR (fractional flow reserve) ≤ 0.80 for a major vessel [45,46]
    - Demonstrable ischemic findings on stress testing (ECG or stress imaging), that are at least mild in degree
- FFR (fractional flow reserve) is the distal to proximal pressure ratio across a coronary lesion. Less than or equal to 0.80 is considered a significant reduction in coronary flow.

Anginal Equivalent [8,37]

- Development of an anginal equivalent (e.g., shortness of breath, fatigue, or weakness) either with or without prior coronary revascularization should be based upon the documentation of reasons to suspect that symptoms other than chest discomfort are not

due to other organ systems (e.g., dyspnea due to lung disease, fatigue due to anemia). This may include respiratory rate, oximetry, lung exam, etc. (as well as d-dimer, chest CT(A), and/or pulmonary function tests (PFT), when appropriate), and then incorporated into the evaluation of coronary artery disease as would chest discomfort. Syncope per se is not an anginal equivalent.

Acronyms / Abbreviations

ADLs: Activities of daily living

BSA: Body surface area in square meters

CABG: Coronary artery bypass grafting

CAD: Coronary artery disease

CMR: Cardiac magnetic resonance imaging

CTA: Computed tomography angiography

ECG: Electrocardiogram

FFR: Fractional flow reserve

IVUS: Intravascular ultrasound

LBBB: Left bundle-branch block

LVEF: Left ventricular ejection fraction

LVH: Left ventricular hypertrophy

MI: Myocardial infarction

MET: Estimated metabolic equivalent of exercise

MPI: Myocardial perfusion imaging

PCI: Percutaneous coronary intervention

PFT: Pulmonary function test

PVCs: Premature ventricular contractions

SE: Stress echocardiography

THR: Target heart rate

VT: Ventricular tachycardia

VF: Ventricular fibrillation

WPW: Wolf Parkinson White

SUMMARY OF EVIDENCE

2023 AHA/ACC/ACCP/ASPC/NLA/PCNA Guideline for the Management of Patients With Chronic Coronary Disease [8]

Study Design: The guideline is based on a comprehensive literature search conducted from September 2021 to May 2022. The search included clinical studies, systematic reviews, meta-analyses, and other evidence conducted on human participants. The databases used for the search included MEDLINE (through PubMed), EMBASE, the Cochrane Library, and the Agency for Healthcare Research and Quality. The guideline was developed by the American Heart Association (AHA) and the American College of Cardiology (ACC) Joint Committee on Clinical Practice Guidelines, in collaboration with and endorsed by several other professional organizations.

Target Population: The guideline is intended for clinicians in primary care and cardiology specialties who care for patients with CCD in the outpatient setting. The target population includes patients with chronic coronary disease, which encompasses a heterogeneous group of conditions such as obstructive and nonobstructive coronary artery disease (CAD) with or without previous myocardial infarction (MI) or revascularization, ischemic heart disease diagnosed only by noninvasive testing, and chronic angina syndromes with varying underlying causes.

Key Factors:

Epidemiology and General Principles: The guideline addresses the prevalence of CCD, which varies by age, sex, race, ethnicity, and geographic region. It also highlights the role of social determinants of health in both risk and outcomes from CCD.

Evaluation, Diagnosis, and Risk Stratification: The guideline recommends the use of stress testing, invasive coronary angiography, and other diagnostic tools to assess the presence and extent of myocardial ischemia and guide therapeutic decision-making.

Treatment: The guideline emphasizes a patient-centered approach to treatment, incorporating shared decision-making, social determinants of health, and team-based care. It includes recommendations for lifestyle modifications, pharmacologic therapies, and revascularization.

Special Populations: The guideline provides specific recommendations for managing CCD in special populations, including patients with heart failure, valvular heart disease, young adults, cancer, women (including pregnancy and postmenopausal hormone therapy), older adults, chronic kidney disease, HIV, autoimmune disorders, and heart transplant recipients.

Patient Follow-Up: The guideline recommends regular follow-up to assess symptoms, functional status, adherence to lifestyle and medical interventions, and monitoring for complications of CCD and its treatments.

Cost and Value Considerations: The guideline includes recommendations for discussing out-of-pocket costs with patients to preempt cost-related nonadherence and ensure access to effective therapies.

2024 ESC Guidelines for the management of chronic coronary syndromes [9]

Study Design: The guidelines were developed through a comprehensive review and evaluation

of the published literature on diagnostic and therapeutic approaches for chronic coronary syndromes. The task force performed a critical review of the scientific and medical knowledge available at the time of publication. The strength of each recommendation and the level of evidence supporting them were weighed and scored according to predefined scales. The guidelines were subject to multiple rounds of double-blind peer review by external experts, including members from across the ESC region, all National Cardiac Societies of the ESC, and relevant ESC subspecialty communities.

Target Population: The guidelines are intended for use by health professionals involved in the medical care of patients with chronic coronary syndromes. The target population includes patients with various clinical presentations of coronary artery disease during stable periods, particularly those preceding or following an acute coronary syndrome. The guidelines address the management of patients with suspected or confirmed chronic coronary syndromes, including those with obstructive and non-obstructive coronary artery disease, microvascular angina, and vasospastic angina.

Key Factors:

Diagnostic Testing: Recommendations for non-invasive and invasive diagnostic tests, including coronary computed tomography angiography (CCTA), stress echocardiography, myocardial perfusion imaging (SPECT/PET), cardiac magnetic resonance imaging (CMR), and invasive coronary angiography with coronary pressure assessment.

Risk Stratification: Assessment of clinical likelihood of obstructive coronary artery disease, estimation of adverse-event risk, and identification of high-risk patients.

Treatment: Guideline-directed medical therapy, lifestyle optimization, antianginal medication, antithrombotic therapy, lipid-lowering drugs, anti-inflammatory agents, and revascularization strategies.

Special Populations: Management of patients with heart failure, angina/ischaemia with non-obstructive coronary arteries, older adults, sex differences, high bleeding-risk patients, and patients with inflammatory rheumatic diseases, hypertension, atrial fibrillation, valvular heart disease, chronic kidney disease, cancer, and human immunodeficiency virus.

ASNC model coverage policy: 2023 cardiac positron emission tomography [7]

Study Design: The policy document is an update to the 2014 model coverage policy for cardiac PET imaging studies. It describes various clinical situations for which a cardiac PET study is currently indicated, supported by numerous references and cross-referenced with appropriate use criteria (AUC). The document includes new sections on the evaluation of coronary microvascular disease, myocardial viability, cardiac sarcoidosis, and infection.

Target Population: The target population includes patients with known or suspected ischemic heart disease (IHD), coronary artery disease (CAD), myocardial viability, cardiac sarcoidosis, and infection. The policy aims to simplify the process for payers to provide coverage for appropriate cardiac PET procedures and serves as a resource for ASNC members, the cardiology community, referring physicians, and patients.

Key Factors

Clinical Indications: The document details various indications under eight categories, justifying the medical necessity for each indication with evidence provided.

ICD-10 Codes: The policy includes ICD-10 Clinical Modification codes and how they pertain to each appropriate indication.

Evaluation of Coronary Microvascular Disease: The document highlights the importance of PET in evaluating coronary microvascular disease, myocardial viability, cardiac sarcoidosis, and infection.

Radiation Exposure: The policy discusses the radiation exposure associated with cardiovascular PET imaging and emphasizes the goal of reducing radiation exposure without affecting image quality or accuracy.

Coding Guidelines: The document provides detailed coding guidelines for ICD-10 codes, Bill Type codes, Revenue Codes, and CPT/HCPCS codes.

ANALYSIS OF EVIDENCE

Shared Conclusions [7–9]

All three articles emphasize the importance of comprehensive management strategies for chronic coronary disease (CCD) and chronic coronary syndromes (CCS). They highlight the need for a multidisciplinary approach, including lifestyle modifications, pharmacological treatments, and revascularization when necessary.

Diagnostic Approaches

- **Horgan et al 2023 JNuclCardiol**: This article focuses on the use of positron emission tomography (PET) for myocardial perfusion imaging (MPI) and metabolic imaging. It discusses the clinical indications for cardiac PET, including its diagnostic accuracy and prognostic value. [7]
- **Virani et al 2023 JACC**: This guideline provides a detailed approach to the evaluation, diagnosis, and risk stratification of patients with chronic coronary disease. It emphasizes the use of non-invasive imaging techniques such as coronary computed tomography angiography (CCTA) and stress echocardiography. [8]
- **Vrints et al 2024 EurHeartJ**: This guideline outlines a stepwise approach to the initial management of individuals with suspected chronic coronary syndrome. It includes recommendations for history taking, risk factor assessment, and the use of various diagnostic tests, including CCTA and stress echocardiography. [9]

Treatment Strategies

- **Horgan et al 2023 JNuclCardiol**: The article discusses the role of PET MPI in guiding therapeutic decision-making, including the assessment of myocardial blood flow and the evaluation of myocardial viability. [7]
- **Virani et al 2023 JACC**: This guideline provides recommendations for the management of patients with chronic coronary disease, including the use of guideline-directed management and therapy (GDMT), revascularization, and the management of special populations. [8]

- **Vrints et al 2024 EurHeartJ**: The guideline emphasizes the importance of patient education, lifestyle optimization, and exercise therapy. It also discusses the use of antianginal and anti-ischemic medications, antithrombotic therapy, and lipid-lowering drugs. [9]

POLICY HISTORY

Date	Summary
July 2025	• This guideline merges two Evolent guidelines with identical clinical criteria: ECG 7312-01 for Myocardial Perfusion Imaging and ECG 024 for Myocardial Perfusion Imaging into Evolent Clinical Guideline 7312 for Myocardial Perfusion Imaging (MPI) ○ This guideline also merges Procedure Codes from these two Evolent guidelines • Added new bullet-point to the General Statement section • Added a Summary of Evidence and Analysis of Evidence • Updated references

LEGAL AND COMPLIANCE

Guideline Approval

Committee

Reviewed / Approved by Evolent Specialty Services Clinical Guideline Review Committee

Disclaimer

Evolent Clinical Guidelines do not constitute medical advice. Treating health care professionals are solely responsible for diagnosis, treatment, and medical advice. Evolent uses Clinical Guidelines in accordance with its contractual obligations to provide utilization management. Coverage for services varies for individual members according to the terms of their health care coverage or government program. Individual members' health care coverage may not utilize some Evolent Clinical Guidelines. Evolent clinical guidelines contain guidance that requires prior authorization and service limitations. A list of procedure codes, services or drugs may not be all inclusive and does not imply that a service or drug is a covered or non-covered service or drug. Evolent reserves the right to review and update this Clinical Guideline in its sole discretion. Notice of any changes shall be provided as required by applicable provider agreements and laws or regulations. Members should contact their Plan customer service representative for specific coverage information.

Evolent Clinical Guidelines are comprehensive and inclusive of various procedural applications for each service type. Our guidelines may be used to supplement Medicare criteria when such criteria is not fully established. When Medicare criteria is determined to not be fully established, we only reference the relevant portion of the corresponding Evolent Clinical Guideline that is applicable to the specific service or item requested in order to determine medical necessity.

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