



2027

Evolent Clinical Guidelines for Medical Necessity Review

Diagnostic Cardiology

Effective January 1, 2027 – December 31, 2027

Guidelines for Clinical Review Determination

Preamble

Evolent is committed to the philosophy of supporting safe and effective treatment for patients. The medical necessity criteria that follow are guidelines for the provision of diagnostic imaging. These criteria are designed to guide both providers and reviewers to the most appropriate diagnostic tests based on a patient's unique circumstances. In all cases, clinical judgment consistent with the standards of good medical practice will be used when applying the guidelines. Determinations are made based on both the guideline and clinical information provided at the time of the request. It is expected that medical necessity decisions may change as new evidence-based information is provided or based on unique aspects of the patient's condition. The treating clinician has final authority and responsibility for treatment decisions regarding the care of the patient.

Guideline Development Process

These medical necessity criteria were developed by Evolent for the purpose of making clinical review determinations for requests for therapies and diagnostic procedures. The developers of the criteria sets included representatives from the disciplines of radiology, internal medicine, nursing, cardiology, and other specialty groups. Evolent's guidelines are reviewed yearly and modified when necessary following a literature search of pertinent and established clinical guidelines and accepted diagnostic imaging practices.

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TABLE OF CONTENTS

Diagnostic Cardiology Clinical Guidelines

- Artificial Intelligence Assisted Coronary Analysis
- Coronary Artery Calcium Scoring by Electron Beam Computed Tomography (EBCT) or Non-Contrast Coronary Computed Tomography (CCT)
- Coronary Artery Computed Tomography Angiography (CCTA)
- Heart Computed Tomography (CT)
- Heart Magnetic Resonance Imaging (MRI)
- Heart Positron Emission Tomography (PET) with or without Computed Tomography (CT) for Attenuation
- Multiple Gated Acquisition Scan (MUGA)
- Myocardial Perfusion Imaging (MPI)
- Stress Echocardiogram
- Transesophageal Echocardiogram (TEE)
- Transthoracic Echocardiogram (TTE)

Evolut Clinical Guideline 7272 for Coronary Artery Calcium Scoring by Electron Beam Computed Tomography (EBCT) or Non-Contrast Coronary Computed Tomography (CCT)

Guideline Number: Evolut_CG_7272	<u>Applicable Codes</u>	
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TABLE OF CONTENTS

STATEMENT	2
GENERAL INFORMATION	2
PURPOSE	2
CLINICAL REASONING	2
INDICATIONS FOR CORONARY ARTERY CALCIUM (CAC) TESTING	2
CODING AND STANDARDS	4
CODES	4
APPLICABLE LINES OF BUSINESS	4
BACKGROUND	4
GENERAL OVERVIEW	4
<i>Global Risk of Cardiovascular Disease</i>	5
AUC SCORE	5
ACRONYMS / ABBREVIATIONS	6
SUMMARY OF EVIDENCE	6
ANALYSIS OF EVIDENCE	8
POLICY HISTORY	9
LEGAL AND COMPLIANCE	10
GUIDELINE APPROVAL	10
<i>Committee</i>	10
DISCLAIMER	10
REFERENCES	11

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.*

Purpose

This guideline includes clinical criteria for coronary artery calcium (CAC) scoring, by either EBCT or non-contrast cardiac computed tomography (CCT). CAC testing provides a quantitative assessment of coronary artery calcium content in Agatston units, as an adjunct to the estimation of global risk (see **Background**) for coronary or cardiovascular events over the next 10 years. A CAC Score > 0 is a highly specific feature of coronary atherosclerosis.

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. ⁽¹⁻⁵⁾

INDICATIONS FOR CORONARY ARTERY CALCIUM (CAC) TESTING

CAC testing is for cardiovascular risk assessment in individuals aged 40-75 years who have an intermediate (5-19.9%) 10-year atherosclerotic cardiovascular disease (ASCVD) risk based

upon the ACC/AHA pooled cohort risk calculator. Documentation is required that the results of the study will affect decision making for preventative actions (i.e., statin therapy).

Patients, regardless of age, can be considered for CAC testing when there is well-documented evidence of one of the following ^(6–10):

- For asymptomatic patients, without known coronary disease, at intermediate global risk (7.5%-19.9%), with or without risk-enhancing factors **(AUC Score 8)** ⁽⁹⁾
- For asymptomatic patients without known coronary disease who are at low to borderline risk (including those < 40 years old), but suspected to be at higher risk due to one or more risk enhancers (listed below) **(AUC Score 7)** ⁽⁹⁾
 - Atherosclerotic cardiovascular disease (ASCVD) risk enhancing factors include any of the following ^(7,9):
 - Family history of premature ASCVD (male age <55 years, female age < 65 years)
 - Primary hypercholesterolemia (LDL-C, 160-189 mg/dL [4.1–4.8 mmol/L] or non-HDL-C, 190-219 mg/dL [4.9–5.6 mmol/L])
 - Chronic kidney disease (eGFR 15–59 mL/min/1.73 m² with or without albuminuria; not treated with dialysis or kidney transplantation)
 - Metabolic syndrome (increased waist circumference [by ethnically appropriate cutpoints], elevated triglycerides [> 150 mg/dL, nonfasting], elevated blood pressure, elevated glucose, and low HDL-C [< 40 mg/dL in men; < 50 mg/dL in women] are factors; a tally of 3 makes the diagnosis)
 - Conditions specific to women (e.g., pre-eclampsia, premature menopause)
 - Inflammatory diseases (human immunodeficiency virus (HIV), psoriasis, rheumatoid arthritis (RA), lupus)
 - Noncoronary vascular disease (e.g., ABI < 0.9)
 - Ethnicity (e.g., South Asian ancestry)
 - Persistently elevated triglycerides (> 175 mg/dL, nonfasting)
 - Elevated high-sensitivity C-reactive protein (hs-CRP) ≥ 2 mg/L
 - Elevated Lp(a) levels ≥ 50 mg/dL or ≥ 125 nmol/L
 - Elevated apoB ≥ 130 mg/dL
- For asymptomatic patients, without known coronary disease, where there is a need for alternative lipid-lowering strategies when statin therapy is contraindicated, due to adverse effects or patient reluctance ⁽¹¹⁾
- CAC testing may be repeated indefinitely for re-assessment of the asymptomatic patient without known coronary disease after a minimum of 5 years until the calcium score breaches 400 or up to twice if the calcium score remains zero ^(12,13)
- Aortic valve calcium scoring to further define stenosis severity in suspected low-flow, low-gradient severe aortic stenosis (AS) with normal or reduced left ventricular ejection

fraction (LVEF) ⁽¹⁴⁾

CODING AND STANDARDS

Codes

Code	Description
S8092	Electron beam computed tomography (also known as ultrafast CT, cine CT)
75571	Computed tomography, heart, without contrast material, with quantitative evaluation of coronary calcium
+0722T	Quantitative computed tomography (CT) tissue characterization, including interpretation and report, obtained with concurrent CT examination of any structure contained in the concurrently acquired diagnostic imaging dataset (List separately in addition to code for primary procedure)

Applicable Lines of Business

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

BACKGROUND

General Overview

CAC testing is for cardiovascular risk assessment in individuals aged 40-75 years who have an intermediate (5-19.9%) 10-year ASCVD risk based upon the ACC/AHA pooled cohort risk calculator. Documentation is required that the results of the study will affect decision making for preventative actions (i.e., statin therapy). CAC testing is a cardiovascular risk assessment tool, applicable only to the patient without known cardiovascular disease, for the purpose of primary prevention. It is not for the patient with suspected or known cardiovascular disease, coronary or

otherwise, who already requires aggressive risk factor modification. This test is not to be utilized for symptomatic patients in active ischemic evaluation.

CAC score > 100 can also provide support for aspirin therapy and statin therapy. ^(12,15)

Calcium scores are used to help determine the use and dosage of statin therapy in patients with various risks of developing clinically symptomatic atherosclerotic disease. Once symptomatic coronary disease has been established or once the patient is considered high risk, the usefulness of calcium scoring falls away as patients should be on high dose therapy and the results of a calcium score would add no further benefit. If a patient is symptomatic, non-invasive or invasive testing should remain first line.

Global Risk of Cardiovascular Disease

Global risk of cardiovascular disease (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 by using one of the risk calculators below.

- Low risk (<5%)
- Borderline risk (5% - 7.4%)
- Intermediate risk (7.5% to 19.9%)
- High risk ($\geq 20\%$)

Global Cardiovascular Risk Calculators ^(6,7,16–18)

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

- Framingham Cardiovascular Risk
- Reynolds Risk Score
 - Can use if there is no history of diabetes. Unique for use of family history
- Pooled Cohort Equation
- ACC/AHA Risk Calculator
- MESA Risk Calculator
 - With addition of coronary artery calcium score, for CAD-only risk

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. ⁽⁴⁾

- Appropriate Care- Median Score 7-9
- May be Appropriate Care- Median Score 4-6

- Rarely Appropriate Care- Median Score 1-3

Acronyms / Abbreviations

AS: Aortic stenosis

ASCVD: Atherosclerotic cardiovascular disease

CAC: Coronary artery calcium

CAD: Coronary artery disease

CCT: Cardiac computed tomography

EBCT: Electron beam computed tomography

HIV: Human immunodeficiency virus

LVEF: Left ventricular ejection fraction

SUMMARY OF EVIDENCE

ACC/AHA/ASE/ASNC/ASPC/HFSA/HRS/SCAI/SCCT/SCMR/STS 2023 Multimodality Appropriate Use Criteria for the Detection and Risk Assessment of Chronic Coronary Disease ⁽⁹⁾

Study Design: The study is a report by the American College of Cardiology (ACC) Solution Set Oversight Committee, in collaboration with several other cardiovascular societies. It updates the prior AUC for various cardiovascular imaging modalities, including radionuclide imaging, stress echocardiography, calcium scoring, coronary computed tomography angiography (CCTA), stress cardiac magnetic resonance (CMR), and invasive coronary angiography.

Target Population: The target population includes patients with known or suspected CCD, which encompasses stable ischemic heart disease (SIHD). The clinical scenarios cover both symptomatic and asymptomatic patients, with and without prior testing or revascularization.

Key Factors:

- **Clinical Scenarios:** The document outlines 64 clinical scenarios for the detection and risk assessment of CCD, drawn from common applications and current clinical practice guidelines.
- **Rating Process:** The clinical scenarios were rated by an independent panel using a modified Delphi process. Ratings were categorized as Appropriate (7-9), May Be Appropriate (4-6), or Rarely Appropriate (1-3).
- **Updates and Changes:** Key changes include the removal of preoperative testing scenarios, simplification of clinical scenario tables, and incorporation of new evidence and guidelines.
- **Assumptions:** The study assumes that each test is performed and interpreted by trained professionals, and that patients are receiving optimal standard care.

- **Advantages and Limitations:** The document provides a table outlining the advantages and limitations of various imaging modalities, such as echocardiography, SPECT, PET, CMR, CCTA, and invasive angiography.

2013 ACC/AHA Guideline on the Assessment of Cardiovascular Risk ⁽⁶⁾

Study Design: The guideline is based on systematic evidence reviews conducted by expert panels convened by the National Heart, Lung, and Blood Institute (NHLBI). The evidence was reviewed and recommendations were crafted by the ACC/AHA Task Force on Practice Guidelines. The methodology included the development of new pooled cohort equations for the prediction of 10-year risk of atherosclerotic cardiovascular disease (ASCVD) events.

Target Population: The target population for the guideline includes non-Hispanic African-American and non-Hispanic white men and women aged 40 to 79 years who are free from ASCVD at the beginning of the period. The guideline also provides recommendations for other populations, including Hispanic-American and Asian-American populations, although specific risk algorithms for these groups are not yet developed.

Key Factors

- **Risk Assessment:** The guideline emphasizes the importance of assessing traditional ASCVD risk factors every 4 to 6 years in adults aged 20 to 79 years who are free from ASCVD. It also recommends estimating 10-year ASCVD risk every 4 to 6 years in adults aged 40 to 79 years.
- **Pooled Cohort Equations:** The guideline introduces race- and sex-specific pooled cohort equations to predict the 10-year risk of a first hard ASCVD event. These equations include variables such as age, total cholesterol, high-density lipoprotein cholesterol, systolic blood pressure, diabetes, and smoking status.
- **Novel Risk Markers:** The guideline discusses the potential utility of novel risk markers such as high-sensitivity C-reactive protein (hs-CRP), coronary artery calcium (CAC) score, and ankle-brachial index (ABI) in improving risk assessment.
- **Long-Term Risk Assessment:** The guideline suggests assessing long-term (≥15 years) or lifetime risk of ASCVD in adults aged 20 to 59 years who are free from ASCVD and are not at high short-term risk.

2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease ⁽⁷⁾

Study Design: The guideline is based on a comprehensive review of existing literature, including randomized controlled trials (RCTs), systematic reviews, meta-analyses, and observational studies. The evidence was gathered from various databases such as Ovid MEDLINE, PubMed, Cochrane Library, and others, covering research published between May and July 2018. The recommendations are evidence-based and supported by extensive evidence tables included in the online data supplement.

Target Population: The guideline addresses the primary prevention of cardiovascular disease (CVD) in adults aged 18 years and older. It focuses on outcomes related to atherosclerotic cardiovascular disease (ASCVD), heart failure, and atrial fibrillation. The recommendations are

applicable to patients with or at risk of developing CVD, with a particular emphasis on those in the United States, although they are relevant globally.

Key Factors:

- **Lifestyle Factors:** Recommendations on nutrition and diet, exercise and physical activity, weight management, and tobacco cessation.
- **Medical Interventions:** Use of statins, antihypertensive medications, and aspirin for primary prevention.
- **Patient-Centered Approaches:** Emphasis on team-based care, shared decision-making, and assessment of social determinants of health.
- **Risk Assessment:** Use of tools like the pooled cohort equations (PCE) to estimate 10-year ASCVD risk and the coronary artery calcium score for risk stratification.
- **Cost and Value Considerations:** Discussion on the cost-effectiveness of various preventive strategies.

ANALYSIS OF EVIDENCE

Shared Findings

All three articles focus on cardiovascular disease (CVD) and its prevention, assessment, and management. They emphasize the importance of lifestyle modifications, risk assessment, and appropriate use of diagnostic tools.

- **Lifestyle Modifications:**
 - **Arnett et al 2019:** This article highlights the significance of promoting a healthy lifestyle throughout life to prevent atherosclerotic cardiovascular disease (ASCVD), heart failure, and atrial fibrillation. It recommends a diet rich in vegetables, fruits, nuts, whole grains, lean proteins, and fish, along with regular physical activity. ⁽⁷⁾
 - **Goff et al 2014:** Similarly, this article underscores the importance of lifestyle modifications, including diet and exercise, in reducing cardiovascular risk. It provides guidelines for assessing cardiovascular risk and emphasizes the role of lifestyle changes in managing blood cholesterol and obesity. ⁽⁶⁾
 - **Winchester et al 2023:** This article also stresses the importance of lifestyle modifications in managing chronic coronary disease (CCD). It includes recommendations for exercise and diet as part of the appropriate use criteria for various diagnostic tests. ⁽⁹⁾
- **Risk Assessment:**
 - **Arnett et al 2019:** The article provides a comprehensive guideline for the primary prevention of cardiovascular disease, including risk assessment tools like the pooled cohort equations to estimate 10-year ASCVD risk. ⁽⁷⁾

- **Goff et al 2014:** This article focuses on the development of new pooled cohort ASCVD risk equations and provides recommendations for assessing 10-year risk of a first hard ASCVD event. ⁽⁶⁾
- **Winchester et al 2023:** The article includes risk assessment as part of the appropriate use criteria for detecting and managing CCD. It provides guidelines for using various diagnostic tools based on the patient's risk profile. ⁽⁹⁾

POLICY HISTORY

Date	Summary
April 2026	● Clarified: ○ Age range in asymptomatic patients at low to borderline risk ○ ASCVD risk enhancing factors ● Removed legislative language ● Added code description ● Adjusted and aligned background section
February 2026	● Adjusted language for clarity for asymptomatic patients indications
July 2025	● This guideline merges two Evolent guidelines with identical clinical criteria: ECG 7272-01 for Electron-Beam Tomography or Non-Contrast Coronary Computed Tomography and ECG 029 for Electron-Beam Tomography or Non-Contrast Coronary Computed Tomography into Evolent Clinical Guideline 7272 for Coronary Artery Calcium Scoring by Electron Beam Computed Tomography (EBCT) or Non-Contrast Coronary Computed Tomography (CCT) ○ This guideline also merges Procedure Codes from these two Evolent guidelines ● Added new bullet-point to the General Statement section ● Clarified indications for CAC testing ● Added a Summary of Evidence and Analysis of Evidence

LEGAL AND COMPLIANCE

Guideline Approval

Committee

Reviewed / Approved by Evolent Specialty Services Clinical Guideline Review Committee

Disclaimer

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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 7275 for Coronary Artery Computed Tomography Angiography (CCTA)

Guideline Number: Evolent_CG_7275	<u>Applicable Codes</u>	
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TABLE OF CONTENTS

STATEMENT	3
GENERAL INFORMATION	3
PURPOSE	3
CLINICAL REASONING	3
INDICATIONS FOR CORONARY COMPUTED TOMOGRAPHIC ANGIOGRAPHY (CCTA)	4
SUSPECTED CORONARY ARTERY DISEASE (CAD)	4
<i>Symptomatic Patients</i>	4
<i>Asymptomatic Patients</i>	4
<i>Unevaluated Acute Coronary Syndrome (ACS)</i>	4
<i>Heart Failure</i>	4
<i>Heart Valve</i>	5
<i>Arrhythmias</i>	5
<i>Prior to Elective Non-Cardiac Surgery in an Asymptomatic Patient</i>	5
<i>Post Cardiac Transplantation (SE Diversion Not Required)</i>	6
<i>Heart Anomaly or Aneurysm</i>	6
<i>Coronary Artery Bypass Grafting Surgery (CABG) or Percutaneous Coronary Intervention (PCI)</i>	6
<i>Assessment of Left Atrial Appendage (LAA) Anatomy</i>	6
<i>Electrophysiologic Procedure Planning</i>	7
<i>PFO or ASD Closure Preprocedural Evaluation</i>	7
CODING AND STANDARDS	7
CODES	7
APPLICABLE LINES OF BUSINESS	7
BACKGROUND	8
GENERAL OVERVIEW	8
AUC SCORE	8
REDUCTION IN CCTA TEST QUALITY	8
PATIENT SELECTION CRITERIA	8
DEFINITIONS	8
<i>Diamond Forrester Table</i>	9
<i>Global CAD Risk Calculators</i>	12
ACRONYMS/ABBREVIATIONS	13

SUMMARY OF EVIDENCE	14
ANALYSIS OF EVIDENCE.....	17
POLICY HISTORY	17
LEGAL AND COMPLIANCE	18
GUIDELINE APPROVAL	18
<i>Committee</i>	18
DISCLAIMER	18
REFERENCES.....	19

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.*

Purpose

Indications for determining medical necessity for Coronary and/or Cardiac Computed Tomographic Angiography (CCTA). Patients should be on maximally tolerated guideline-directed medical therapy (GDMT), when applicable.

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. ^(1–5)

INDICATIONS FOR CORONARY COMPUTED TOMOGRAPHIC ANGIOGRAPHY (CCTA) ^(6–9)

Suspected Coronary Artery Disease (CAD)

Symptomatic Patients

- Intermediate and high pretest probability patients ⁽¹⁰⁾
- Low pretest probability patients should be considered for exercise treadmill test (ETT) unless other criteria for CCTA are met ⁽¹¹⁾
- Exercise ECG stress test with intermediate Duke Treadmill Score (DTS) (- 10 to + 4) ^(11,12)
- CCTA is being performed to avoid performing cardiac catheterization in patients with chest pain syndrome with intermediate pretest probability of CAD, uninterpretable ECG and are not able to exercise with no prior CCTA done within the last 12 months who have ^(10,11):
 - Equivocal, borderline, or discordant stress evaluation with continued symptoms concerning for CAD (**AUC Score 8**) ⁽⁸⁾
 - Repeat testing in patient with new or worsening symptoms since prior normal stress imaging (**AUC Score 7**) ⁽⁸⁾
 - Chest pain of uncertain etiology, when non-invasive tests are negative, but symptoms are typical and management requires that significant coronary artery disease be excluded (**AUC Score 7**) ⁽⁸⁾

Asymptomatic Patients ⁽¹¹⁾

- Asymptomatic patients without known CAD:
 - Previously unevaluated ECG evidence of possible myocardial ischemia including ischemic ST segment or T wave abnormalities (see **Definitions**)
 - Previously unevaluated pathologic Q waves (see **Definitions**)
 - Previously unevaluated Left Bundle Branch Block (LBB)

Unevaluated Acute Coronary Syndrome (ACS)

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

Heart Failure

- Newly diagnosed clinical systolic heart failure or diastolic heart failure, with reasonable suspicion of cardiac ischemia unless invasive coronary angiography is planned (SE

diversion not required)^(13,14) **(AUC Score 7)**⁽⁸⁾

Heart Valve

- Before valve surgery or transcatheter intervention as an alternative to coronary angiography/pre-procedural anatomic assessment^(15–17)
- To establish the etiology of mitral regurgitation⁽¹⁷⁾
- Pre-Transaortic Valve Replacement (TVAR) evaluation as an alternative to coronary angiography^(18,19)

Arrhythmias

- Ventricular arrhythmias
 - Sustained ventricular tachycardia (VT) > 100 bpm, ventricular fibrillation (VF), or exercise-induced VT, when invasive coronary arteriography is not immediately planned⁽¹⁴⁾
- Non-sustained VT, multiple episodes, each ≥ 3 beats at ≥ 100 bpm, or frequent premature ventricular contractions (PVCs) (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⁽¹⁶⁾

Prior to Elective Non-Cardiac Surgery in an Asymptomatic Patient

- An intermediate or high-risk surgery with one or more risk factors (see below), **AND** documentation of an inability to walk (or < 4 metabolic equivalents (METs)) **AND** there has not been an imaging stress test within 1 year **(AUC Score 6)**^(20,21)
 - **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 myocardial perfusion imaging (MPI), if there has not been a conclusive stress evaluation, CTA, or heart catheterization within the past year, at the discretion of the transplant service^(8,22)

Post Cardiac Transplantation (SE Diversion Not Required)

- Annual assessment for transplant vasculopathy, if other ischemia evaluation is not planned ⁽²³⁾

Heart Anomaly or Aneurysm

- Evaluation of coronary anomaly or aneurysm ^(24–28)
 - Further evaluation of coronary anomaly detected on non-dedicated imaging (such as transthoracic echocardiogram (TTE))
 - Evaluation prior to planned repair
 - Evaluation due to change in clinical status and/or new concerning signs or symptoms
 - Kawasaki disease and MIS-C follow up – for medium sized or greater aneurysms ⁽²⁹⁾ periodic surveillance can be considered every 2-5 years. Once aneurysmal size has reduced to small aneurysms, surveillance can be performed every 3-5 years. No further surveillance once normalized.
- Evaluation of suspected pulmonary embolism

NOTE: Cardiac magnetic resonance (CMR) is favored in younger patients for coronary anomaly evaluation ^(22,24)

Coronary Artery Bypass Grafting Surgery (CABG) or Percutaneous Coronary Intervention (PCI)

- Prior CABG or PCI history
 - Symptomatic patient with prior CABG or PCI history, with angina interfering in performing daily activities, despite being on guideline directed medical therapy (GDMT), and with an equivocal stress test results. No prior CCTA done within the last 12 months (**AUC Score 7**) ⁽⁸⁾
- Evaluation of coronary artery bypass grafts, to assess ^(8,30):
 - Patency and location when invasive coronary arteriography was either nondiagnostic or not performed/planned (**AUC Score 7**) ⁽⁸⁾
 - Location of grafts prior to cardiac or another chest surgery (**AUC Score 7**) ⁽⁸⁾

Assessment of Left Atrial Appendage (LAA) Anatomy ⁽³¹⁾

- CCTA may be performed in the following circumstances:
 - Evaluation of anatomy, potential cardiac source of emboli, and suitability for percutaneous occlusion before device placement (**AUC Score 7**). ⁽¹³⁾ TEE remains the preferred choice of modality for this procedure
 - For surveillance at 45 days and 1 year or FDA (U.S. Food and Drug Administration) guidance/guidelines for follow-up to assess device stability and device leak, and exclude migration, displacement, or erosion
 - For reassessment at 6 months if 45-day imaging (TEE or CT) shows incomplete

closure of left atrial appendage

Electrophysiologic Procedure Planning

- Evaluation of anatomy (pulmonary vein isolation planning) prior to radiofrequency ablation

PFO or ASD Closure Preprocedural Evaluation ⁽¹³⁾

- For evaluation of anatomy, potential cardiac source of emboli, and suitability for percutaneous occlusion device placement (**AUC Score 7**)

Congenital Heart Disease Preprocedural Evaluation

- Patients with right ventricular to pulmonary artery (RV-PA) conduit, prior to transcatheter intervention to assess coronary artery proximity, conduit calcification and anatomic characteristics ⁽³²⁾

CODING AND STANDARDS

Codes

Code	Description
75574	Computed tomographic angiography, heart, coronary arteries and bypass grafts (when present), with contrast material, including 3D image postprocessing (including evaluation of cardiac structure and morphology, assessment of cardiac function, and evaluation of venous structures, if performed)

Applicable Lines of Business

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

BACKGROUND

General Overview

A coronary computerized tomography angiogram (CCTA) is a noninvasive imaging study that uses intravenously administered contrast material and high-resolution, rapid imaging computed tomography (CT) ^(33,34)

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. ⁽²⁾

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

Reduction in CCTA Test Quality

- The following can reduce the quality of the test in patients with ⁽⁸⁾:
 - Morbid obesity
 - High or irregular heart rates
 - Severe coronary calcification

Patient Selection Criteria

- Patient selection for CCTA must be considered and may be inappropriate for the following:
 - Known history of severe and/or anaphylactic contrast reaction
 - Inability to cooperate with scan acquisition and/or breath-hold instructions
 - Pregnancy
 - Clinical instability (e.g., acute myocardial infarction, decompensated heart failure, severe hypotension)
 - Renal Impairment as defined by local protocols
 - Image quality depends on keeping heart rate (HR) optimally < 60 bpm (after beta blockers), a regular rhythm, stents > 3.0 mm in diameter, and vessels requiring imaging ≥ 1.5 mm diameter ⁽³⁵⁾

Definitions

- Stable patients without known CAD fall into 2 categories ^(6–8):
 - **Asymptomatic**, for whom global risk of CAD events can be determined from

coronary risk factors, using calculators available online (see [Global CAD Risk Calculators](#))

- **Symptomatic**, for whom we estimate the pretest probability that their chest-related symptoms are due to clinically significant CAD
- Angina
 - Beginning in 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 ⁽⁸⁾ to **Less Likely Anginal Symptoms** and **Likely Anginal Symptoms**.
 - **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).
 - 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.

Diamond Forrester Table ⁽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; **Low:** 5 - 10% pretest probability of CAD; **Intermediate:** 10% - 90% pretest probability of CAD; **High:** > 90% pretest probability of CAD

- **Typical Angina (Definite)** is defined as including ALL **3** characteristics:

- Substernal chest pain or discomfort with characteristic quality and duration
- Provoked by exertion or emotional stress
- Relieved by rest and/or nitroglycerin
- **Atypical Angina (Probable)** has only **2** of the above characteristics
- **Nonanginal Chest Pain/Discomfort** has only **0 - 1** of the above characteristics
- An uninterpretable baseline ECG includes ⁽⁶⁾:
 - 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)
 - Left ventricular hypertrophy (LVH) with repolarization abnormalities, Wolff-Parkinson-White (WPW) syndrome, ventricular paced rhythm, or left bundle branch block (LBBB)
 - Digitalis use with associated ST - T abnormalities
 - Resting HR under 50 bpm on a beta blocker and an anticipated suboptimal workload

NOTE: Right bundle branch block (RBBB) with less than 1 mm ST depression at rest may be suitable for ECG treadmill testing
- 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 Without Imaging versus Stress Testing with Imaging
 - An ECG stress test **WITHOUT** imaging (ie, exercise treadmill ECG test) requires 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. Examples of eligible patients include ⁽⁸⁾:
 - The (symptomatic) low or intermediate pretest probability patient who can exercise and has an interpretable ECG ⁽⁸⁾
 - 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
 - The patient requiring evaluation of syncope or presyncope during exertion ⁽³⁷⁾

NOTE: When exercise cannot be performed, pharmacologic stress can be considered.
- Duke Exercise ECG Treadmill Score (DTS) ⁽³⁸⁾
 - Calculates risk from ECG treadmill alone:

- DTS = exercise time in minutes - (5 x ST deviation in mm or 0.1 mV increments) - (4 x exercise angina score)
 - Angina score: 0 = none, 1 = non-limiting, and 2 = exercise-limiting
- The score ranges from - 25 to + 15
 - Low-risk $\geq + 5$
 - Intermediate risk - 10 to + 4
 - High-risk $\leq - 11$
- Scenarios that can additionally support a CCTA over a regular exercise treadmill test in the low probability scenario ⁽³⁹⁾
 - Inability to Exercise
 - Physical limitations precluding ability to exercise for at least 3 full minutes of Bruce protocol
 - The patient has limited functional capacity (< 4 METS) such as **ONE** of the following:
 - Unable to take care of their activities of daily living (ADLs) or ambulate
 - Unable to walk 2 blocks on level ground
 - Unable to climb 1 flight of stairs
 - Unable to vacuum, dust, do dishes, sweep, or carry a small grocery bag
 - Other Comorbidities
 - Prior cardiac surgery (coronary artery bypass graft or valvular)
 - Left ventricular ejection fraction (LVEF) $\leq 50\%$
 - 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 blood pressure (BP) > 180 or Diastolic BP > 120
 - ECG and Echo-Related Baseline Findings
 - Pacemaker or implantable cardioverter defibrillator (ICD)
 - Resting wall motion abnormalities on echocardiography
 - Complete LBBB
 - Risk-Related scenarios
 - Intermediate or high global risk in patients requiring type IC antiarrhythmic drugs
 - Arrhythmia risk with exercise
- 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.

■ **CAD Risk—Low**

- 10-year absolute coronary or cardiovascular risk < 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 > 20%

Global CAD Risk Calculators

- Framingham Cardiovascular Risk
- Reynolds Risk Score
 - Can use if there is no history of diabetes. Unique for use of family history
- Pooled Cohort Equation
- ACC/AHA Risk Calculator
- MESA Risk Calculator
 - With addition of coronary artery calcium score, for CAD-only risk
- **Definitions of Coronary Artery Disease** ^(6,7,40–42)
 - **Coronary artery calcification (CAC)** is a marker of risk, as measured by Agatston score on coronary artery calcium imaging. It is not a diagnostic tool so much as it is a risk stratification tool. Its incorporation into global risk can be achieved by using the Multi-Ethnic Study of Atherosclerosis (MESA) risk calculator.
 - **Coronary Artery Disease (CAD)** is a narrowing or blockage of the coronary arteries (blood vessels that carry blood and oxygen to the heart), usually caused by atherosclerosis (a buildup of fatty material and plaque inside the coronary arteries) which may cause chest pain, shortness of breath during exercise, and heart attacks.
 - **Ischemia-producing disease** (also called hemodynamically or functionally significant disease, for which revascularization might be appropriate) generally implies at least one of the following:
 - Demonstrable ischemic findings on stress testing (ECG or stress imaging), that are at least mild in degree ⁽⁴¹⁾
 - Suggested by percentage diameter stenosis $\geq 70\%$ by angiography; intermediate lesions are 50 – 69% ⁽⁴³⁾
 - For a left main artery, suggested by a percentage stenosis $\geq 50\%$ or minimum luminal cross-sectional area on IVUS ≤ 6 square mm ^(6,41)
 - FFR Fractional Flow Reserve (FFR) ≤ 0.80 for a major vessel ⁽⁴¹⁾

- FFR is the distal to proximal pressure ratio across a coronary lesion during maximal hyperemia induced by either intravenous or intracoronary adenosine. Less than or equal to 0.80 is considered a significant reduction in coronary flow.
 - iFR Instantaneous Wave-Free Ratio (iFR) ≤ 0.89 for a major vessel ^(44,45)
 - iFR measures the ratio of distal coronary to aortic pressure during the wave free period of diastole, with a value ≤ 0.89 considered hemodynamically significant. ^(44,45)
 - **Ischemic symptoms (angina pectoris):** tightness, heaviness, pressure, squeezing, or other discomfort in the chest or adjacent areas. Ischemia may also present with fatigue, faintness, or dyspnea.
 - **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).
- Anginal Equivalent ^(6,37,46)
 - 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 that symptoms other than chest discomfort are not due to other organ systems (e.g., dyspnea due to lung disease, fatigue due to anemia), by presentation of clinical data such as respiratory rate, oximetry, lung exam, etc. (as well as D-dimer, chest CT(A), and/or PFTs, 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

ACS: Acute coronary syndrome

ADLs: Activities of daily living

BP: Blood Pressure

CABG: Coronary artery bypass grafting surgery

CAD: Coronary artery disease

CCS: Coronary calcium score

CCTA: Coronary computed tomography angiography

CMR: Cardiac magnetic resonance

CT(A): Computed tomography (angiography)

COPD: Chronic obstructive pulmonary disease

DTS: Duke Treadmill Score

ECG: Electrocardiogram

EF: Ejection fraction

ETT: Exercise Treadmill Test

FFR: Fractional flow reserve
GDMT: Guideline directed medical therapy
HR: Heart rate
ICD: Implantable cardioverter-defibrillator
iFR: Instantaneous wave-free ratio or instant flow reserve
IVUS: Intravascular ultrasound
LA: Left Atrial
LAA: Left Atrial Appendage
LBBB: Left bundle branch block
LVH: Left ventricular hypertrophy
MESA: Multi-Ethnic Study of Atherosclerosis
METS: Metabolic equivalents
MI: Myocardial infarction
MPI: Myocardial perfusion imaging
PCI: Percutaneous coronary intervention
PFT: Pulmonary function test
PVC: Premature ventricular contractions
RBBB: Right bundle branch block
SE: Stress echocardiography
TEE: Transesophageal Echocardiogram
TTE: Transthoracic echocardiography
TVAR: Transaortic Valve Replacement
VT: Ventricular Tachycardia
VF: Ventricular Fibrillation
WPW: Wolff-Parkinson-White syndrome

SUMMARY OF EVIDENCE

ACC/AHA/ASE/ASNC/ASPC/HFSA/HRS/SCAI/SCCT/SCMR/STS 2023 Multimodality Appropriate Use Criteria for the Detection and Risk Assessment of Chronic Coronary Disease ⁽⁸⁾

Study Design: The study is a report by the American College of Cardiology (ACC) Solution Set Oversight Committee, in collaboration with several other cardiovascular societies. It updates the prior AUC for various cardiovascular imaging modalities, including radionuclide imaging, stress

echocardiography, calcium scoring, coronary computed tomography angiography (CCTA), stress cardiac magnetic resonance (CMR), and invasive coronary angiography.

Target Population: The target population includes patients with known or suspected CCD, which encompasses stable ischemic heart disease (SIHD). The clinical scenarios cover both symptomatic and asymptomatic patients, with and without prior testing or revascularization.

Key Factors:

- **Clinical Scenarios:** The document outlines 64 clinical scenarios for the detection and risk assessment of CCD, drawn from common applications and current clinical practice guidelines.
- **Rating Process:** The clinical scenarios were rated by an independent panel using a modified Delphi process. Ratings were categorized as Appropriate (7-9), May Be Appropriate (4-6), or Rarely Appropriate (1-3).
- **Updates and Changes:** Key changes include the removal of preoperative testing scenarios, simplification of clinical scenario tables, and incorporation of new evidence and guidelines.
- **Assumptions:** The study assumes that each test is performed and interpreted by trained professionals, and that patients are receiving optimal standard care.
- **Advantages and Limitations:** The document provides a table outlining the advantages and limitations of various imaging modalities, such as echocardiography, SPECT, PET, CMR, CCTA, and invasive angiography.

2023 AHA/ACC/ACCP/ASPC/NLA/PCNA Guideline for the Management of Patients With Chronic Coronary Disease ⁽⁶⁾

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.

Society for Cardiovascular Magnetic Resonance perspective on the ACC/AHA/ASE/ASNC/ASPC/HFSA/HRS/SCAI/SCCT/SCMR/STS 2023 multi-modality appropriate use criteria for the detection and risk assessment of chronic coronary disease ⁽⁹⁾

Study Design: The study design involves a review and discussion of the recommendations in the 2023 AUC, which updates the 2013 AUC for the management of stable ischemic heart disease (SIHD).

Target Population: The target population includes symptomatic and asymptomatic patients with a spectrum of scenarios in each of the two categories. The document aims to complement clinical practice guidelines and aid clinicians in decision-making for common clinical scenarios in CCD and implement best practices in patient care.

Key Factors:

- The diagnostic accuracy, cost-effectiveness, and predictive value of stress perfusion cardiovascular magnetic resonance (CMR) in patients with CCD.
- The comparison of stress CMR with other imaging modalities such as nuclear imaging, stress echocardiography, and coronary computed tomography angiography (CCTA).
- The advantages and limitations of CMR, including its ability to assess wall motion, ischemia, and infarction in one study, and its higher spatial resolution for smaller-sized hearts.
- The importance of clinician judgment, test advantages and disadvantages, and local expertise in choosing the appropriate test for an individual patient.
- The inclusion of new categories such as "No Test" for low-risk patients and the

emphasis on patient-specific and local factors in decision-making.

ANALYSIS OF EVIDENCE

Shared Conclusions ^(6,8,9)

- **Chronic Coronary Disease (CCD) Management:** All three articles emphasize the importance of managing CCD through a combination of lifestyle changes, pharmacologic therapies, and diagnostic testing. They highlight the need for a patient-centered approach that considers individual risk factors, symptoms, and preferences.
- **Diagnostic Testing:** The articles agree on the use of various diagnostic modalities such as stress echocardiography, myocardial perfusion imaging (MPI), cardiovascular magnetic resonance (CMR), and coronary computed tomography angiography (CCTA) for the detection and risk assessment of CCD. They emphasize the importance of selecting the appropriate test based on the patient's clinical scenario and the availability of local expertise and equipment.
- **Appropriate Use Criteria (AUC):** Both the Bandettini et al. and Winchester et al. articles discuss the AUC for multimodality imaging in CCD. They provide detailed guidelines on when specific tests are appropriate, may be appropriate, or rarely appropriate based on different clinical scenarios.

POLICY HISTORY

Date	Summary
June 2026	• Added indications for Heart Valve, Post Cardiac Transplant, Heart Anomaly or Aneurysm, and Limited Prior or Replacement Imaging indications added • Updated the definitions in Background section • Global CAD Risk calculators table replaced with bulleted list • Abbreviations list updated • CPT Code table added • Regulatory language removed • Updated references
July 2025	• This guideline merges two Evolent guidelines with identical clinical criteria: ECG 7275-01 for Coronary CT Angiography and ECG 062 for Coronary CT Angiography into Evolent Clinical Guideline 7275 for Coronary Artery Computed Tomography Angiography (CCTA)

Date	Summary
	○ This guideline also merges Procedure Codes from these two Evolent guidelines ● Added new bullet-point to the General Statement section ● Added indications for Unevaluated Acute Coronary Syndrome, Arrhythmias, Prior To Elective Non-Cardiac Surgery In Asymptomatic Patients, and Post Cardiac Transplant ● 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

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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 7293 for Artificial Intelligence Assisted Coronary Analysis

Guideline Number: Evolent_CG_7293	<u>Applicable Codes</u>	
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TABLE OF CONTENTS

STATEMENT	2
GENERAL INFORMATION	2
PURPOSE	2
CLINICAL REASONING	2
INDICATIONS	2
FRACTIONAL FLOW RESERVE COMPUTED TOMOGRAPHY (FFR _{CT})	2
ARTIFICIAL INTELLIGENCE (AI) ASSISTED CORONARY ANALYSIS	3
LIMITATION	3
CODING AND STANDARDS	4
CODES	4
APPLICABLE LINES OF BUSINESS	4
BACKGROUND	4
GENERAL OVERVIEW	4
AUC SCORE	5
THE DEVELOPMENT OF FFR-CT AS A TECHNOLOGY	5
DEFINITIONS	5
ACRONYMS / ABBREVIATIONS	6
SUMMARY OF EVIDENCE	6
ANALYSIS OF EVIDENCE	8
POLICY HISTORY	9
LEGAL AND COMPLIANCE	9
GUIDELINE APPROVAL	9
Committee	9
DISCLAIMER	9
REFERENCES	11

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.*

Purpose

Fractional flow reserve computed tomography (FFR_{CT}) is a technology that estimates the effect of coronary arterial narrowing on blood flow based upon the images acquired in the coronary computerized tomographic angiography (CCTA) study. Its role is to provide information that can more appropriately select patients requiring invasive coronary angiography. ⁽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.

In instances where an AUC has not been established through prior publication, 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

Fractional Flow Reserve Computed Tomography (FFR_{CT})

- Intermediate degrees of stenosis (40 - 90%) on CCTA to guide decision making and help identify those patients who would benefit from revascularization ^(1,7–9)
- Intermediate lesions in the above range and coronary calcification have made percentage stenosis interpretation difficult, thus could support approval of FFR_{CT}, in

conjunction with the above criteria ^(10,11)

Artificial Intelligence (AI) Assisted Coronary Analysis

There are currently no established societal standard or formal guidelines supporting the routine use for AI-based approaches, which commonly offered under brand names such as HeartFlow or Cleerly.

LIMITATION

The following clinical scenarios below do not apply for the use of FFR_{CT} ⁽¹⁰⁾:

- Problematic artifacts, and/or clinical circumstances:
 - When patients have artifacts (heavy calcium) or body habitus (BMI > 35 kg/m²) that could interfere with the examination, the suitability for FFR_{CT} is at the discretion of the vendor who provides the FFR_{CT} service
 - Known ischemic coronary artery disease that has not been revascularized and there has been no change in patient status or in the CCTA images
- Recent myocardial infarction within 30 days ⁽¹²⁾
- Prior coronary artery bypass graft surgery
- Complex congenital heart disease or ventricular septal defect (VSD) with pulmonary-to-systemic flow ratio > 1.4
- Metallic stents ≤ 3.0 mm in diameter in the coronary system
- Coronary lesions with a vessel diameter < 1.8 mm ^(13,14)
- Severe wall motion abnormality on CCTA results
- Severe myocardial hypertrophy
- High risk indicators on stress test ⁽¹⁴⁾
- Coronary angiography within the past 90 days ⁽¹⁴⁾
- Marginal quality of the submitted imaging data, due to motion, blooming, misalignment, arrhythmia, etc.

CODING AND STANDARDS

Codes

Code	Description
75580	Noninvasive estimate of coronary fractional flow reserve (FFR) derived from augmentative software analysis of the data set from a coronary computed tomography angiography, with interpretation and report by a physician or other qualified health care professional

Applicable Lines of Business

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

BACKGROUND

General Overview

Fractional flow reserve (FFR) is used to determine the functional significance of a coronary stenosis in angiographically "intermediate" or "indeterminant" lesions which allows the operator to decide when percutaneous coronary intervention (PCI) may be beneficial or safely deferred. During coronary catheterization, a catheter is inserted into the femoral (groin) or radial arteries (wrist) using a sheath and guidewire. FFR uses a small sensor (transducer) on the tip of the wire to measure pressure, temperature, and flow in order to determine the exact severity of the lesion during maximal blood flow (hyperemia). Hyperemia is induced by injecting products such as adenosine or papaverine. A pullback of the pressure wire is performed, and pressures are recorded across the vessel.

FFR is then calculated as the ratio of distal coronary pressure to aortic pressure measured during maximal hyperemia. A normal value for FFR is 1.0. $FFR \leq 0.80$ in an angiographically intermediate lesion (50-70% stenosis) is considered to be a significant coronary lesion (>70% stenosis). ⁽¹⁵⁾

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. ⁽⁵⁾

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

The Development of FFR-CT as a Technology ^(16,17)

Fractional Flow Reserve (FFR) is the ratio of baseline coronary flow to coronary flow during maximal hyperemia. Its use in the cardiac catheterization laboratory has successfully demonstrated utility in the quantitation of intracoronary flow dynamics secondary to lesional and microvasculature conditions. This technology has proven helpful in evaluating individual patients, with respect to prognostication of coronary artery disease and decisions regarding the appropriateness of coronary revascularization.

Definitions

- CCTA has shown utility in the evaluation of patients with stable chest pain, typically intermediate pretest probability, warranting non-invasive evaluation, ^(14,18,19) as well as in low-risk emergency department scenarios. ⁽²⁰⁾
- Fractional flow reserve using CCTA seeks to provide an estimation of FFR by non-invasive methodology. Following assessment of quality CCTA images, in the appropriate subsets of patients with coronary stenoses, the technology makes mathematical assumptions to simulate maximal hyperemia and calculates an estimation of FFR (fractional flow reserve) for those coronary vessels with lesions, based upon the principles of fluid mechanics inherent to the Navier-Stokes Theorem. ^(15,21)
- Quantitative estimation of coronary lesional hemodynamic severity using FFR_{CT} might enable deferral of invasive coronary arteriography when values are above 0.80, since such lesions would not warrant revascularization. ⁽¹⁰⁾
- FFR_{CT} measurements appear reproducible, ⁽²²⁾ with initial data demonstrating a strong correlation to invasive FFR, resulting in a high diagnostic performance. ⁽²³⁾ Invasive FFR has excellent reproducibility ⁽²⁴⁾ and a demonstrated track record of favorable outcomes when used in the selection of patients and vessels requiring PCI. ^(25–27) Evidence suggests that FFR_{CT} might be a better predictor of revascularization or adverse events than severe stenosis alone on CCTA ⁽²⁸⁾ and that a negative FFR_{CT} in the evaluation of chest pain results in lower revascularization rates and lower cardiovascular death and MI at 1 year follow-up. ⁽²⁹⁾
- The FFR_{CT} data to date provides no evidence showing that revascularization based upon FFR_{CT} improves clinical outcomes over invasive angiographic assessment.
- Current revascularization guidelines do not advocate FFR_{CT} as a surrogate for invasive FFR, although, those guidelines refer to FFR_{CT} as an “emerging technology”. ⁽³⁰⁾

Acronyms / Abbreviations

AI: Artificial Intelligence

BMI: Body Mass Index

CCTA: Coronary Computerized Tomographic Angiography

FFR: Fractional Flow Reserve

FFR_{CT}: Fractional Flow Reserve derived noninvasively from CCTA

PCI: Percutaneous Coronary Intervention

VSD: Ventricular Septal Defect

SUMMARY OF EVIDENCE

2021 AHA/ACC/ASE/CHEST/SAEM/SCCT/SCMR Guideline for the Evaluation and Diagnosis of Chest Pain: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines ⁽¹⁾

- **Study Design:** The guideline is based on a comprehensive literature review conducted from November 11, 2017, to May 1, 2020, encompassing randomized and nonrandomized trials, observational studies, registries, reviews, and other evidence conducted on human subjects. Additional relevant studies published through April 2021 were also considered.
- **Target Population:** The guideline focuses on adult patients presenting with chest pain in various clinical settings, including emergency departments and outpatient clinics. It aims to provide recommendations and algorithms for clinicians to assess and diagnose chest pain in these patients.
- **Key Factors:**
 - **Initial Evaluation:** The guideline emphasizes the importance of a focused history, physical examination, and diagnostic testing, including electrocardiograms (ECGs), chest radiography, and biomarkers such as cardiac troponins.
 - **Risk Stratification:** Patients are categorized into low-, intermediate-, and high-risk strata to facilitate disposition and subsequent diagnostic evaluation.
 - **Diagnostic Testing:** Various noninvasive and invasive diagnostic tests are recommended, including coronary computed tomography angiography (CCTA), invasive coronary angiography (ICA), exercise ECG, stress echocardiography, stress nuclear myocardial perfusion imaging (MPI), and cardiovascular magnetic resonance imaging (CMR).
 - **Special Considerations:** The guideline addresses unique considerations for women, older patients, diverse racial and ethnic backgrounds, and patients with specific conditions such as prior coronary artery bypass graft (CABG) surgery, dialysis, and substance use.
 - **Shared Decision-Making:** Emphasis is placed on shared decision-making between

clinicians and patients, using decision aids to improve understanding and facilitate risk communication.

FFRCT: Current Status ⁽¹⁰⁾

- **Study Design:** The article reviews the current body of evidence on FFR_{CT} through discussion of existing trials on the modality and provides case examples illustrating its current uses, limitations, and potential future applications.
- **Target Population:** The review focuses on patients with coronary artery disease (CAD) and evaluates the physiologic significance of coronary artery stenosis using FFR_{CT}.
- **Key Factors:**
 - **Conventional Fractional Flow Reserve:** The article discusses the traditional invasive coronary angiography (ICA) method for evaluating lesion severity and its limitations.
 - **Noninvasive Evaluation:** Various noninvasive methods for evaluating coronary ischemia are reviewed, including stress echocardiography, myocardial perfusion imaging (MPI), stress cardiac MRI, and coronary CT angiography (CTA).
 - **FFR CT Technique:** The article explains the computational fluid dynamics method used to derive FFR_{CT} from coronary CTA data and its advantages over traditional methods.
 - **Evidence from Trials:** Several large-scale multicenter trials are summarized, including DISCOVER-FLOW, DeFACTO, NXT, PACIFIC, ReASSESS, and others, highlighting the improved diagnostic accuracy and discrimination of FFR_{CT} compared with coronary CTA alone.
 - **Cost-Effectiveness:** The article discusses studies investigating the cost-effectiveness of FFR_{CT} and its impact on medical decision-making.
 - **Limitations and Future Directions:** Technical and logistical limitations of FFR_{CT} are addressed, along with potential future advancements to improve its accessibility and use.

Clinical outcomes of fractional flow reserve by computed tomographic angiography-guided diagnostic strategies vs. usual care in patients with suspected coronary artery disease: the prospective longitudinal trial of FFR_{CT}: outcome and resource impacts study ⁽¹⁴⁾

- **Study Design:** The study, known as the PLATFORM trial, is a prospective, consecutive cohort study utilizing a comparative effectiveness observational design. It was conducted at 11 European sites and Duke Clinical Research Institute (DCRI) with fidelity to the protocol. The study enrolled 584 patients with new onset chest pain and compared usual testing (n=287) with CTA/FFR_{CT} testing (n=297).
- **Target Population:** The study focused on symptomatic outpatients aged 18 years or older without known CAD but with an intermediate likelihood of obstructive CAD. These patients had planned non-emergent, non-invasive, or invasive cardiovascular testing to

evaluate suspected CAD.

- **Key Factors:**

- **Primary Endpoint:** The primary endpoint was the percentage of patients with planned invasive coronary angiography (ICA) who had no significant obstructive CAD within 90 days.
- **Secondary Endpoints:** These included death, myocardial infarction, and unplanned revascularization, which were independently and blindly adjudicated.
- **Diagnostic Strategies:** The study compared usual care testing with CTA/FFR_{CT}-guided diagnostic strategies. In the CTA/FFR_{CT} cohort, all subjects underwent CTA instead of the planned non-invasive or invasive evaluation.
- **Clinical Event Rates:** Clinical event rates within 90 days were low in both the usual care and CTA/FFR_{CT} arms.
- **Radiation Exposure:** Cumulative radiation exposure within 90 days was similar between the usual care cohort and the CTA/FFR_{CT} cohort.
- **Revascularization Rates:** There were no differences in rates of revascularization between the CTA/FFR_{CT} and usual care arms.

ANALYSIS OF EVIDENCE

Shared Conclusions:

- **Fractional Flow Reserve (FFR) and Computed Tomographic Angiography (CTA):** All three articles discuss the use of FFR derived from CTA (FFR_{CT}) as a non-invasive method to evaluate coronary artery disease (CAD). They highlight its importance in providing both anatomic and physiologic evaluation of coronary stenosis. **Douglas et al 2015** and **Chen et al 2021** emphasize the improved diagnostic accuracy of FFR_{CT} compared to traditional methods like invasive coronary angiography (ICA) and stress testing. ^(10,14) **Gulati et al 2021** also mentions the role of FFR_{CT} in the evaluation and diagnosis of chest pain, ⁽¹⁾ aligning with the findings of the other two articles.
- **Diagnostic Accuracy and Specificity:** All three articles agree that FFR_{CT} improves diagnostic accuracy and specificity in detecting ischemia-causing coronary stenoses compared to traditional methods. **Douglas et al 2015** reports a significant reduction in the rate of invasive angiography showing no obstructive CAD when using FFR_{CT}. ⁽¹⁴⁾ **Chen et al 2021** highlights the improved specificity of FFR_{CT} in reducing unnecessary ICA. ⁽¹⁰⁾ **Gulati et al 2021** supports the use of FFR_{CT} for accurate diagnosis and management of chest pain. ⁽¹⁾

POLICY HISTORY

Date	Summary
May 2026	- Guideline title changed from Evolent Clinical Guideline 7293 for Fractional Flow Reserve Computed Tomography (CT) to Evolent Clinical Guideline 7293 for Artificial Intelligence Assisted Coronary Analysis - Added a statement for AI-based coronary analysis according to the current societal standard - Added technical code description
July 2025	Edited Original Date and Last Revised Date in the Title Table to reconcile the merging of guidelines in April 2025
June 2025	Added a Summary of Evidence and Analysis of Evidence
April 2025	- This guideline merges and replaces two Evolent guidelines with identical clinical criteria: ECG 7293-01 for Fractional Flow Reserve CT and ECG 062-1 for Fractional Flow Reserve CT into Evolent Clinical Guideline 7293 for Fractional Flow Reserve Computed Tomography (CT) - New bullet-point added in the Statement/General Information section regarding guideline criteria - References updated

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-



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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 7296 for Heart Computed Tomography (CT)

Structure and Morphology, Congenital Studies

Guideline Number: Evolent_CG_7296	<u>Applicable Codes</u>	
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TABLE OF CONTENTS

STATEMENT	3
GENERAL INFORMATION	3
PURPOSE	3
CLINICAL REASONING	3
INDICATIONS FOR HEART CT	3
CONGENITAL HEART DISEASE	3
<i>Patent Ductus Arteriosus</i>	4
<i>Aortic Dilation</i>	4
<i>Aortic Coarctation and Interrupted Aortic Arch</i>	4
<i>Tetralogy of Fallot</i>	4
<i>D-Loop Transposition of the Great Arteries</i>	4
<i>Congenitally Corrected Transposition of the Great Arteries</i>	4
TRUNCUS ARTERIOSUS	5
SINGLE-VENTRICLE HEART DISEASE	5
CARDIOMYOPATHY	5
VALVULAR HEART DISEASE	5
EVALUATION OF INTRA- AND EXTRA-CARDIAC STRUCTURES	6
ELECTROPHYSIOLOGIC PROCEDURE PLANNING	6
TRANSCATHETER STRUCTURAL INTERVENTION PLANNING	6
AORTIC PATHOLOGY	7
OTHER COMBINATION STUDIES WITH HEART CT	7
HEART MRI (OR CT) AND CHEST MAGNETIC RESONANCE ANGIOGRAPHY (MRA) (OR CTA)	7
CODING AND STANDARDS	8
CODES	8
APPLICABLE LINES OF BUSINESS	8
BACKGROUND	9
GENERAL OVERVIEW	9
AUC SCORE	9
ACRONYMS / ABBREVIATIONS	9

SUMMARY OF EVIDENCE	10
ANALYSIS OF EVIDENCE.....	13
POLICY HISTORY	13
LEGAL AND COMPLIANCE	14
GUIDELINE APPROVAL	14
<i>Committee</i>	14
DISCLAIMER	14
REFERENCES.....	15

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.*

Purpose

Indications for determining medical necessity for non-contrast cardiac computed tomography.

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. ⁽¹⁻⁵⁾

INDICATIONS FOR HEART CT

Congenital Heart Disease ^(6,7)

For all indications below, either computed tomography (CT) or cardiac magnetic resonance imaging (CMR) can be performed:

- All congenital lesions: prior to planned repair and for change in clinical status and/or new concerning signs or symptoms

Patent Ductus Arteriosus

- Routine surveillance (1-2 years) in a patient with postprocedural aortic obstruction (**AUC Score 7**)⁽⁶⁾

Aortic Dilation

- Routine surveillance (6-12 months) in a child with aortic sinus and/or ascending aortic dilation with increasing size (**AUC Score 7**)⁽⁶⁾

Aortic Coarctation and Interrupted Aortic Arch

- Routine surveillance (3-5 years) in a child or adult with mild aortic coarctation (**AUC Score 7**)⁽⁶⁾
- Post procedure (surgical or catheter-based) routine surveillance (3-5 years) in an asymptomatic patient to evaluate for aortic arch aneurysms, in-stent stenosis, stent fracture, or endoleak (**AUC Score 8**)⁽⁶⁾

Tetralogy of Fallot

- Post procedure routine surveillance (2-3 years) in a patient with valvular or ventricular dysfunction, right ventricular outflow tract obstruction, branch pulmonary artery stenosis, arrhythmias, or presence of a right ventricle (RV) to pulmonary artery (PA) conduit (**AUC Score 7**)⁽⁶⁾

D-Loop Transposition of the Great Arteries

- Post procedure routine surveillance (3-5 years) in an asymptomatic patient (**AUC Score 7**)⁽⁶⁾
- Post procedure routine surveillance (1-2 years) in a patient with dilated neo-aortic root with increasing size, or neo-aortic regurgitation (**AUC Score 7**)⁽⁶⁾
- Post procedure routine surveillance (3-12 months) in a patient with $\geq$ moderate systemic atrioventricular valve regurgitation (AVVR), systemic right ventricle (RV) dysfunction, left ventricular outflow tract (LVOT) obstruction, or arrhythmias (**AUC Score 7**)⁽⁶⁾

Congenitally Corrected Transposition of the Great Arteries

- Unrepaired: routine surveillance (3-5 years) in an asymptomatic patient (**AUC Score 7**)⁽⁶⁾
- Postoperative: routine surveillance (3-5 years) in an asymptomatic patient (**AUC Score 7**)⁽⁶⁾
- Postoperative anatomic repair: routine surveillance (6-12 months) in a patient with valvular or ventricular dysfunction, right or left ventricular outflow tract obstruction, or presence of an RV-to-PA conduit (**AUC Score 7**)⁽⁶⁾
- Postoperative physiological repair with ventricle septal defect (VSD) closure and/or left ventricle (LV)-to-PA conduit: routine surveillance (3-12 months) in a patient with $\geq$

moderate systemic AV valve regurgitation, systemic RV dysfunction, and/or LV to PA conduit dysfunction (**AUC Score 7**) ⁽⁶⁾

Truncus Arteriosus

- Routine surveillance (1-2 years) in an asymptomatic child or adult with $\geq$ moderate truncal stenosis and/or regurgitation (**AUC Score 7**) ⁽⁶⁾

Single-Ventricle Heart Disease

Includes hypoplastic left heart syndrome, double-inlet LV, double-inlet RV, mitral atresia, tricuspid atresia, unbalanced AV septal defect (AVSD):

- Postoperative routine surveillance (3-5 years) in an asymptomatic patient (**AUC Score 7**) ⁽⁶⁾

Cardiomyopathy ⁽⁸⁾

- Quantification of myocardial (muscle) mass, when cardiovascular magnetic resonance (CMR) is contraindicated or cannot be performed ⁽⁹⁻¹¹⁾ (**AUC Score 7**) ⁽⁸⁾
- Assessment of left ventricular systolic dysfunction when prior noninvasive imaging has been inadequate (**AUC Score 7**) ⁽⁸⁾
- Assessment of right ventricular morphology in suspected arrhythmogenic right ventricular cardiomyopathy (**AUC Score 7**), ⁽¹²⁾ based upon other findings such as ⁽⁹⁾:
 - Non-sustained Ventricular tachycardia (VT)
 - Unexplained syncope
 - Electrocardiogram (ECG) abnormalities ⁽¹¹⁾
 - First-degree relative with positive genotype of ARVC (either, but CMR is superior to CT) ^(9,11)

Valvular Heart Disease ^(13,14)

- Characterization of native or prosthetic valves with clinical signs or symptoms suggesting valve dysfunction, when transthoracic echocardiography (TTE), transesophageal echocardiography (TEE), and/or fluoroscopy have been inadequate (**AUC Score 7**) ⁽¹³⁾
- Evaluation of RV systolic function in severe tricuspid regurgitation (TR), including systolic and diastolic volumes, when TTE images are inadequate and CMR is not readily available
- Pulmonary hypertension in the absence of severe valvular disease ⁽¹⁵⁾
- Evaluation of suspected infective endocarditis with moderate to high pretest probability (ie, staph bacteremia, fungemia, prosthetic heart valve, or intracardiac device), when TTE and TEE have been inadequate
- Evaluation of suspected paravalvular infections when the anatomy cannot be clearly

delineated by TTE and TEE

Evaluation of Intra- and Extra-cardiac Structures ⁽⁸⁾

- Evaluation of cardiac mass, suspected tumor or thrombus, or cardiac source of emboli, when imaging with TTE and TEE have been inadequate (**AUC Score 7**) ⁽⁸⁾
- Re-evaluation of prior findings for interval change (ie, reduction or resolution of atrial thrombus after anticoagulation) when a change in therapy is anticipated (**AUC Score 7**) ^(7,8)
- Evaluation of pericardial anatomy (**AUC Score 8**), ^(8,12) when TTE and/or TEE are inadequate or for better tissue characterization of a mass and detection of metastasis (CMR superior for physiologic assessment (constrictive versus restrictive) and tissue characterization, CT superior for calcium assessment) ^(9,16,17)

Electrophysiologic Procedure Planning ^(9,12)

- Evaluation of pulmonary venous anatomy prior to radiofrequency ablation of atrial fibrillation and for follow-up when needed for evaluation of pulmonary vein stenosis (**AUC Score 8**) ⁽¹²⁾
- Non-invasive coronary vein mapping prior to placement of biventricular pacing leads (**AUC Score 8**) ⁽¹²⁾

Transcatheter Structural Intervention Planning

- Evaluation of left atrial appendage (LAA) anatomy for:
 - Evaluation of anatomy, potential cardiac source of emboli, and suitability for percutaneous occlusion device placement (**AUC Score 7**). ⁽¹⁸⁾ TEE remains the preferred choice of modality for this procedure ⁽¹⁸⁾
 - Surveillance at 45 days and 1 year or FDA (U.S. Food and Drug Administration) guidance/guidelines for follow-up to assess LAA occlusion device stability and device leak, and exclude migration, displacement, or erosion ⁽¹⁹⁾
 - Reassessment at 6 months if 45-day imaging (TEE or CT) shows incomplete device closure of left atrial appendage
- Pre-procedural evaluation prior to patent foramen ovale (PFO) or atrial septal defect (ASD) closure:
 - Assessment of atrium septal anatomy and suitability for device closure (**AUC Score 7**) ⁽¹⁸⁾
- Evaluation for transcatheter aortic valve replacement (TAVR) (**AUC Score 9**) ^(13,20)
- When TTE and TEE cannot provide adequate imaging, CT imaging can be used for planning: robotic mitral valve repair, ventricular septal defect closure, endovascular grafts, and percutaneous pulmonic valve implantation ⁽¹⁹⁾
- Evaluation for suitability of transcatheter mitral valve procedures, alone or in addition to TEE ⁽²¹⁾

Aortic Pathology (8,13,22–24)

- CT, magnetic resonance (MR), or echo can be used for screening and follow-up, with CT and MR preferred for imaging beyond the proximal ascending thoracic aorta in the following scenarios:
 - Evaluation of dilated aortic sinuses or ascending aorta identified by TTE (**AUC Score 8**)⁽⁸⁾
 - Suspected acute aortic pathology, such as dissection (**AUC Score 9**)⁽⁸⁾
 - Re-evaluation of known aortic dilation or aortic dissection with a change in clinical status or cardiac examination or when findings would alter management (**AUC Score 8**)⁽⁸⁾
 - Screening first-degree relatives of individuals with a history of thoracic aortic aneurysm or dissection, or an associated high-risk mutation for thoracic aneurysm in common (**AUC Score 7**)⁽⁸⁾
 - Screening second-degree relative of a patient with thoracic aortic aneurysm, when the first-degree relative has aortic dilation, aneurysm, or dissection
 - Six-month follow-up after initial finding of a dilated thoracic aorta, for assessment of rate of change
 - Annual follow-up of enlarged thoracic aorta with size up to 4.4 cm
 - Biannual (twice/year) follow-up of enlarged aortic root ≥ 4.5 cm or showing growth rate ≥ 0.5 cm/year
- Patients with Marfan syndrome may undergo annual imaging with CT, magnetic resonance imaging (MRI) or TTE, with increase to biannual (twice-yearly) when diameter ≥ 4.5 cm or when expansions is > 0.5 cm/year (**AUC Score 8**)⁽⁸⁾
- Patient with Turner syndrome should undergo initial imaging with CT, MRI, or TTE for evidence of dilatation of the ascending thoracic aorta. If imaging is normal and there are no risk factors for aortic dissection, repeat imaging should be performed every 5 - 10 years, or if otherwise indicated. If the aorta is enlarged, appropriate follow-up imaging should be done according to size, as above
- Evaluation of the aorta in the setting of a known or suspected connective tissue disease or genetic condition that predisposes to aortic aneurysm or dissection (ie, Loeys-Dietz, Ehlers-Danlos), with re-evaluation at 6 months for rate of expansion. Complete evaluation with CMR from the cerebrovascular circulation to the pelvis is recommended with Loeys-Dietz syndrome.

OTHER COMBINATION STUDIES WITH HEART CT

Heart MRI (or CT) and Chest Magnetic Resonance Angiography (MRA) (or CTA)

- When medical necessity criteria indications are met for each Chest MRA (or CTA) and

Heart MRI (see Evolent Clinical Guideline 7297 for Heart Magnetic Resonance Imaging) or Heart CT, such as for certain congenital malformations when evaluation of cardiac and extra cardiac structures are needed.

CODING AND STANDARDS

Codes

Code	Description
75572	Computed tomography, heart, with contrast material, for evaluation of cardiac structure and morphology (including 3D image postprocessing, assessment of cardiac function, and evaluation of venous structures, if performed)
75573	Computed tomography, heart, with contrast material, for evaluation of cardiac structure and morphology in the setting of congenital heart disease (including 3D image postprocessing, assessment of left ventricular [LV] cardiac function, right ventricular [RV] structure and function and evaluation of vascular structures, if performed)
+0722T	Quantitative computed tomography (CT) tissue characterization, including interpretation and report, obtained with concurrent CT examination of any structure contained in the concurrently acquired diagnostic imaging dataset (List separately in addition to code for primary procedure)

Applicable Lines of Business

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

BACKGROUND

General Overview

- Cardiac computed tomography (Heart CT) images the cardiac chambers, great vessels, valves, myocardium, and pericardium to assess cardiac structure and function, particularly when echocardiography (transthoracic echocardiography and transesophageal echocardiography) cannot provide adequate information
- CT imaging can be used for assessment of:
 - Structures of the heart (eg, chambers, valves, great vessels, masses), as in this guideline
 - Quantitative level of calcium in the walls of the coronary arteries, in the separate coronary artery calcium (CAC) scoring guideline

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. ⁽²⁾

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

Acronyms / Abbreviations

ARVD/C: Arrhythmogenic right ventricular dysplasia/cardiomyopathy

ASD: Atrial septal defect

AVSD: Atrioventricular septal defect

AVVR: Atrioventricular valve regurgitation

CABG: Coronary artery bypass grafting surgery

CAD: Coronary artery disease

CCS: Coronary calcium score

CCT: Cardiac (Heart) CT

CHD: Coronary heart disease

CMR: Cardiac magnetic resonance (imaging)

CT: Computed tomography

CTA: Computed tomography angiography

ECG: Electrocardiogram

EF: Ejection fraction

HF: Heart failure

LAA: Left atrial appendage

LVOT: Left ventricular outflow tract

MI: Myocardial infarction

MPI: Myocardial perfusion Imaging or cardiac nuclear imaging

MRA: Magnetic resonance angiography

MR: Magnetic resonance

MRI: Magnetic resonance imaging

PA: Pulmonary artery

PCI: Percutaneous coronary intervention

PFO: Patent foramen ovale

PVML: Paravalvular mitral leak

RV: Right ventricle

SE: Stress echocardiogram

TAVR: Transcatheter aortic valve replacement

TMVR: Transcatheter mitral valve replacement

TR: Tricuspid regurgitation

TEE: Transesophageal echocardiography

TTE: Transthoracic echocardiography

VSD: Ventricle septal defect

VT: Ventricular tachycardia

SUMMARY OF EVIDENCE

ACC/AHA/ASE/HRS/ISACHD/SCAI/SCCT/SCMR/SOPE 2020 Appropriate Use Criteria for Multimodality Imaging During the Follow-Up Care of Patients With Congenital Heart Disease ⁽⁶⁾

Study Design: The study was conducted by the American College of Cardiology Solution Set Oversight Committee and Appropriate Use Criteria Task Force, along with several other cardiovascular societies. It involved the development of appropriate use criteria (AUC) for multimodality imaging during the follow-up care of patients with congenital heart disease (CHD). The criteria were developed using guidelines, clinical trial data, and expert opinion in the field of CHD. The writing group developed 324 clinical indications, which were separated into 19 tables according to the type of cardiac lesion. These scenarios were presented to an independent panel for rating, with each being scored on a scale of 1 to 9, with 1 to 3 categorized as "Rarely Appropriate," 4 to 6 as "May Be Appropriate," and 7 to 9 as "Appropriate".

Target Population: The target population includes both pediatric and adult patients with established congenital heart disease. The criteria address cardiac imaging in adult and pediatric patients with established CHD, focusing on evaluation before and after cardiac surgery or catheter-based intervention, routine surveillance, and evaluation of new-onset signs or symptoms.

Key Factors:

- **Indications:** The study developed 324 clinical indications related to the follow-up care of patients with CHD. These indications were categorized into 19 tables based on the type of cardiac lesion.
- **Imaging Modalities:** The study evaluated the use of various noninvasive cardiac imaging modalities, including transthoracic echocardiography (TTE), transesophageal echocardiography (TEE), cardiovascular magnetic resonance (CMR), cardiovascular computed tomography (CCT), stress imaging, and lung scan.
- **Rating System:** Each clinical scenario was rated on a scale of 1 to 9, with 1 to 3 categorized as "Rarely Appropriate," 4 to 6 as "May Be Appropriate," and 7 to 9 as "Appropriate." The ratings were based on clinical practice guidelines, expert opinion, and available evidence.

Outcomes: The study aimed to provide guidance to clinicians in the care of patients with established CHD by identifying reasonable imaging modality options for evaluation and surveillance. It also aimed to serve as an educational and quality improvement tool to identify patterns of care and reduce the number of rarely appropriate tests in clinical practice.

2018 AHA/ACC Guideline for the Management of Adults With Congenital Heart Disease ⁽²⁵⁾

Study Design The study involved the development of the 2018 AHA/ACC Guideline for the Management of Adults with Congenital Heart Disease (ACHD). The guidelines were developed by the American College of Cardiology (ACC) and the American Heart Association (AHA) Task Force on Clinical Practice Guidelines. The process included a comprehensive review of published evidence, diagnostic and therapeutic procedures, and assessment of the risk-benefit ratio. The guidelines were developed by a task force of selected experts in the field, representing various ACC sub-specialty groups.

Target Population: The guidelines focus on adults with congenital heart disease (ACHD), including those with simple, moderate, and complex congenital heart defects. The target population encompasses a wide range of congenital heart conditions, such as atrial septal defect (ASD), ventricular septal defect (VSD), atrioventricular septal defect (AVSD), patent ductus arteriosus (PDA), left ventricular outflow tract obstruction (LVOTO), coarctation of the aorta (CoA), and aortopathies.

Key Factors:

- **Recommendations:** The guidelines provide evidence-based recommendations for the diagnosis, management, and treatment of ACHD, including surgical and catheter interventions, medical therapy, and follow-up care.

- **Diagnostic Testing:** The guidelines emphasize the importance of accurate diagnosis, risk assessment, and selection of the most suitable type of intervention. Diagnostic testing includes echocardiography, cardiovascular magnetic resonance imaging (CMR), cardiovascular computed tomography (CCT), and cardiac catheterization.
 - **Medical Therapy:** The guidelines recommend medical therapy for heart failure, arrhythmias, pulmonary hypertension, and other related conditions. Specific therapies include beta blockers, angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs), and pulmonary vasodilators.
 - **Surgical and Catheter Interventions:** The guidelines provide detailed recommendations for surgical and catheter interventions for various congenital heart defects, including ASD, VSD, AVSD, PDA, LVOTO, CoA, and aortopathies.
- Follow-up Care:** The guidelines emphasize the importance of lifelong follow-up care for ACHD patients, including regular imaging, exercise testing, and monitoring for complications.

ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2019 Appropriate Use Criteria for Multimodality Imaging in the Assessment of Cardiac Structure and Function in Nonvalvular Heart Disease ⁽⁸⁾

Study Design: The study is a report developed by the American College of Cardiology Appropriate Use Criteria Task Force, along with several other cardiovascular societies. It aims to provide appropriate use criteria (AUC) for multimodality imaging in nonvalvular heart disease. The clinical scenarios (indications) were developed by a diverse writing group and scored by an independent rating panel using standardized methodology.

Target Population: The target population includes patients with nonvalvular heart disease, encompassing various conditions such as heart failure, diseases of the aorta and pericardium, and any disorder involving abnormal cardiac structure or function excluding valvular diseases.

Key Factors:

- **Clinical Scenarios:** The document covers 102 clinical scenarios representing patient presentations encountered in everyday practice. These scenarios were developed based on the most current American College of Cardiology/American Heart Association Clinical Practice Guidelines.
- **Imaging Modalities:** The study evaluates multiple imaging modalities, including transthoracic echocardiography (TTE), transesophageal echocardiography (TEE), cardiovascular magnetic resonance imaging (CMR), computed tomography (CT), and others.
- **Appropriateness Ratings:** Each clinical scenario was rated on a scale of 1 to 9, with scores of 7 to 9 indicating that a modality is considered appropriate, scores of 4 to 6 indicating that a modality may be appropriate, and scores of 1 to 3 indicating that a modality is considered rarely appropriate.
- **Objective:** The primary objective is to provide a framework for the assessment of these scenarios by practices that will improve and standardize physician decision-making.

ANALYSIS OF EVIDENCE

Shared Conclusions ^(6,8,25)

- **Importance of Multimodality Imaging:** All three articles emphasize the significance of using multiple imaging modalities to assess and manage heart disease. They highlight the strengths and limitations of different imaging techniques and recommend their use based on specific clinical scenarios.
- **Individualized Care Plans:** The articles stress the need for personalized care plans tailored to the patient's specific condition and clinical status. This approach ensures that patients receive the most appropriate and effective care.
- **Collaboration Among Healthcare Providers:** The importance of collaboration between cardiologists, surgeons, and other healthcare providers is a common theme. This multidisciplinary approach is crucial for optimizing patient outcomes and managing complex cases.

POLICY HISTORY

Date	Summary
June 2026	● Added evaluation of left atrial appendage (LAA) anatomy to Transcatheter Structural Intervention Planning section ● Updated Combination Studies ● CPT Code table added ● References updated
July 2025	● This guideline merges two Evolent guidelines with identical clinical criteria: ECG 7296-01 for Heart CT and ECG 025 for Heart CT into Evolent Clinical Guideline 7296 for Heart Computed Tomography (CT) ○ Added a subtitle – Structure and Morphology, Congenital Studies ○ This guideline also merges Procedure Codes from these two Evolent guidelines ● Added new bullet-point to the General Statement section ● Checked the Medicare Advantage box in the Applicable Lines of Business table ● Added AUC Score section to the Background ● 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

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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 7297 for Heart Magnetic Resonance Imaging (MRI)

Guideline Number: Evolent_CG_7297	<u>Applicable Codes</u>	
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TABLE OF CONTENTS

STATEMENT	3
GENERAL INFORMATION	3
PURPOSE	3
SPECIAL NOTE	3
CLINICAL REASONING	3
INDICATIONS FOR CARDIAC MAGNETIC RESONANCE (CMR)	4
CARDIOMYOPATHY & HEART FAILURE	4
VALVULAR HEART DISEASE	5
EVALUATION OF INTRA- AND EXTRA-CARDIAC STRUCTURES	5
PRE-PROCEDURE EVALUATION	6
ASSESSMENT FOLLOWING LEFT ATRIAL APPENDAGE (LAA) OCCLUSION	6
PRE-ABLATION PLANNING	6
AORTIC PATHOLOGY	6
CONGENITAL HEART DISEASE (CHD)	7
CORONARY ARTERY DISEASE EVALUATION	9
GENETIC CONDITIONS	9
COMBINATION STUDIES WITH HEART MRI	10
HEART MRI (OR CT) CHEST MAGNETIC RESONANCE ANGIOGRAPHY (MRA) (OR CT ANGIOGRAPHY (CTA)) ..	10
CODING AND STANDARDS	10
CODES	10
APPLICABLE LINES OF BUSINESS	11
BACKGROUND	11
GENERAL OVERVIEW	11
MYOCARDITIS STAGES	12
AUC SCORE	13
DEFINITIONS	13
<i>Diamond Forrester Table</i>	13
ACRONYMS/ABBREVIATIONS	14
SUMMARY OF EVIDENCE	16

ANALYSIS OF EVIDENCE.....	18
POLICY HISTORY	18
LEGAL AND COMPLIANCE	19
GUIDELINE APPROVAL	19
<i>Committee</i>	19
DISCLAIMER	19
REFERENCES.....	21

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.*

Purpose

Cardiac magnetic resonance imaging (CMR) is an imaging modality used to assess cardiac or vascular anatomy, function, perfusion, and tissue characteristics in a single examination. In lesions affecting the right heart, CMR provides excellent visualization and volume determination regardless of right ventricular (RV) shape. This is particularly useful in patients with congenital heart disease.

Special Note

Since many cardiac patients have cardiac implanted electrical devices, the risk of CMR to the patient and the device must be weighed against the benefit to the patient in terms of clinical value in optimal management. ⁽¹⁻⁴⁾

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.

In instances where an AUC has not been established through prior publication, 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. ⁽⁵⁻⁹⁾

INDICATIONS FOR CARDIAC MAGNETIC RESONANCE (CMR)

Cardiomyopathy & Heart Failure ^(10–12)

- To assess systolic and diastolic function in the evaluation of a newly diagnosed cardiomyopathy (**AUC Score 7**) ⁽¹⁰⁾
- Suspected infiltrative disease such as amyloidosis, sarcoidosis, ^(13,14) iron overload (ie, hemochromatosis or resulting from frequent transfusions), or endomyocardial fibrosis if Heart Positron Emission Tomography (PET) has not been performed (**AUC Score 8**) ⁽¹⁰⁾
- Monitoring of response to chelation therapy for myocardial iron overload (see **Background**) ⁽¹³⁾
- Suspected inherited or acquired cardiomyopathy (**AUC Score 7**) ⁽¹⁰⁾
- Diagnosis of acute myocarditis, with suspicion based upon new, unexplained findings such as:
 - Rise in troponin not clearly due to acute myocardial infarction
 - Change in ECG suggesting acute myocardial injury or pericarditis, without evident myocardial infarction
- Follow up for acute myocarditis based on stage ⁽¹⁵⁾ (see **Background**):
 - Stage B and low-risk stage C:
 - 6 months when initial cardiac MRI demonstrated myocardial inflammation or late gadolinium enhancement (LGE)
 - High-risk stage C and stage D:
 - 6 months
- Assessment of hypertrophic cardiomyopathy (HCM) ⁽¹⁶⁾ (**AUC Score 8**) ⁽¹⁰⁾
 - When transthoracic echocardiography (TTE) is inadequate for diagnosis, management, or operative planning, or when tissue characterization (degree of fibrosis) will impact indications for implantable cardioverter-defibrillator (ICD)
 - For patients with left ventricular hypertrophy (LVH) when there is a suspicion of alternative diagnoses, including infiltrative or storage disease as well as athlete's heart
 - For patients with obstructive HCM in whom the autonomic mechanism of obstruction is inconclusive on echocardiography, CMR is indicated for selection and planning of septal reduction therapy (SRT)
 - For patients with HCM, repeat imaging on a periodic basis (every 3-5 years) for the purpose of sudden cardiac death (SCD) risk stratification to evaluate changes in late gadolinium enhancement (LGE), ejection fraction (EF), development of apical aneurysm or left ventricle (LV) wall thickness
- Arrhythmogenic right ventricular cardiomyopathy to aid in identification and diagnosis

(assessment of myocardial fat, fibrosis, and RV tissue characteristics), based upon reason for suspicion, such as:

- Non-sustained ventricular tachycardia (VT)
- Unexplained syncope
- ECG abnormalities
- First-degree relatives with positive genotype for arrhythmogenic right ventricular dysplasia (ARVD)
- Noncompaction cardiomyopathy to aid in the diagnosis (measurement of compacted to noncompacted myocardium) when TTE is suggestive
- Viability assessment when Single Positron Emission Tomography (SPECT), PET or Dobutamine Echo has provided “equivocal or indeterminate” results
- Clinical symptoms and signs consistent with a cardiac diagnosis known to cause presyncope/syncope (including, but not limited to, HCM) **(AUC Score 7)** ⁽¹⁰⁾
- Pulmonary hypertension in the absence of severe valvular disease **(AUC Score 7)** ⁽¹⁰⁾
- Cardiomyopathy
 - Hemosiderosis
 - Restrictive cardiomyopathy **(AUC Score 7)** ⁽¹⁰⁾
 - Cardio toxic chemotherapy

Valvular Heart Disease

- Evaluation of valvular stenosis, regurgitation, or valvular masses when TTE is inadequate **(AUC Score 7)** ⁽¹⁷⁾
- Before transcatheter aortic valve replacement (TAVR) assessment if the patient has not undergone cardiac computed tomography (CT) ⁽¹⁸⁾
- Prior to transcatheter mitral valve intervention when TTE and transesophageal echocardiography (TEE) result in uncertain assessment of the severity of mitral regurgitation ^(19,20)
- Suspected clinically significant bioprosthetic valvular dysfunction and inadequate images from TTE and TEE **(AUC Score 7)** ⁽¹⁷⁾

Evaluation of Intra- and Extra-Cardiac Structures

- Initial evaluation of cardiac mass, suspected tumor or thrombus, or potential cardiac source of emboli **(AUC Score 7)** ⁽¹⁰⁾
- Re-evaluation of intracardiac mass when findings would change therapy; no prior imaging in the last three months **(AUC Score 7)** ⁽¹⁰⁾
- Evaluation of pericardial disease to provide structural and functional assessment and differentiate constrictive vs restrictive physiology **(AUC Score 8)** ⁽¹⁰⁾

- Assessment of left ventricular pseudoaneurysm, when TTE was inadequate
- Identification and characteristics of coronary aneurysms or anomalous coronary arteries (**AUC Score 7**) ⁽¹⁰⁾

Pre-Procedure Evaluation

- Pre-procedure evaluation for closer of Atrial Septal Defect (ASD) or Patent Foramen Ovale (PFO) (**AUC Score 7**) ⁽¹⁰⁾
- For assessment of atrial septal anatomy and atrial septal aneurysm
- For assessment of suitability for percutaneous device closure

Assessment Following Left Atrial Appendage (LAA) Occlusion

- For surveillance at 45 days or FDA guidance, if TEE or Heart CT was not done, to assess:
 - Device stability
 - Device leaks
 - To exclude device migration

Pre-Ablation Planning

- Evaluation of left atrium and pulmonary veins prior to radiofrequency ablation for atrial fibrillation, if cardiac CT has not been done

Aortic Pathology

- CT, MR, or echocardiogram can be used for screening and follow-up, with CT and MR preferred for imaging beyond the proximal ascending thoracic aorta (**AUC Score 8**) ⁽¹⁰⁾
- Screening of first-degree relatives with a history of thoracic aortic aneurysm or dissection (**AUC Score 7**) ⁽¹⁰⁾
- 6 month follow-up after initial diagnosis of thoracic aortic aneurysm to measure rate of change
- Annual follow-up for an enlarged thoracic aortic aneurysm (usually defined as > 4.4.cm)
- Biannual (2 times per year) follow-up of enlarged aortic root or showing growth rate ≥ 0.5 cm/year
- Screening of first-degree relative with a bicuspid aortic valve
- Re-evaluation (<1 year) of the size and morphology of the aortic sinuses and ascending aorta in patients with a bicuspid aortic valve (AV) and an ascending aortic diameter > 4 cm with **ONE** of the following:
 - Aortic diameter > 4.5 cm

- Rapid rate of change in aortic diameter
- Family history (first-degree relative) of aortic dissection
- Patients with Turner's Syndrome annually if an abnormality exists, if initial study normal, can have imaging every 5-10 years ⁽²¹⁾
- Evaluation in patients with known or suspected connective tissue disease or genetic condition that predispose to aortic aneurysm or dissection, such as Marfan Syndrome, Ehlers-Danlos, or Loeys-Dietz Syndrome (at the time of diagnosis and 6 months thereafter), followed by annual imaging (can be done more frequently if > 4.5 cm or rate of growth > 0.5 cm/year, up to twice per year) (**AUC Score 8**) ⁽¹⁰⁾

Congenital Heart Disease (CHD)

For all indications below, either CT or CMR can be done:

- All lesions: evaluation prior to planned repair and evaluation for change in clinical status and/or new concerning signs or symptoms
- Patent Ductus Arteriosus: routine surveillance (1-2 years) in a patient with postprocedural aortic obstruction (**AUC Score 7**) ⁽²²⁾
- Anomalous pulmonary venous connections (APVC), to assess pulmonary venous anatomy, RV size and determine shunt fraction ⁽²³⁾
 - Initial evaluation
 - Routine surveillance (3-5 years) in unrepaired APVC, with or without TTE
- Eisenmenger Syndrome and Pulmonary Hypertension associated with CHD (**AUC Score 7**) ⁽²²⁾
 - Evaluation due to change in pulmonary arterial hypertension-targeted therapy
 - Initial evaluation with suspicion of pulmonary hypertension following CHD surgery
- Aortic Stenosis or Regurgitation:
 - Routine surveillance (6-12 months) in a child with aortic sinus and/or ascending aortic dilation with increasing size (**AUC Score 8**) ⁽²²⁾
 - Routine surveillance (2-3 years) in a child with aortic sinus and/or ascending aortic dilation with stable size (CMR only) (**AUC Score 7**) ⁽²²⁾
- Aortic Coarctation and Interrupted Aortic Arch (**AUC Score 8**) ⁽²²⁾ :
 - In the absence of prior imaging documenting congenital heart disease, a cardiac MRI is appropriate for suspected coarctation (**AUC Score 8**) ⁽²²⁾
 - Routine surveillance (3-5 years) in a child or adult with mild aortic coarctation
 - Post procedure (surgical or catheter-based) routine surveillance (3-5 years) in an asymptomatic patient to evaluate for aortic arch aneurysms, in-stent stenosis, stent fracture, or endoleak
- Coronary anomalies

- Tetralogy of Fallot:
 - Postoperative routine surveillance (2-3 years) in a patient with pulmonary regurgitation and preserved ventricular function (CMR only) (**AUC Score 7**) ⁽²²⁾
 - Routine surveillance (2-3 years) in an asymptomatic patient with no or mild sequelae (CMR only) (**AUC Score 7**) ⁽²²⁾
 - Routine surveillance (2–3 years) in a patient with valvular or ventricular dysfunction, right ventricular outflow tract obstruction, branch pulmonary artery stenosis, arrhythmias, or presence of an RV-to-pulmonary artery (PA) conduit (**AUC Score 8**) ⁽²²⁾
- Double Outlet Right Ventricle: Routine surveillance (3-5 years) in an asymptomatic patient with no or mild sequelae (CMR only)
- Double-chambered right ventricle (DCRV) with $\geq$ moderate right ventricular outflow tract (RVOT) obstruction, to characterize anatomy ⁽²³⁾
- D-Loop Transposition of the Great Arteries (postoperative):
 - Routine surveillance (3-5 years) in an asymptomatic patient (**AUC Score 7**) ⁽²²⁾
 - Routine surveillance (1-2 years) in a patient with dilated aortic root with increasing size, or aortic regurgitation (**AUC Score 8**) ⁽²²⁾
 - Routine surveillance (3-12 months) in a patient with $\geq$ moderate systemic AV valve regurgitation, systemic RV dysfunction, left ventricular outflow (LVOT) obstruction, or arrhythmias
- Congenitally Corrected Transposition of the Great Arteries (**AUC Score 7**) ⁽²²⁾:
 - Unrepaired: routine surveillance (3-5 years) in an asymptomatic patient
 - Postoperative: routine surveillance (3-5 years) in an asymptomatic patient
 - Postoperative anatomic repair: routine surveillance (6-12 months) in a patient with valvular or ventricular dysfunction, right or left ventricular outflow tract obstruction, or presence of an RV-to-PA conduit
 - Postoperative physiological repair with ventricular septal defect (VSD) closure and/or LV-to-PA conduit: routine surveillance (3-12 months) in a patient with $\geq$ moderate systemic AV valve regurgitation, systemic RV dysfunction, and/or LV-to-PA conduit dysfunction
- Truncus Arteriosus: routine surveillance (1-2 years) in an asymptomatic child or adult with $\geq$ moderate truncal stenosis and/or regurgitation (**AUC Score 7**) ⁽²²⁾
- Single-Ventricle Heart Disease:
 - Postoperative routine surveillance (1-2 years) in an asymptomatic patient
 - Routine surveillance (1-2 years) in an asymptomatic adult postoperative Stage 2 palliation (CMR only) (**AUC Score 7**) ⁽²²⁾
- Ebstein's Anomaly and Tricuspid Valve Dysplasia (only CMR indicated):
 - Evaluation prior to planned repair and evaluation for change in clinical status and/or

new concerning signs or symptoms (**AUC Score 7**) ⁽²²⁾

- Pulmonary Stenosis (PS) (only CMR indicated) (**AUC Score 7**) ⁽²²⁾
 - Unrepaired: routine surveillance (3-5 years) in an asymptomatic adult with PS and pulmonary artery dilation
 - Postprocedural (surgical or catheter-based): routine surveillance (1-3 years) in an asymptomatic adult with moderate or severe sequelae
- Moderate pulmonary regurgitation (PR)
 - After treatment of isolated pulmonary stenosis: to assess anatomy, degree of regurgitation and measure RV volumes and systolic function ⁽²³⁾
- Pulmonary Atresia (postprocedural complete repair): routine surveillance (1-3 years) in an asymptomatic adult with ≥ moderate sequelae (**AUC Score 7**) ⁽²²⁾

Coronary Artery Disease Evaluation

CMR, which is done pharmacologically, is used for the assessment of coronary artery disease, and can be performed if the patient would otherwise be a candidate for a pharmacologic myocardial perfusion imaging (MPI).

- If the patient can walk and is having MPI for another reason (left bundle branch block (LBBB), coronary artery bypass graft (CABG), etc.), MPI is chosen over CMR
- Assessment of LV wall motion to identify patients with akinetic segments that would benefit from coronary revascularization
- To identify the extent and location of myocardial necrosis in patients with chronic or acute ischemic heart disease
- Follow-up of known coronary artery disease (CAD)
 - Coronary stenosis of unclear significance on previous coronary angiography ^(12,24)
- To diagnose microvascular dysfunction in patients with persistent stable anginal chest pain with suspected ischemia and nonobstructive coronary artery disease (INOCA) as documented in provider notes (no MPI diversion required). ⁽²⁵⁾

GENETIC CONDITIONS

- ADPKD (Autosomal Dominant Polycystic Kidney Disease) **AND** family history of thoracic aortic dissection ⁽²⁶⁾:
 - Every 2 years (including at diagnosis)

NOTE: Either Cardiac MRI **OR** Chest MRI, not both
- Beta-Thalassemia ⁽²⁷⁾:
 - Annually
- Duchenne muscular dystrophy (DMD): Heart MRI is the preferred non-invasive imaging

modality. TTE is typically used for younger children (ie, < age 6-7 years) to avoid need for anesthesia.⁽²⁸⁾

- Age < 6-7 years: at diagnosis and annually
- Age ≥ 10 years: at least annually, when Heart MRI cannot be done
- Female carriers: baseline assessment early adulthood with continued surveillance (ie, initial imaging normal) every 3-5 years, when Heart MRI cannot be done
- Fabry disease⁽²⁹⁾:
 - At diagnosis
- Hemochromatosis^(30,31):
 - Annually or as needed in those with history of cardiac siderosis

COMBINATION STUDIES WITH HEART MRI

Heart MRI (or CT) Chest Magnetic Resonance Angiography (MRA) (or CT Angiography (CTA))

- When medical necessity criteria indications are met for each Chest MRA (or CTA) and Heart MRI or Heart CT (see Evolent Clinical Guideline 7296 for Heart Computed Tomography), such as for certain congenital malformations when evaluation of cardiac and extra cardiac structures are needed.

CODING AND STANDARDS

Codes

Code	Description
75557	Cardiac magnetic resonance imaging for morphology and function without contrast material
75559	Cardiac magnetic resonance imaging for morphology and function without contrast material; with stress imaging
75561	Cardiac magnetic resonance imaging for morphology and function without contrast material(s), followed by contrast material(s) and further sequences
75563	Cardiac magnetic resonance imaging for morphology and function without contrast material(s), followed by contrast material(s) and further sequences; with stress imaging

Code	Description
+0698T	Quantitative magnetic resonance for analysis of tissue composition (eg, fat, iron, water content), including multiparametric data acquisition, data preparation and transmission, interpretation and report, obtained with diagnostic MRI examination of the same anatomy (eg, organ, gland, tissue, target structure); multiple organs (List separately in addition to code for primary procedure)
+75565	Cardiac magnetic resonance imaging for velocity flow mapping (List separately in addition to code for primary procedure)

Applicable Lines of Business

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

BACKGROUND

General Overview ⁽³²⁾

- CMR in CAD ^(24,33,34) is often required when transthoracic echocardiography (TTE) and transesophageal echocardiography (TEE) provide inadequate imaging data.
- Stress CMR for assessment of coronary artery disease (CAD) is performed pharmacologically either as a vasodilator perfusion imaging with gadolinium contrast or dobutamine inotropic wall motion (ventriculography).
- With respect to CAD evaluation, since CMR is only pharmacologic (non-exercise stress), and stress echocardiography (SE) or myocardial perfusion imaging (MPI) provide similar information about CAD:
 - Requests for stress CMR require diversion to exercise SE first, and to exercise MPI second.
 - Exemptions for the diversion to SE or exercise MPI:
 - If body habitus or marked obesity (e.g., BMI ≥ 40) would interfere significantly with imaging with SE and MPI ⁽³⁵⁾
 - Evaluation of young (< 55 years old) patients with documented complex CAD,

who are likely to need frequent non-invasive coronary ischemia evaluation and/or frequent radiation exposure from other testing ⁽³⁶⁾

- Heart MRI is an imaging method that uses powerful magnets and radio waves to create pictures of the heart. It does not use radiation (x-rays).

Myocardial Iron Overload ⁽¹³⁾

- T2* MRI imaging measures myocardial relaxation time (measured in milliseconds (ms)), which is inversely related to iron content (lower T2* = increased iron load)
- Frequency of surveillance imaging during treatment (ie, chelation therapy) is based on T2* values:
 - >20 ms: every other year
 - 10-20 ms: annually
 - <10 ms: every 6 months

Myocarditis Stages ^(10–12)

- Stage A: at risk for myocarditis (i.e., due to cardiotoxic agent exposure, genetic predisposition, viral infections) but without symptoms and no diagnosis of myocarditis
- Stage B: asymptomatic, with risk factors, and elevated troponin or evidence of myocarditis on cardiac MRI or by histopathology
- Stage C: symptomatic with elevated troponin or evidence of myocarditis on cardiac MRI or by histopathology
 - Low risk stage C characterized by **ALL** the following:
 - normal LVEF
 - no LGE on MRI
 - hemodynamic and electrical stability
 - High risk stage C characterized by **ANY** of the following:
 - reduced LVEF
 - NSVT or frequent ventricular ectopy
 - clinically significant bradyarrhythmia
 - LGE on cardiac MRI
 - Increased fluorodeoxyglucose (FDG) uptake on cardiac PET
 - hemodynamic instability or clinical heart failure
- Stage D:
 - All criteria for stage C **AND**
 - Hemodynamic instability vasopressors or temporary circulatory support **OR** electrical

instability requiring intervention

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. ⁽⁶⁾

- 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 ^(24,33,34):
 - **Asymptomatic**, for whom global risk of CAD events can be determined from coronary risk factors, using calculators available online
 - **Symptomatic**, for whom we estimate the pretest probability that their chest-related symptoms are due to clinically significant ($\geq 50\%$) CAD (below):
- Angina
 - Beginning in 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 ⁽²⁴⁾ to **Less Likely Anginal Symptoms** and **Likely Anginal Symptoms**.
 - **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).
 - 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.

Diamond Forrester Table ^(37,38)

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

Age (Years)	Gender	Typical/ Definite Angina Pectoris	Atypical/ Probable Angina Pectoris	Nonanginal Chest Pain
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

- **Typical Angina (Definite)** is defined as including all **3** characteristics:
 - Substernal chest pain or discomfort with characteristic quality and duration
 - Provoked by exertion or emotional stress
 - Relieved by rest and/or nitroglycerine
- **Atypical Angina (Probable)** has only **2** of the above characteristics
- **Nonanginal Chest Pain/Discomfort** has only **0 - 1** of the above characteristics
- For additional information on stress imaging, please refer to Evolent Clinical Guideline 7312 for Myocardial Perfusion Imaging.

Acronyms/Abbreviations

APKD: Autosomal dominant polycystic kidney disease

APVC: Anomalous pulmonary venous connection

ARVD/C: Arrhythmogenic right ventricular dysplasia/cardiomyopathy

ASD: Atrial septal defect

AV: Aortic valve

CABG: Coronary artery bypass grafting surgery

CAD: Coronary artery disease

CHD: Congenital heart disease

CMR: Cardiac magnetic resonance (imaging)

CT: Computed tomography

CTA: Computed tomography angiography
DCRV: double chambered right ventricle
DMD: Duchenne muscular dystrophy
ECG: Electrocardiogram
EF: Ejection fraction
FDG: Fluorodeoxyglucose
HCM: Hypertrophic cardiomyopathy
ICD: Implantable cardioverter-defibrillator
INOCA: Ischemia and nonobstructive coronary artery disease
LAA: Left atrial appendage
LBBB: Left bundle-branch block
LGE: Late gadolinium enhancement
LV: Left ventricle
LVH: Left ventricular hypertrophy
LVOT: Left ventricular outflow
MPI: Myocardial perfusion imaging
MR: Mitral regurgitation
MRA: Magnetic resonance angiography
MR: Magnetic resonance
MRI: Magnetic resonance imaging
NSVT: non-sustained ventricular tachycardia
PA: Pulmonary artery
PET: Positron emission tomography
PFO: Patent foramen ovale
PS: Pulmonary stenosis
PR: Pulmonary regurgitation
RV: Right ventricle
SCD: Sudden cardiac death
SE: Stress echocardiography
SPECT: Single Positron Emission Tomography
SRT: Septal reduction therapy
TAVR: Transcatheter Aortic Valve Replacement
TTE: Transthoracic Echo

TEE: Transesophageal Echo

VSD: Ventricular septal defect

VT: Ventricular tachycardia

SUMMARY OF EVIDENCE

ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2019 Appropriate Use Criteria for Multimodality Imaging in the Assessment of Cardiac Structure and Function in Nonvalvular Heart Disease ⁽¹⁰⁾

Study Design: The study is a report developed by the American College of Cardiology Appropriate Use Criteria Task Force, along with several other cardiovascular societies. It aims to provide appropriate use criteria (AUC) for multimodality imaging in nonvalvular heart disease. The clinical scenarios (indications) were developed by a diverse writing group and scored by an independent rating panel using standardized methodology.

Target Population: The target population includes patients with nonvalvular heart disease, encompassing various conditions such as heart failure, diseases of the aorta and pericardium, and any disorder involving abnormal cardiac structure or function excluding valvular diseases.

Key Factors:

- **Clinical Scenarios:** The document covers 102 clinical scenarios representing patient presentations encountered in everyday practice. These scenarios were developed based on the most current American College of Cardiology/American Heart Association Clinical Practice Guidelines.
- **Imaging Modalities:** The study evaluates multiple imaging modalities, including transthoracic echocardiography (TTE), transesophageal echocardiography (TEE), cardiovascular magnetic resonance imaging (CMR), computed tomography (CT), and others.
- **Appropriateness Ratings:** Each clinical scenario was rated on a scale of 1 to 9, with scores of 7 to 9 indicating that a modality is considered appropriate, scores of 4 to 6 indicating that a modality may be appropriate, and scores of 1 to 3 indicating that a modality is considered rarely appropriate.
- **Objective:** The primary objective is to provide a framework for the assessment of these scenarios by practices that will improve and standardize physician decision-making.

ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2017 Appropriate Use Criteria for Multimodality Imaging in Valvular Heart Disease ⁽¹⁷⁾

Study Design: The study was conducted by the American College of Cardiology (ACC) Appropriate Use Criteria Task Force in collaboration with several other professional organizations, including the American Association for Thoracic Surgery, American Heart Association, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, and

Society of Thoracic Surgeons. The study aimed to develop AUC for multimodality imaging in the diagnosis and management of VHD.

Target Population: The target population includes patients with valvular heart disease, encompassing a wide range of clinical scenarios from asymptomatic patients at risk of developing VHD to patients with severe symptoms requiring surgical intervention. The study also addresses the use of imaging modalities in patients undergoing transcatheter aortic valve replacement (TAVR) and percutaneous mitral valve repair.

Key Factors

- **Clinical Scenarios:** The study developed 92 clinical scenarios representing patient presentations encountered in everyday practice. These scenarios were evaluated and rated by an independent rating panel on a scale of 1 to 9.
- **Imaging Modalities:** The study assessed the appropriateness of various imaging modalities, including transthoracic echocardiography (TTE), transesophageal echocardiography (TEE), cardiac computed tomography (CCT), cardiovascular magnetic resonance imaging (CMR), and others.
- **Rating System:** The clinical scenarios were rated as Appropriate (scores 7-9), May Be Appropriate (scores 4-6), or Rarely Appropriate (scores 1-3) based on the expected incremental information, combined with clinical judgment, and the expected negative consequences.
- **Methodology:** The study used a standardized methodology to develop the clinical scenarios and indications, which were reviewed and critiqued by the parent AUC Task Force and numerous external reviewers¹. The scenarios were then rated by an independent panel to ensure an appropriate balance of specialized expertise and general practice.

ACC/AHA/ASE/HRS/ISACHD/SCAI/SCCT/SCMR/SOPE 2020 Appropriate Use Criteria for Multimodality Imaging During the Follow-Up Care of Patients With Congenital Heart Disease ⁽²²⁾

Study Design: The study was conducted by the American College of Cardiology Solution Set Oversight Committee and Appropriate Use Criteria Task Force, along with several other cardiovascular societies. It involved the development of appropriate use criteria (AUC) for multimodality imaging during the follow-up care of patients with congenital heart disease (CHD). The criteria were developed using guidelines, clinical trial data, and expert opinion in the field of CHD. The writing group developed 324 clinical indications, which were separated into 19 tables according to the type of cardiac lesion. These scenarios were presented to an independent panel for rating, with each being scored on a scale of 1 to 9, with 1 to 3 categorized as "Rarely Appropriate," 4 to 6 as "May Be Appropriate," and 7 to 9 as "Appropriate".

Target Population: The target population includes both pediatric and adult patients with established congenital heart disease. The criteria address cardiac imaging in adult and pediatric patients with established CHD, focusing on evaluation before and after cardiac surgery or catheter-based intervention, routine surveillance, and evaluation of new-onset signs or symptoms.

Key Factors:

- **Indications:** The study developed 324 clinical indications related to the follow-up care of patients with CHD. These indications were categorized into 19 tables based on the type of cardiac lesion.
- **Imaging Modalities:** The study evaluated the use of various noninvasive cardiac imaging modalities, including transthoracic echocardiography (TTE), transesophageal echocardiography (TEE), cardiovascular magnetic resonance (CMR), cardiovascular computed tomography (CCT), stress imaging, and lung scan.
- **Rating System:** Each clinical scenario was rated on a scale of 1 to 9, with 1 to 3 categorized as "Rarely Appropriate," 4 to 6 as "May Be Appropriate," and 7 to 9 as "Appropriate." The ratings were based on clinical practice guidelines, expert opinion, and available evidence.
- **Outcomes:** The study aimed to provide guidance to clinicians in the care of patients with established CHD by identifying reasonable imaging modality options for evaluation and surveillance. It also aimed to serve as an educational and quality improvement tool to identify patterns of care and reduce the number of rarely appropriate tests in clinical practice.

ANALYSIS OF EVIDENCE

Shared Findings ^(10,17,22):

- **Appropriate Use Criteria (AUC):** All three articles focus on the development and application of Appropriate Use Criteria for multimodality imaging in different contexts of heart disease. They emphasize the importance of standardized methodology and evidence-based guidelines to improve patient care and outcomes.
- **Multimodality Imaging:** Each article discusses the use of various imaging modalities such as transthoracic echocardiography (TTE), transesophageal echocardiography (TEE), cardiovascular magnetic resonance (CMR), cardiovascular computed tomography (CCT), and stress imaging. They highlight the strengths and limitations of these modalities in different clinical scenarios.
- **Evaluation and Surveillance:** The articles address the need for routine surveillance and evaluation of patients with heart disease, whether valvular, non-valvular, or congenital. They provide guidelines on the frequency and appropriateness of imaging tests based on patient symptoms, clinical status, and specific heart conditions.

POLICY HISTORY

Date	Summary
June 2026	● Congenital Heart Disease section indications on Anomalous pulmonary venous connections (APVC) expanded, Double-

Date	Summary
	chambered right ventricle (DCRV) added, and modern pulmonary regurgitation (pr) expanded • Added Duchenne muscular dystrophy (DMD) and updated Hemochromatosis indications to Genetic Conditions • Combination studies section, Background Cardiac Definitions section, and Abbreviations section all updated • Removed regulatory language • CPT Code table added • Updated references
July 2025	• This guideline merges two Evolent guidelines with identical clinical criteria: ECG 7297-01 for Heart MRI and ECG 028 for Heart MRI into Evolent Clinical Guideline 7297 for Heart Magnetic Resonance Imaging (MRI) ◦ This guideline also merges Procedure Codes from these two Evolent guidelines • Added new bullet-point to the General Statement section • Added indications for myocardial iron overload and imaging in known genetic conditions • Checked the Medicare Advantage box in the Applicable Lines of Business table • 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



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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 7311 for Multiple Gated Acquisition Scan (MUGA)

Guideline Number: Evolent_CG_7311	<u>Applicable Codes</u>	
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Original Date: January 2026	Last Revised Date: April 2026	Implementation Date: January 2027

TABLE OF CONTENTS

STATEMENT	2
GENERAL INFORMATION	2
PURPOSE	2
CLINICAL REASONING	2
INDICATIONS FOR MULTIPLE GATED ACQUISITION (MUGA) SCAN	2
CODING AND STANDARDS	3
CODES	3
APPLICABLE LINES OF BUSINESS	4
BACKGROUND	4
GENERAL OVERVIEW	4
AUC SCORE	4
ACRONYMS / ABBREVIATIONS	4
SUMMARY OF EVIDENCE	5
ANALYSIS OF EVIDENCE	7
POLICY HISTORY	7
LEGAL AND COMPLIANCE	8
GUIDELINE APPROVAL	8
Committee	8
DISCLAIMER	8
REFERENCES	9

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.*

Purpose ^(1–3)

Multiple-gated acquisition (MUGA) scanning uses radiolabeled red blood cells to scan right and left ventricular images in a cine loop format that is synchronized with the electrocardiogram.

A prior MUGA scan is not an indication for repeat MUGA (if another modality would be suitable, i.e., transthoracic echocardiography (TTE)).

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. ^(4–8)

INDICATIONS FOR MULTIPLE GATED ACQUISITION (MUGA) SCAN ⁽⁹⁾

- To evaluate left ventricular function in a patient with coronary artery disease, valvular heart disease, myocardial disease, or congenital heart disease, in any of the following scenarios:

- When ventricular function is required for management, and TTE or other imaging has proven inadequate ^(1,10)
- Radionuclide ventriculography is being performed for assessment of right ventricular (RV) function with no prior MUGA done within the last 3 months
- In the course of treatment with cardiotoxic medication when TTE images are inadequate to evaluate left ventricular systolic function ^(1,10–13):
 - Baseline assessment prior to initiation of therapy
 - Monitoring during therapy. The frequency of testing should be left to the discretion of the ordering provider but in the absence of new abnormal findings, generally no more often than every 6 weeks while on active therapy
 - Long term surveillance after completion of therapy may be required, especially for those who have been exposed to anthracycline medication. The frequency of testing is generally every 6-12 months, or at the discretion of the provider

CODING AND STANDARDS

Codes

Code	Description
A9512	Technetium Tc-99m pertechnetate, diagnostic, per mCi
A9560	Technetium Tc-99m labeled red blood cells, diagnostic, per study dose, up to 30 mCi
78472	Cardiac blood pool imaging, gated equilibrium; planar, single study at rest or stress (exercise and/or pharmacologic), wall motion study plus ejection fraction, with or without additional quantitative processing
78473	Cardiac blood pool imaging, gated equilibrium; multiple studies, wall motion study plus ejection fraction, at rest and stress (exercise and/or pharmacologic), with or without additional quantification
78494	Cardiac blood pool imaging, gated equilibrium, SPECT, at rest, wall motion study plus ejection fraction, with or without quantitative processing
+78496	Cardiac blood pool imaging, gated equilibrium, single study, at rest, with right ventricular ejection fraction by first pass technique (List separately in addition to code for primary procedure)

Applicable Lines of Business

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

BACKGROUND

General Overview

The two types of radionuclide studies commonly used for cardiac evaluation are myocardial perfusion imaging and ventriculography. Myocardial perfusion imaging is used primarily for the evaluation of coronary artery disease. Ventriculography is sometimes referred to as multiple gated acquisition scanning (MUGA) and is primarily used to evaluate valvular disease and cardiomyopathies. Either type of study may be obtained at rest or stress.

Radionuclide Ventriculography is a medical imaging test used to determine a patient's cardiac function in the right, or more typically, left ventricle. Cardiac ventriculography involves injecting a radioisotope into the heart's ventricle(s) through a peripheral vein to measure the volume of blood pumped. Both regional and global left ventricular function (ejection fraction) as well as left ventricular size is measured.

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. ⁽⁵⁾

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

Acronyms / Abbreviations

EF: Ejection fraction

MUGA: Multiple gated acquisition (nuclear scan of ventricular function)

TTE: Transthoracic echocardiography

SUMMARY OF EVIDENCE

2013 ACCF/ACR/ASE/ASNC/SCCT/SCMR Appropriate Utilization of Cardiovascular Imaging in Heart Failure ⁽¹⁾

Study Design: The study is a joint report by the American College of Radiology Appropriateness Criteria Committee and the American College of Cardiology Foundation Appropriate Use Criteria Task Force. It involves a multidisciplinary rating panel comprising imagers, cardiovascular clinicians, general practitioners, and outcomes experts. The panel assessed the appropriateness of imaging procedures for various clinical indications in heart failure patients using a modified Delphi exercise.

Target Population: The target population includes patients with heart failure, which is a rapidly growing epidemic affecting approximately 5.8 million patients in the United States. The study focuses on patients with suspected, incompletely characterized, or known heart failure, including those with ischemic and nonischemic etiologies.

Key Factors

- **Prevalence and Clinical Significance:** Heart failure is a significant cause of morbidity and mortality, with a 5-year mortality rate of approximately 50% after diagnosis.
- **Economic Impact:** Annual medical expenditures related to heart failure in the United States exceed \$39.2 billion.
- **Imaging Modalities:** The study evaluates various imaging modalities, including echocardiography, cardiovascular magnetic resonance (CMR), single-photon emission computed tomography (SPECT), positron emission tomography (PET), cardiovascular computed tomography (CCT), and conventional diagnostic cardiac catheterization.
- **Clinical Scenarios:** The study identifies key clinical scenarios for imaging use, such as newly suspected heart failure, evaluation for ischemic etiology, viability evaluation, consideration and follow-up for implantable cardioverter-defibrillator (ICD) or cardiac resynchronization therapy (CRT), and repeat evaluation of heart failure.
- **Appropriateness Criteria:** The study provides detailed criteria for the appropriateness of imaging procedures based on clinical indications, emphasizing the importance of balancing risk and benefit in the context of available resources.

ACCF/ASNC/ACR/AHA/ASE/SCCT/SCMR/SNM 2009 Appropriate Use Criteria for Cardiac Radionuclide Imaging ⁽²⁾

Study Design: The study conducted by the American College of Cardiology Foundation (ACCF) and several other specialty societies aimed to revise the original Single-Photon Emission Computed Tomography Myocardial Perfusion Imaging (SPECT MPI) Appropriateness Criteria published four years earlier. The revision was necessary to reflect changes in test utilization, new clinical data, and to clarify RNI use where omissions or lack of clarity existed in the original criteria. The study involved developing 67 clinical scenarios by a writing group and scoring them by a separate technical panel on a scale of 1 to 9 to designate appropriate use, inappropriate use, or uncertain use.

Target Population: The target population for this study included patients with various cardiovascular conditions where cardiac RNI is frequently considered. This included patients with coronary artery disease (CAD), acute coronary syndrome (ACS), heart failure, atrial fibrillation, ventricular tachycardia, syncope, elevated troponin levels, and those undergoing preoperative evaluation for noncardiac surgery.

Key Factors

- **Appropriate Use Criteria (AUC):** The study aimed to provide guidance on the appropriate use of cardiac RNI for diverse clinical scenarios. The criteria were expected to be useful for clinicians, healthcare facilities, and third-party payers engaged in the delivery of cardiovascular imaging.
- **Clinical Scenarios:** The study developed 67 clinical scenarios that were scored by the technical panel. The scenarios included detection of CAD, risk assessment without ischemic equivalent, risk assessment with prior test results and/or known chronic stable CAD, risk assessment within 3 months of an ACS, post-revascularization, assessment of viability/ischemia, and evaluation of ventricular function.
- **Scoring System:** The technical panel scored each indication on a scale of 1 to 9, with scores 7-9 indicating appropriate use, 4-6 indicating uncertain use, and 1-3 indicating inappropriate use.
- **Impact on Clinical Decision Making:** The results of the study were anticipated to have a significant impact on physician decision making, test performance, and reimbursement policy, and to help guide future research.

ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2019 Appropriate Use Criteria for Multimodality Imaging in the Assessment of Cardiac Structure and Function in Nonvalvular Heart Disease ⁽⁹⁾

Study Design: The study is a report developed by the American College of Cardiology Appropriate Use Criteria Task Force, along with several other cardiovascular societies. It aims to provide appropriate use criteria (AUC) for multimodality imaging in nonvalvular heart disease. The clinical scenarios (indications) were developed by a diverse writing group and scored by an independent rating panel using standardized methodology.

Target Population: The target population includes patients with nonvalvular heart disease, encompassing various conditions such as heart failure, diseases of the aorta and pericardium, and any disorder involving abnormal cardiac structure or function excluding valvular diseases.

Key Factors:

- **Clinical Scenarios:** The document covers 102 clinical scenarios representing patient presentations encountered in everyday practice. These scenarios were developed based on the most current American College of Cardiology/American Heart Association Clinical Practice Guidelines.
- **Imaging Modalities:** The study evaluates multiple imaging modalities, including transthoracic echocardiography (TTE), transesophageal echocardiography (TEE), cardiovascular magnetic resonance imaging (CMR), computed tomography (CT), and others.

- **Appropriateness Ratings:** Each clinical scenario was rated on a scale of 1 to 9, with scores of 7 to 9 indicating that a modality is considered appropriate, scores of 4 to 6 indicating that a modality may be appropriate, and scores of 1 to 3 indicating that a modality is considered rarely appropriate.
- **Objective:** The primary objective is to provide a framework for the assessment of these scenarios by practices that will improve and standardize physician decision-making.

ANALYSIS OF EVIDENCE

Shared Conclusions ^(1,2,9)

- **Appropriate Use Criteria (AUC):** All three articles emphasize the importance of appropriate use criteria (AUC) in guiding clinical decision-making for cardiovascular imaging. They highlight the need for standardized methodologies to evaluate the appropriateness of various imaging modalities in different clinical scenarios.
- **Multimodality Imaging:** The articles agree on the value of multimodality imaging in assessing cardiac structure and function. They discuss the use of echocardiography, cardiovascular magnetic resonance (CMR), single-photon emission computed tomography (SPECT), positron emission tomography (PET), and computed tomography (CT) in various clinical contexts.
- **Clinical Guidelines:** Each article references clinical guidelines from the American College of Cardiology (ACC) and the American Heart Association (AHA) to support their recommendations. They emphasize the importance of adhering to these guidelines to ensure high-quality cardiovascular care.

POLICY HISTORY

Date	Summary
April 2026	● Added in CPT table and descriptions ● Removed Legislative Language
July 2025	● This guideline merges two Evolent guidelines with identical clinical criteria: ECG 7311-01 for Multiple Gated Acquisition Scan and ECG 027 for Multiple Gated Acquisition Scan into Evolent Clinical Guideline 7311 for Multiple Gated Acquisition Scan (MUGA) ○ 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

LEGAL AND COMPLIANCE

Guideline Approval

Committee

Reviewed / Approved by Evolent Specialty Services Clinical Guideline Review Committee

Disclaimer

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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	<u>Applicable Codes</u>	
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Original Date: January 2026	Last Revised Date: June 2026	Implementation Date: January 2027

TABLE OF CONTENTS

STATEMENT	3
GENERAL INFORMATION	3
SPECIAL NOTE	3
CLINICAL REASONING	3
INDICATIONS FOR MPI	4
SUSPECTED CORONARY ARTERY DISEASE (CAD)	4
ABNORMAL CALCIUM SCORES	4
INCONCLUSIVE CAD EVALUATION AND OBSTRUCTIVE CAD	5
FOLLOW-UP POST-CORONARY REVASCLARIZATION: CORONARY ARTERY BYPASS GRAFT (CABG) OR PERCUTANEOUS CORONARY INTERVENTION (PCI)	5
FOLLOW-UP OF KNOWN CAD	6
SPECIAL DIAGNOSTIC CONDITIONS REQUIRING CORONARY EVALUATION	6
<i>Unevaluated Acute Coronary Syndrome</i>	6
<i>Heart Failure</i>	6
<i>Viability</i>	6
<i>Suboptimal Revascularization</i>	7
<i>Arrhythmias</i>	7
<i>Anti-Arrhythmic Drug Therapy</i>	7
<i>Coronary Anomaly and Aneurism</i>	7
<i>Radiation</i>	7
<i>Sarcoidosis and Amyloidosis (PYP study)</i>	7
PRIOR TO ELECTIVE NON-CARDIAC SURGERY IN AN ASYMPTOMATIC PATIENT	8
PRIOR TO ORGAN OR STEM CELL TRANSPLANTATION	8
POST CARDIAC TRANSPLANTATION (SE DIVERSION NOT REQUIRED)	8
CODING AND STANDARDS	8
CODES	8
APPLICABLE LINES OF BUSINESS	10
BACKGROUND	10
GENERAL OVERVIEW	10
AUC SCORE	11
DEFINITIONS	11

<i>Diamond Forrester Table</i>	12
<i>Global CAD Risk Calculators</i>	14
ACRONYMS / ABBREVIATIONS	16
SUMMARY OF EVIDENCE	17
ANALYSIS OF EVIDENCE	19
POLICY HISTORY	20
LEGAL AND COMPLIANCE	21
GUIDELINE APPROVAL	21
<i>Committee</i>	21
DISCLAIMER	21
REFERENCES	22

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**). Preference toward stress echocardiography will be denoted by 

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)

NOTE: The terms "typical," "atypical," and "non-anginal symptoms" can still be observed in medical records. However, the American College of Cardiology (ACC) has simplified its terminology to "Less likely anginal symptoms" and "Likely anginal symptoms" (see **Background**) which are utilized below.

- Symptomatic patients without known CAD, with no imaging stress test within the last 12 months, who meet any **ONE** of the following:
 - Less likely anginal symptoms (**AUC Score 6**) ⁽¹⁾
 - When a patient cannot walk a treadmill
 - When baseline EKG makes standard exercise test inaccurate (see **Background**) ^{SE}
 - Likely anginal symptoms (typical angina) ⁽¹⁾
 - < 50 years old with ≤ 1 risk factor if an ECG treadmill test cannot be done (**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 and/or ≥ 2 risk factors (**AUC Score 8**) ⁽¹⁾
 - New or worsening symptoms, negative result ≥ 1 year prior, **AND** meets one of the criteria above for repeat testing ^{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 **Background**).
 - Previously unevaluated pathologic Q waves (see **Background**)
 - Previously unevaluated complete left bundle branch block (LBB)

Abnormal Calcium Scores (1,11–14)

- Symptomatic patient with a prior Coronary Calcium Agatston Score (CAC) 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 CAC Score of >100. No prior stress imaging done within the last 12 months ^{SE}
- Asymptomatic patient with any **ONE** of the following:
 - CAC Score > 400 ⁽¹⁵⁾
 - A qualitative assessment where 'severe' CAC 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 ⁽¹⁶⁾ **SE**

Inconclusive CAD Evaluation and Obstructive CAD ⁽¹⁾

When any **ONE** of the following remains a concern:

- Exercise stress ECG with low-risk Duke treadmill score (DTS) ≥ 5 , (see **Background**) but current symptoms indicate increasing likelihood of disease
- Exercise stress ECG with an intermediate DTS (**AUC Score 7**) **SE**
NOTE: SE diversion is not required for symptoms consistent with likely anginal symptoms
- Intermediate coronary computed tomography angiography (CCTA) defined as 40 - 70% lesions performed (**AUC Score 7**)
- Non-diagnostic exercise stress test with inability to achieve target heart rate (THR) defined as $\geq 85\%$ age predicted maximal heart rate by physiologic exercise
- 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

Follow-Up Post-Coronary Revascularization: Coronary Artery Bypass Graft (CABG) or Percutaneous Coronary Intervention (PCI) ⁽¹⁾

- **Asymptomatic** follow-up stress imaging at a minimum of 2 years post CABG or PCI (whichever is most recent) for patients with any **ONE** of the following **SE**:
 - High risk for (or with a history of) silent ischemia. Risk factors for silent ischemia include **ANY** of the following (**AUC Score 7**):
 - Diabetes with accelerated progression of CAD
 - Chronic kidney disease (CKD)
 - Peripheral artery disease (PAD)
 - Prior brachytherapy
 - In-stent restenosis (ISR)
 - Saphenous venous graft (SVG) intervention
 - Prior high-risk PCI (ie, PCI of left main coronary artery or multi-vessel severe CAD with a single remaining stented patent vessel) (**AUC Score 6**)
- 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 ⁽¹⁷⁾
- New, recurrent, or worsening symptoms, if it will alter management:

- Typical/likely angina or symptoms documented to be similar to those prior to treatment ⁽¹⁸⁾ **(AUC Score 8)**
- Atypical/less likely angina or symptoms documented to be unlike those prior to revascularization ^{SE}

NOTE: SE diversion is not required for post CABG patients

Follow-Up of Known CAD ⁽¹⁾

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 ($\geq 50\%$ left main coronary artery or $\geq 70\%$ left anterior descending (LAD), left circumflex (LCX) or right coronary artery (RCA)) without intervening coronary revascularization for:

- New, recurrent, or worsening symptoms, if it will alter management
 - Typical/likely angina or symptoms documented to be similar to those prior to treatment ⁽⁸⁾
 - Atypical/less likely angina or symptoms documented to be unlike those prior to treatment ^{SE}

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. ^(8,19–21) 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)** ^(1,22)

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)** ^(1,22)

Arrhythmias

- Ventricular arrhythmias **(AUC Score 7)** ⁽¹⁾
 - Sustained ventricular tachycardia (VT) > 100 beats per minute (bpm), ventricular fibrillation (VF), or exercise-induced VT, when invasive coronary arteriography is not planned ⁽²³⁾
 - Non-sustained VT, multiple episodes, each ≥ 3 beats at ≥ 100 bpm, or frequent premature ventricular contractions (PVC) (defined as ≥ 30/hour on remote monitoring) without known cause or associated cardiac pathology, when an exercise ECG cannot be performed ⁽²⁴⁾

Anti-Arrhythmic Drug Therapy

- Class IC antiarrhythmic drug
 - In the intermediate and high global risk patient prior to Class IC antiarrhythmic drug initiation
 - Annually in intermediate and high global risk patient taking Class IC antiarrhythmic drug ⁽²⁵⁾

Coronary Anomaly and Aneurism

- Assessment of hemodynamic significance of one of the following documented conditions:
 - Anomalous coronary arteries ⁽²⁶⁾
 - Myocardial bridging of coronary artery ⁽²⁷⁾
- Coronary aneurysms in Kawasaki's disease ^(28–30) or due to atherosclerosis

Radiation SE

- Post radiation therapy to the anterior or left chest, every 5 years following initiation ⁽³¹⁾

Sarcoidosis and Amyloidosis (PYP study)

- Cardiac sarcoidosis: as a combination study with Heart PET for the evaluation and treatment of cardiac sarcoidosis ⁽³²⁾
- Cardiac amyloidosis: for the diagnosis of cardiac transthyretin amyloidosis (ATTR)

NOTE: Not to be used for the diagnosis of cardiac light chain amyloidosis (AL) ⁽³³⁾

Prior To Elective Non-Cardiac Surgery in an Asymptomatic Patient

- Intermediate or high-risk surgery with ≥ 1 risk factors (see below), **AND** documentation of an inability to walk (or < 4 metabolic equivalents (METs)) **AND** there has not been an imaging test for myocardial ischemia within 1 year (**AUC Score 6**)^(34,35)
 - **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 Risks:**
 - **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, and prostate surgery
 - **Low risk surgery:** Endoscopic procedures, superficial procedure, cataract surgery, and breast surgery

Prior to Organ or Stem Cell Transplantation

- Preoperative planning for organ or stem cell, 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^(36,37) (**AUC Score 7**)⁽³⁵⁾

Post Cardiac Transplantation (SE Diversion Not Required)

- Annually after heart transplantation to assess transplant vasculopathy, if other ischemia evaluation is not planned⁽³⁸⁾

CODING AND STANDARDS

Codes

Code	Description
A9500	Technetium Tc-99m sestamibi, diagnostic, per study dose
A9502	Technetium Tc-99m tetrofosmin, diagnostic, per study dose
A9505	Thallium TI-201 thallous chloride, diagnostic, per mCi

Code	Description
J0153	Injection, adenosine, 1 mg (not to be used to report any adenosine phosphate compounds)
J1245	Injection, dipyridamole, per 10 mg
J2785	Injection, regadenoson, 0.1 mg
78451	Myocardial perfusion imaging, tomographic (SPECT) (including attenuation correction, qualitative or quantitative wall motion, ejection fraction by first pass or gated technique, additional quantification, when performed); single study, at rest or stress (exercise or pharmacologic)
78452	Myocardial perfusion imaging, tomographic (SPECT) (including attenuation correction, qualitative or quantitative wall motion, ejection fraction by first pass or gated technique, additional quantification, when performed); multiple studies, at rest and/or stress (exercise or pharmacologic) and/or redistribution and/or rest reinjection
78453	Myocardial perfusion imaging, planar (including qualitative or quantitative wall motion, ejection fraction by first pass or gated technique, additional quantification, when performed); single study, at rest or stress (exercise or pharmacologic)
78454	Myocardial perfusion imaging, planar (including qualitative or quantitative wall motion, ejection fraction by first pass or gated technique, additional quantification, when performed); multiple studies, at rest and/or stress (exercise or pharmacologic) and/or redistribution and/or rest reinjection
78466	Myocardial imaging, infarct avid, planar; qualitative or quantitative
78468	Myocardial imaging, infarct avid, planar; with ejection fraction by first pass technique
78469	Myocardial imaging, infarct avid, planar; tomographic SPECT with or without quantification
78481	Cardiac blood pool imaging (planar), first pass technique; single study, at rest or with stress (exercise and/or pharmacologic), wall motion study plus ejection fraction, with or without quantification
78483	Cardiac blood pool imaging (planar), first pass technique; multiple studies, at rest and with stress (exercise and/or pharmacologic), wall motion study plus ejection fraction, with or without quantification
78499	Unlisted cardiovascular procedure, diagnostic nuclear medicine

Code	Description
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
+0742T	Absolute quantitation of myocardial blood flow (AQMBF), single-photon emission computed tomography (SPECT), with exercise or pharmacologic stress, and at rest, when performed (List separately in addition to code for primary procedure)

Applicable Lines of Business

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

BACKGROUND

General Overview

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 **Global CAD Risk Calculators**).
 - **Symptomatic**, for whom we estimate the pretest probability that their chest-related symptoms are due to clinically significant CAD (below)
- **Angina:**
 - Beginning in 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 ⁽¹⁾ to **Less Likely Anginal Symptoms** and **Likely Anginal Symptoms**.
 - **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).
- 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.

Diamond Forrester Table ⁽³⁹⁾

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

- **Typical Angina (Definite)** is defined as including all **3** characteristics:
 - Substernal chest pain or discomfort with characteristic quality and duration
 - Provoked by exertion or emotional stress
 - Relieved by rest and/or nitroglycerine
- **Atypical Angina (Probable)** has only **2** of the above characteristics
- **Nonanginal Chest Pain/Discomfort** has only **0 - 1** of the above characteristics
- 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)
 - Left ventricular hypertrophy (LVH) with repolarization abnormalities, Wolff-Parkinson-White (WPW) syndrome, A ventricular paced rhythm, or left bundle branch block (LBBB)
 - Digitalis use with associated ST – T abnormalities
 - Resting HR under 50 bpm on a beta-blocker and an anticipated suboptimal workload

- Bundle Branch Blocks (BBB)
 - Left BBB
 - Right BBB or intraventricular conduction delay (IVCD), either containing ST or T wave abnormalities (see above)

NOTE: Right bundle branch block (RBBB) with less than 1 mm ST depression at rest may be suitable for ECG treadmill testing
- 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 Without Imaging versus Stress Testing with Imaging**
 - An ECG stress test **WITHOUT** imaging (ie, 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. Examples of eligible patients include ⁽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
 - The patient requiring evaluation of syncope or presyncope during exertion ⁽⁴⁰⁾

NOTE: When exercise cannot be performed, pharmacologic stress can be considered.
- **Duke Exercise ECG Treadmill Score (DTS)** ⁽⁴¹⁾
 - Calculates risk from ECG treadmill alone:
 - $DTS = \text{exercise time in minutes} - (5 \times \text{ST deviation in mm or } 0.1 \text{ mV increments}) - (4 \times \text{exercise angina score})$
 - Angina score being 0 = none, 1 = non-limiting, and 2 = exercise-limiting
 - The score typically ranges from - 25 to + 15.
 - Low-risk $\geq + 5$
 - Intermediate risk - 10 to + 4
 - High-risk $\leq - 11$
- MPI may be performed without diversion to a SE in any of the following ^(1,42):
 - 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 $\leq 40\%$
 - 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 CAD Risk Calculators

- Framingham Cardiovascular Risk
- Reynolds Risk Score
 - Can use if there is no history of diabetes. Unique for use of family history
- Pooled Cohort Equation
- ACC/AHA Risk Calculator
- MESA Risk Calculator
 - With addition of coronary artery calcium score, for CAD-only risk

- **Definitions of Coronary Artery Disease** ^(8,9,13,43)
 - **Coronary artery calcification (CAC)** 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.
 - **Coronary Artery Disease (CAD)** is a narrowing or blockage of the coronary arteries (blood vessels that carry blood and oxygen to the heart), usually caused by atherosclerosis (a buildup of fatty material and plaque inside the coronary arteries) which may cause chest pain, shortness of breath during exercise, and heart attacks.
 - **Ischemia-producing disease** (also called hemodynamically or functionally significant disease, for which revascularization might be appropriate) generally implies at least one of the following:
 - Demonstrable ischemic findings on stress testing (ECG or stress imaging), that are at least mild in degree ⁽⁴³⁾
 - Suggested by percentage diameter stenosis $\geq 70\%$ by angiography; intermediate lesions are 50 – 69% ⁽¹⁾
 - For a left main artery, suggested by a percentage stenosis $\geq 50\%$ ^(8,43,44)
 - Fractional Flow Reserve (FFR) ≤ 0.80 for a major vessel ^(43,44)
 - FFR is the distal to proximal pressure ratio across a coronary lesion during maximal hyperemia induced by either intravenous or intracoronary adenosine. Less than or equal to 0.80 is considered a significant reduction in coronary flow.
 - Instantaneous Wave-Free Ratio (iFR) ≤ 0.89 for a major vessel ^(45,46)
 - iFR measures the ratio of distal coronary to aortic pressure during the wave free period of diastole, with a value ≤ 0.89 considered hemodynamically significant. ^(45,46)
 - **Ischemic symptoms (angina pectoris):** tightness, heaviness, pressure, squeezing, or other discomfort in the chest or adjacent areas. Ischemia may also present with fatigue, faintness, or dyspnea.
 - 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).
- **Anginal Equivalent** ^(8,40)
 - 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.
- **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.
 - **CAD Risk—Low**
 - 10-year absolute coronary or cardiovascular risk < 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 > 20%.

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

GDMT: Guideline-Directed Medical Therapy

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
June 2026	● Added indications for risk factors in Suspected CAD section ● Updated the Follow-Up Post-Coronary Revascularization to include the following indications: prior high risk PCI, high risk ischemia, and new, recurrent or worsening symptoms ● Indications in known CAD updated ● Added Prior to Organ Stem Cell Transplantation heading ● Post Cardiac Transplantation heading and indications updated ● CPT code table added ● Legislative language removed ● Background section updated ● References updated
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

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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 7328 for Stress Echocardiogram

Guideline Number: Evolent_CG_7328	<u>Applicable Codes</u>	
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TABLE OF CONTENTS

STATEMENT	3
GENERAL INFORMATION	3
PURPOSE	3
SPECIAL NOTE	3
CLINICAL REASONING	3
INDICATIONS	4
SUSPECTED CORONARY ARTERY DISEASE (CAD)	4
ABNORMAL CALCIUM SCORES	4
INCONCLUSIVE CAD EVALUATION AND OBSTRUCTIVE CAD	5
FOLLOW-UP POST-CORONARY REVASCULARIZATION (CORONARY ARTERY BYPASS GRAFT (CABG) OR PERCUTANEOUS CORONARY INTERVENTION (PCI))	5
FOLLOW-UP OF KNOWN CAD	6
SPECIAL DIAGNOSTIC CONDITIONS REQUIRING CORONARY EVALUATION	6
VALVULAR DISEASE	6
DIASTOLIC FUNCTION	7
PRIOR TO ELECTIVE NON-CARDIAC SURGERY IN AN ASYMPTOMATIC PATIENT	7
PRIOR TO ORGAN OR STEM CELL TRANSPLANTATION	8
POST-CARDIAC TRANSPLANTATION	8
CODING AND STANDARDS	8
CODES	8
APPLICABLE LINES OF BUSINESS	10
BACKGROUND	10
GENERAL OVERVIEW	10
AUC SCORE	10
DEFINITIONS OF CAD	11
ANGINA	12
Diamond Forrester Table	12
Anginal Equivalent	13
DUKE EXERCISE ECG TREADMILL SCORE (DTS)	13
ECG STRESS TEST WITHOUT IMAGING	14
GLOBAL RISK OF CARDIOVASCULAR DISEASE	14

<i>Global CAD Risk Calculators</i>	14
UNINTERPRETABLE BASELINE ECG	14
ACRONYMS/ABBREVIATIONS	15
SUMMARY OF EVIDENCE	17
ANALYSIS OF EVIDENCE	18
POLICY HISTORY	18
LEGAL AND COMPLIANCE	19
GUIDELINE APPROVAL	19
<i>Committee</i>	19
DISCLAIMER	19
REFERENCES	20

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.*

Purpose

This guideline is for stress imaging, specifically Stress Echocardiography (SE) with appropriate preference for suitable alternatives, such as an exercise treadmill exam without imaging, when more suitable, unless otherwise stated (see **Background**).

Special Note

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 (1,7–10)

Suspected Coronary Artery Disease (CAD) ⁽¹⁾

NOTE: The terms ‘typical’, ‘atypical’, and ‘non-anginal symptoms’ can still be observed in medical records. However, the American College of Cardiology (ACC) has simplified its terminology to ‘Less likely anginal symptoms’ and ‘Likely anginal symptoms’ (see **Background**) which are utilized below.

- Symptomatic patients without known CAD, with no imaging stress test within the last 12 months, who meet any **ONE** of the following criteria:
 - Less likely anginal symptoms, when baseline electrocardiogram (ECG) makes standard exercise test inaccurate (see **Background**) (**AUC Score 8**)
 - Likely anginal symptoms (typical angina):
 - < 50 years old with ≤ 1 risk factor, if ECG treadmill test cannot be done (**AUC Score 7**)

NOTE: AUC score for this indication is identical to those for myocardial perfusion imaging (MPI) and exercise tolerance test. 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 and/or ≥ 2 risk factors (**AUC Score 8**)
 - New or worsening symptoms, negative result ≥ 1 year prior, **AND** meets one of the criteria above, for repeat testing
- Asymptomatic patients without known CAD, with previously unevaluated ECG evidence of possible myocardial ischemia or prior infarction (see **Background**) including any **ONE** of the following (**AUC Score 6**):
 - Ischemic ST segment or T wave abnormalities
 - Pathologic Q waves
 - Complete left bundle branch block

Abnormal Calcium Scores ^(11,12)

- Symptomatic patient with a prior Coronary Calcium Agatston (CAC) Score of > 100. No prior stress imaging done within the last 12 months ^(1,11) (**AUC Score 7**) ⁽¹⁾
- Asymptomatic high global CAD risk patient with a prior CAC Score of > 100. No prior stress imaging done within the last 12 months ^(11,13)
- Asymptomatic patient, with CAC Score > 400 **OR** a reported qualitative assessment where ‘severe’ coronary artery calcification is incidentally detected on computed tomography (CT) imaging performed for other clinical indications. No prior stress imaging done within the last 12 months ^(14,15)

Inconclusive CAD Evaluation and Obstructive CAD

When any **ONE** of the following remains a concern:

- Exercise stress ECG with low-risk Duke treadmill score ≥ 5 (see **Background**), but current symptoms indicate increasing likelihood of disease ⁽¹⁾
- Exercise stress ECG with an intermediate Duke treadmill score (**AUC Score 8**) ⁽¹⁾
- Previously unevaluated ventricular wall motion abnormality demonstrated by another imaging modality, to determine if the patient has myocardial ischemia ^(1,11)
- Intermediate coronary computed tomography angiography (CCTA) defined as 40-70% lesion (**AUC Score 7**) ⁽¹⁾
- Coronary stenosis of unclear significance on previous coronary angiography not previously evaluated

Follow-Up Post-Coronary Revascularization (Coronary Artery Bypass Graft (CABG) or Percutaneous Coronary Intervention (PCI)) ⁽¹⁾

- Asymptomatic follow-up stress imaging at a minimum of 2 years post CABG or PCI (whichever is most recent) for patients with any **ONE** of the following:
 - High risk for (or with a history of) silent ischemia. Risk factors for silent ischemia include any of the following (**AUC Score 7**):
 - Diabetes with accelerated progression of CAD
 - Chronic kidney disease (CKD)
 - Peripheral artery disease (PAD)
 - Prior brachytherapy
 - In-stent restenosis (ISR)
 - Saphenous vein graft (SVG) intervention
 - Prior high-risk PCI (ie, PCI of left main coronary artery or multi-vessel severe CAD with a single remaining stented patent vessel) (**AUC Score 5**)
- 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 ⁽¹⁶⁾
- New, recurrent, or worsening symptoms, if it will alter management:
 - Typical/likely angina or symptoms document to be similar to those experienced prior to revascularization (**AUC Score 8**) ⁽¹⁾
 - Atypical/less likely angina or symptoms documented to be unlike those prior to revascularization ⁽¹¹⁾

Follow-Up of Known CAD ⁽¹⁾

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 ($\geq 50\%$ left main coronary artery or $\geq 70\%$ left anterior descending (LAD), left circumflex (LCX), or right coronary artery (RCA)) without intervening coronary revascularization, for:

- New, recurrent, or worsening symptoms, if it will alter management ⁽¹⁷⁾:
 - Typical/likely angina or symptoms documented to be similar to those experienced prior to treatment
 - Atypical/less likely angina or symptoms documented to be unlike those prior to treatment

Special Diagnostic Conditions Requiring Coronary Evaluation

- Prior acute coronary syndrome (with documentation in provider notes), within last 12 months, without a stress test or coronary angiography performed since
- Newly diagnosed systolic or diastolic heart failure, with reasonable suspicion of cardiac ischemia, unless invasive coronary angiography is immediately planned ⁽¹⁸⁾
- Ventricular arrhythmias ^(19,20)
 - Sustained ventricular tachycardia (VT) > 100 beats per minute (bpm) (**AUC Score 7**) ⁽¹⁾, ventricular fibrillation (VF) (**AUC Score 7**) ⁽¹⁾, or exercise-induced VT (**AUC Score 8**) ⁽¹⁾, when invasive coronary arteriography has not been performed
 - Non-sustained VT, multiple episodes, each ≥ 3 beats at ≥ 100 bpm, or frequent premature ventricular contractions (PVCs) (defined as ≥ 30 /hour on remote monitoring), when an exercise ECG cannot be performed (**AUC Score 7**) ⁽¹⁾
- Intermediate and high global risk patients prior to Class IC antiarrhythmic drug initiation and annually thereafter until discontinuation ^(19,20) (**AUC Score 7**) ⁽¹⁾
- Hemodynamic assessment of ischemia in the following documented conditions:
 - Anomalous coronary arteries in an asymptomatic individual without prior stress echocardiography (**AUC Score 8**) ⁽²¹⁾
 - Myocardial bridging of a coronary artery ⁽²²⁾
- Coronary aneurysms in Kawasaki's disease ⁽²³⁾
- Post radiation therapy to the anterior or left chest, every 5 years following initiation ⁽²⁴⁾ (**AUC Score 6**) ⁽¹⁾

Valvular Disease

Evaluation with Inclusion of Doppler

- Aortic stenosis (AS) and flow (contractile) reserve in symptomatic patients with severe

AS by calculated valve area, low flow/gradient, and ejection fraction < 50% ^(2,25)

- Asymptomatic moderate or severe AS, for measurement of changes in valve hemodynamics ^(2,25) **(AUC Score 8)** ⁽²⁵⁾
- Non-severe aortic regurgitation (AR) with symptoms, for assessment of functional capacity and to assess for other causes of symptoms ^(2,25) **(AUC Score 7)** ⁽²⁵⁾
- For evaluation of mitral stenosis (MS) if there is exertional shortness of breath which suggests the amount of MS is worse than is seen on the resting ECG ^(2,25) **(AUC Score 8)** ⁽²⁵⁾
- For evaluation for mitral regurgitation (MR) if there is any **ONE** of the following ^(2,25,26):
 - Exertional shortness of breath which suggests the amount of MR is worse than is seen on the resting ECG **(AUC Score 8)** ⁽²⁵⁾
 - The ECG is not able to distinguish whether the MR is moderate or severe in a patient that is asymptomatic **(AUC Score 7)** ⁽²⁵⁾
- For evaluation of hypertrophic cardiomyopathy (HCM), with or without symptoms, and no resting or provokable outflow tract gradient ≥ 50 mmHg on transthoracic echocardiogram (TTE), for detection and quantification of dynamic left ventricular outflow tract (LVOT) obstruction ⁽²⁷⁾

Diastolic Function

- Unexplained dyspnea and suspected heart failure with preserved ejection fraction (HFpEF) with normal or equivocal diastolic function on resting images **(AUC Score 8)** ⁽¹⁾

Prior to Elective Non-Cardiac Surgery in an Asymptomatic Patient

- An intermediate or high-risk surgery with ≥ 1 risk factors (see below), documentation of an inability to walk (or < 4 estimated metabolic equivalents of exercise [METs]), **AND** there has not been an imaging stress test within 1 year ^(28–30) **(AUC Score 6)** ⁽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 Risks:**
 - **High risk surgery:** Aortic and other major vascular surgery, peripheral vascular surgery, and 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, and prostate surgery
 - **Low risk surgery:** Endoscopic procedures, superficial procedure, cataract surgery, and breast surgery

Prior to Organ or Stem Cell Transplantation

- Preoperative planning for organ or stem cell transplantation, if there has not been a conclusive stress evaluation, CTA, or heart catheterization within the past year, at the discretion of the transplant service **(AUC Score 6)** ⁽³¹⁾

Post-Cardiac Transplantation

- Annual assessment for transplant vasculopathy, if other ischemia evaluation is not planned ⁽³²⁾

CODING AND STANDARDS

Codes

Code	Description
C8923	Transthoracic echocardiography (TTE) with contrast, or without contrast followed by with contrast, real-time with image documentation (2D), includes M-mode recording, when performed, complete, without spectral or color doppler echocardiography
C8924	Transthoracic echocardiography (TTE) with contrast, or without contrast followed by with contrast, real-time with image documentation (2D), includes M-mode recording when performed, follow-up or limited study
C8928	Transthoracic echocardiography (TTE) with contrast, or without contrast followed by with contrast, real-time with image documentation (2D), includes M-mode recording, when performed, during rest and cardiovascular stress test using treadmill, bicycle exercise and/or pharmacologically induced stress, with interpretation and report
C8929	Transthoracic echocardiography (TTE) with contrast, or without contrast followed by with contrast, real-time with image documentation (2D), includes M-mode recording, when performed, complete, with spectral doppler echocardiography, and with color flow doppler echocardiography
C8930	Transthoracic echocardiography (TTE) with contrast, or without contrast followed by with contrast, real-time with image documentation (2D), includes M-mode recording, when performed, during rest and cardiovascular stress test using treadmill, bicycle exercise and/or pharmacologically induced stress, with interpretation and report; including performance of continuous electrocardiographic monitoring, with physician supervision

Code	Description
93350	Echocardiography, transthoracic, real-time with image documentation (2D), includes M-mode recording, when performed, during rest and cardiovascular stress test using treadmill, bicycle exercise and/or pharmacologically induced stress, with interpretation and report
93351	Echocardiography, transthoracic, real-time with image documentation (2D), includes M-mode recording, when performed, during rest and cardiovascular stress test using treadmill, bicycle exercise and/or pharmacologically induced stress, with interpretation and report; including performance of continuous electrocardiographic monitoring, with supervision by a physician or other qualified health care professional
+93320	Doppler echocardiography, pulsed wave and/or continuous wave with spectral display (List separately in addition to codes for echocardiographic imaging); complete
+93321	Doppler echocardiography, pulsed wave and/or continuous wave with spectral display (List separately in addition to codes for echocardiographic imaging); follow-up or limited study (List separately in addition to codes for echocardiographic imaging)
+93325	Doppler echocardiography color flow velocity mapping (List separately in addition to codes for echocardiography)
+93352	Use of echocardiographic contrast agent during stress echocardiography (List separately in addition to code for primary procedure)
+93356	Myocardial strain imaging using speckle tracking-derived assessment of myocardial mechanics (List separately in addition to codes for echocardiography imaging)

Applicable Lines of Business

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

BACKGROUND

General Overview

Stress echocardiography is an exercise stress test which utilizes echocardiography to provide information on exercise tolerance, ischemic burden, and structural heart disease including valvular disease and provides analysis of left ventricular function.

Stress echocardiography (SE) refers to ultrasound imaging of the heart during exercise ECG testing, during which visualized wall motion abnormalities can provide evidence of potential significant CAD.

While drug-induced stress with dobutamine can be an alternative to exercise stress testing in patients who are unable to exercise, this guideline does not require use of this modality. Hence, reference in this document to SE predominantly refers to exercise stress echocardiography.

Although SE provides comparable accuracy without radiation risk, relative to MPI, scenarios which do not permit effective use of SE might be better suited for stress imaging with MPI, cardiovascular magnetic resonance imaging (CMR) or positron emission tomography (PET), or CCTA.

Cardiac Doppler ultrasound is a form of ultrasound that can detect and measure blood flow. Doppler ultrasound depends on the Doppler Effect, a change in the frequency of a wave resulting from the motion of a reflector, the red blood cell. There are three types of Doppler ultrasound performed during a cardiac Doppler examination:

- Pulsed Doppler
- Continuous wave Doppler
- Color flow Doppler

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. ⁽⁴⁾

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

Definitions of CAD (7,8,12,33,34)

- **Coronary artery calcification (CAC):** a marker of risk, as measured by Agatston score on coronary artery calcium imaging. It is not a diagnostic tool so much as it is a risk stratification tool. Its incorporation into global risk can be achieved by using the Multi-Ethnic Study of Atherosclerosis (MESA) risk calculator.
- **Coronary artery disease (CAD):** narrowing or blockage of the coronary arteries (blood vessels that carry blood and oxygen to the heart), usually caused by atherosclerosis (a buildup of fatty material and plaque inside the coronary arteries) which may cause chest pain, shortness of breath during exercise, and heart attacks.
 - Risk factors for CAD include:
 - Diabetes mellitus
 - Smoking
 - Family history of premature CAD (men < 55 years of age, women < 65 years of age)
 - Hypertension
 - Dyslipidemia
- **Ischemia-producing disease** (also called hemodynamically or functionally significant disease, or obstructive coronary disease for which revascularization might be appropriate) implies at least one of the following:
 - Demonstrable ischemic findings on stress testing (ECG or stress imaging), that are at least mild in degree ⁽³⁵⁾
 - Suggested by percentage diameter stenosis $\geq 70\%$ by angiography; intermediate lesions are 50-69% ⁽³⁶⁾
 - For a left main artery, suggested by a percentage stenosis $> 50\%$ or minimum luminal cross-sectional area on intravascular ultrasound (IVUS) $\leq 6 \text{ mm}^2$ ^(7,34,37)
 - FFR ≤ 0.80 for a major vessel ^(9,34)
 - FFR is the distal to proximal pressure ratio across a coronary lesion during maximal hyperemia induced by either intravenous or intracoronary adenosine. Less than or equal to 0.80 is considered a significant reduction in coronary flow
 - Instantaneous Wave-Free Ratio (iFR) ≤ 0.89 for a major vessel ^(38,39)
 - iFR measures the ratio of distal coronary to aortic pressure during the wave free period of diastole, with a value ≤ 0.89 considered hemodynamically significant ^(38,39)
- **Ischemic symptoms (angina pectoris):** tightness, heaviness, pressure, squeezing, or

other discomfort in the chest or adjacent areas. Ischemia may also present with fatigue, faintness, or dyspnea.

- **Percentage stenosis:** the reduction in diameter stenosis when angiography is the method and can be estimated or measured using angiography or more accurately measured with IVUS
- Stable patients without known CAD fall into 2 categories ^(1,7,8):
 - **Asymptomatic patients**, for whom Global Risk of CAD events can be determined from coronary risk factors using calculators available online (see [Global Cardiovascular Risk Calculators](#))
 - **Symptomatic patients**, for whom the Pretest Probability that their chest-related symptoms are due to clinically significant CAD is estimated (see [Angina](#))

Angina

Beginning in 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 ⁽¹⁾ to **Less Likely Anginal Symptoms** and **Likely Anginal Symptoms**.

- **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 (eg, resolving spontaneously within seconds or lasting for an extended period unrelated to exertion).

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.

Diamond Forrester Table ⁽⁴⁰⁾

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

Age (Years)	Gender	Typical/Definite Angina Pectoris	Atypical/Probable Angina Pectoris	Nonanginal Chest Pain
≥ 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

- **Typical Angina (Definite)** is defined as including ALL **3** characteristics:
 - Substernal chest pain or discomfort with characteristic quality and duration
 - Provoked by exertion or emotional stress
 - Relieved by rest and/or nitroglycerin
- **Atypical Angina (Probable)** has only **2** of the above characteristics
- **Nonanginal Chest Pain/Discomfort** has only **0 – 1** of the above characteristics

Anginal Equivalent ^(7,41,42)

- Development of an anginal equivalent (eg, 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 (eg, 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, when appropriate), and then incorporated into the evaluation of coronary artery disease as would chest discomfort. Syncope per se is not an anginal equivalent.

Duke Exercise ECG Treadmill Score (DTS) ⁽⁴³⁾

- Calculate risk from ECG treadmill alone:
 - Duke Exercise ECG Treadmill Score (DTS) = exercise time in minutes - (5 x ST deviation in mm or 0.1 mV increments) - (4 x exercise angina score)
 - Angina score: 0 = none, 1 = non-limiting, 2 = exercise-limiting
 - The score ranges from - 25 to + 15
 - Low-risk ≥ + 5
 - Intermediate risk from - 10 to + 4
 - High-risk ≤ -11

ECG Stress Test Without Imaging

An ECG stress test **WITHOUT** imaging (ie, exercise treadmill ECG test) requires 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. Examples of eligible patients include ⁽¹⁾:

- The symptomatic low or intermediate pretest probability patient who can exercise and has an interpretable ECG
- 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
- The patient requiring evaluation of syncope or presyncope during exertion ⁽⁴¹⁾

When exercise cannot be performed, pharmacologic stress can be considered.

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.

- **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%.

Global CAD Risk Calculators ^(44–48)

- Framingham Cardiovascular Risk
- Reynolds Risk Score
 - Can use if there is not history of diabetes. Unique for use of family history.
- Pooled Cohort Equation
- ACC/AHA Risk Calculator
- MESA Risk Calculator
 - With addition of CAC score, for CAD-only risk

Uninterpretable Baseline ECG

- An uninterpretable baseline ECG includes ⁽⁷⁾:
 - 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)
- Left ventricular hypertrophy (LVH) with associated ST-T abnormalities, pre-excitation pattern such as WPW, a ventricular paced rhythm, or left bundle branch block
- Digitalis use
- Resting HR under 50 beats/minute 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

Acronyms/Abbreviations

AATS: American Association for Thoracic Surgery

ACC: American College of Cardiology

ACCF: American College of Cardiology Foundation

ACCP: American College of Clinical Pharmacy

ADLs: Activities of daily living

AHA: American Heart Association

ASE: American Society of Echocardiography

AR: Aortic regurgitation

ASNC: American Society of Nuclear Cardiology

ASPC: American Society for Preventive Cardiology

AUC: Appropriate use criteria

BP: Blood pressure

CABG: Coronary artery bypass grafting surgery

CAD: Coronary artery disease

CCTA: Coronary computed tomography angiography

CKD: Chronic kidney disease

CMR: Cardiovascular magnetic resonance imaging

CTA: Computed tomography angiography

CT(A): Computed tomography (angiography)

DTS: Duke Treadmill Score

ECG: Electrocardiogram

FFR: Fractional flow reserve

HCM: Hypertrophic cardiomyopathy

HFpEF: Heart failure with preserved ejection fraction

HFSA: Heart Failure Society of America

HRS: Heart Rhythm Society
ISR: In-stent restenosis
IVUS: Intravascular ultrasound
LAD: Left anterior descending artery
LBBB: Left bundle branch block
LCX: Left circumflex artery
LVH: Left ventricular hypertrophy
LVOT: Left ventricular outflow tract
MESA: Multi-Ethnic Study of Atherosclerosis
MET: Estimated metabolic equivalent of exercise
MI: Myocardial infarction
MPI: Myocardial perfusion imaging
MR: Mitral regurgitation
MS: Mitral stenosis
NLA: National Lipid Association
PAD: Peripheral artery disease
PCI: Percutaneous coronary intervention
PCNA: Preventive Cardiovascular Nurses Association
PET: Positron emission tomography
PFT: Pulmonary function test
PVCs: Premature ventricular contractions
RCA: Right coronary artery
SCAI: Society for Cardiovascular Angiography and Interventions
SCCT: Society of Cardiovascular Computed Tomography
SCMR: Society for Cardiovascular Magnetic Resonance
SE: Stress echocardiography
SPECT: Single-photon emission computed tomography
STS: Society of Thoracic Surgeons
SVG: Saphenous vein graph
TTE: Transthoracic echocardiography
VT: Ventricular tachycardia
VF: Ventricular fibrillation
WPW: Wolff-Parkinson-White

SUMMARY OF EVIDENCE

ACC/AHA/ASE/ASNC/ASPC/HFSA/HRS/SCAI/SCCT/SCMR/STS 2023 Multimodality Appropriate Use Criteria for the Detection and Risk Assessment of Chronic Coronary Disease ⁽¹⁾

Study Design: This document is an appropriate use criterion (AUC) for the detection and risk assessment of chronic coronary disease. It was developed by the American College of Cardiology Solution Set Oversight Committee and other specialty societies.

Target Population: Patients with known or suspected chronic coronary disease, including those with symptoms of ischemia, those without symptoms but at risk for atherosclerotic cardiovascular disease, and those with other cardiovascular conditions.

Key Factors: The AUC provides ratings for various diagnostic and prognostic tests, including stress testing, imaging, and invasive procedures. It aims to guide clinicians in selecting appropriate tests based on clinical scenarios, considering factors such as patient symptoms, prior testing, and risk factors. The document also includes a "no test" option for certain scenarios, emphasizing the importance of clinical judgment and patient preferences.

2012 ACCF/AHA/ACP/AATS/PCNA/SCAI/STS guideline for the diagnosis and management of patients with stable ischemic heart disease ⁽⁷⁾

Study Design: This document is a practice guideline for the diagnosis and management of patients with stable ischemic heart disease. It was developed by the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, along with other associations.

Target Population: Adult patients with stable known or suspected ischemic heart disease, including those with new-onset chest pain or stable pain syndromes.

Key Factors: The guideline covers various aspects such as clinical evaluation, risk assessment, treatment recommendations, and patient follow-up. It emphasizes the importance of patient involvement in decision-making and provides detailed recommendations for diagnosis, risk assessment, and treatment, including lifestyle modifications and medical therapy.

2023 AHA/ACC/ACCP/ASPC/NLA/PCNA Guideline for the Management of Patients With Chronic Coronary Disease ⁽⁹⁾

Study Design: This guideline provides an update on the management of patients with chronic coronary disease, consolidating new evidence since the previous guidelines. It was developed by the American Heart Association/American College of Cardiology Joint Committee on Clinical Practice Guidelines.

Target Population: Patients with chronic coronary disease, including those with stable ischemic heart disease and those who have had a myocardial infarction or revascularization.

Key Factors: The guideline emphasizes a patient-centered approach, considering social determinants of health and incorporating shared decision-making and team-based care. It includes recommendations for lifestyle changes, medical therapy, revascularization, and management of special populations.

ANALYSIS OF EVIDENCE

Analysis (1,7,9):

Stress echocardiography is consistently recognized as a valuable tool for diagnosing and managing patients with CAD and SIHD. The shared conclusions across the three articles highlight its diagnostic accuracy, non-invasive nature, and role in risk stratification. However, the articles differ in their focus on methodology, clinical scenarios, and technological advancements. The 2012 guidelines provide a foundational review of evidence, while the 2023 updates incorporate new studies and advancements in imaging technologies. The appropriate use criteria in the Winchester 2023 article offer practical guidance for clinicians in selecting the right test based on patient characteristics and clinical presentation.

Shared Conclusions:

- All three articles emphasize the diagnostic value of stress echocardiography in detecting myocardial ischemia and assessing cardiac function. Stress echocardiography is highlighted as a reliable method for evaluating patients with suspected coronary artery disease (CAD) and stable ischemic heart disease (SIHD).
- Stress echocardiography is consistently recommended for risk stratification in patients with known or suspected CAD. It helps in identifying patients at higher risk for adverse cardiovascular events, guiding therapeutic decision-making.
- The non-invasive nature of stress echocardiography is praised across all articles. It is considered a safer alternative to invasive procedures like coronary angiography, especially for initial diagnostic purposes.

POLICY HISTORY

Date	Summary
May 2026	• Updated indications to capture risk factors under Suspected CAD • Added indication related to symptoms under Follow-Up of Known CAD and Follow-Up Post-Revascularization • Renamed Pre Organ Transplant section to Prior to Organ or Stem Cell Transplantation • Clarified indications under Post-Cardiac Transplantation • Removed State Specific Regulatory Language • Updated Background section for readability
December 2025	• Added the following CPT Codes for Evolent prior authorization scope: C8923, C8924, C8928, C8929, C8930

Date	Summary
July 2025	• This guideline merges and replaces two Evolent guidelines with identical clinical criteria: ECG 7328-01 for Stress Echocardiography and ECG 026 for Stress Echocardiography into Evolent Clinical Guideline 7328 for Stress Echocardiogram • Added in general information statement regarding guideline criteria development by reputable sources, standard of care, and best practices • Updated AUC scores • Applicable Line of Business adjusted – Medicare checked • Added a Summary of Evidence and Analysis of Evidence

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 7336 for Transesophageal Echocardiogram (TEE)

Guideline Number: Evolent_CG_7336	<u>Applicable Codes</u>	
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TABLE OF CONTENTS

STATEMENT	3
GENERAL INFORMATION	3
PURPOSE	3
CLINICAL REASONING	3
INDICATIONS	3
GENERAL CRITERIA	3
AORTIC PATHOLOGY	4
VALVULAR DISEASE	4
INFECTIVE ENDOCARDITIS (NATIVE OR PROSTHETIC VALVES)	4
CARDIAC MASS OR SOURCE OF EMBOLI	4
ATRIAL FIBRILLATION/FLUTTER	5
TRANSCATHETER AORTIC VALVE REPLACEMENT (TAVR)	5
PATENT FORAMEN OVALE OR ATRIAL SEPTAL DEFECT	5
LEFT ATRIAL APPENDAGE OCCLUSION (LAAO)	5
PERCUTANEOUS MITRAL VALVE REPAIR	5
HYPERTROPHIC CARDIOMYOPATHY (HCM)	5
ADULT CONGENITAL HEART DISEASE	6
VENTRICULAR ASSIST DEVICES (VADs)	6
CODING AND STANDARDS	6
CODES	6
APPLICABLE LINES OF BUSINESS	8
BACKGROUND	8
AUC SCORE	8
ACRONYMS/ABBREVIATIONS	8
SUMMARY OF EVIDENCE	9
ANALYSIS OF EVIDENCE	10
POLICY HISTORY	10
LEGAL AND COMPLIANCE	11
GUIDELINE APPROVAL	11



Committee 11

DISCLAIMER 11

REFERENCES..... 13

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.*

Purpose

Transesophageal echocardiography (TEE) enables cardiac ultrasound imaging from within the esophagus, which provides a window for enhanced quality images as well as additional views, beyond that acquired by standard transthoracic echocardiography (TTE).

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. ^(1–5)

INDICATIONS

General Criteria ^(6,7)

- Transesophageal echocardiogram (TEE) may be performed after a nondiagnostic transthoracic echocardiogram (TTE) due to inadequate visualization of relevant structures, or if there is a high likelihood of a nondiagnostic TTE **(AUC Score 7)** ⁽⁸⁾

Aortic Pathology

- Suspected acute aortic pathology (eg, aortic dissection) ⁽⁹⁾
- Dilated aortic sinuses or ascending aorta on TTE **(AUC Score 7)** ⁽⁸⁾
- Evaluation of aortic sinuses, sinotubular junction, or ascending aorta in patients with bicuspid aortic valve when morphology cannot be assessed by TTE, and other imaging has not been done (including computed tomography (CT) or magnetic resonance imaging (MRI)) **(AUC Score 7)** ⁽⁸⁾

Valvular Disease ⁽⁶⁾

- Discordance between clinical assessment and TTE assessment of any **ONE** of the following:
 - Severity of mitral regurgitation (MR) **(AUC Score 9)** ⁽⁶⁾
 - Severity of aortic regurgitation (AR) **(AUC Score 8)** ⁽⁶⁾
- When TTE is inadequate:
 - Evaluation of mitral stenosis, when there is a discrepancy between clinical signs or symptoms **(AUC Score 6)** ⁽⁶⁾
 - Evaluation of native or prosthetic valves with clinical signs or symptoms suggesting valve dysfunction **(AUC Score 8)** ⁽⁶⁾
 - Re-evaluation of known prosthetic valve dysfunction when it would change management or guide therapy **(AUC Score 7)** ⁽⁶⁾

Infective Endocarditis (Native or Prosthetic Valves) ^(6,10)

- Suspected infective endocarditis (IE) of native valve, prosthetic valve, or endocardial lead with positive blood culture or new murmur **(AUC Score 8)** ⁽⁶⁾
- Moderate to high pretest probability of IE (eg, staph bacteremia, fungemia, prosthetic heart valve, or intracardiac device), when TTE is negative **(AUC Score 9)** ⁽⁶⁾
- Re-evaluation of IE in a patient with a change in clinical status or cardiac examination (eg, new murmur, embolism, persistent fever, heart failure (HF), abscess, or atrioventricular block) **(AUC Score 8)** ⁽⁶⁾
- Re-evaluation of IE if the patient is at elevated risk for progression/complications or when the findings alter therapy, when TTE is inadequate **(AUC Score 6)** ⁽⁶⁾

Cardiac Mass or Source of Emboli ^(8,10)

- Initial evaluation to exclude cardiac origin of transient ischemic attack (TIA) or ischemic stroke **(AUC Score 7)** ⁽⁸⁾
- Evaluation of cardiac mass, suspected tumor, or thrombus, when other cardiac imaging is inconclusive **(AUC Score 7)** ⁽⁸⁾
- Re-evaluation of prior TEE findings for interval change (eg, resolution of thrombus after

anticoagulation), when findings would change management **(AUC Score 7)** ⁽⁸⁾

Atrial Fibrillation/Flutter ⁽¹¹⁾

- Evaluation for clinical decision-making regarding anticoagulation, cardioversion, and/or radiofrequency ablation

Transcatheter Aortic Valve Replacement (TAVR) ^(6,12)

(AUC Score 7) ⁽⁶⁾

- Pre-procedural assessment of annular size and shape, number of cusps, and degree of calcification, when CT or MRI cannot be performed
- Post-procedural assessment of degree of aortic regurgitation (including valvular and paravalvular) with suspicion of valve dysfunction, if TTE is inadequate

Patent Foramen Ovale or Atrial Septal Defect ⁽¹³⁾

- Evaluation for anatomy, potential cardiac source of emboli, and suitability for percutaneous device closure **(AUC Score 7)** ⁽¹³⁾
- Evaluation post device closure with clinical concern for infection, malposition, embolization, or persistent shunt **(AUC Score 8)** ⁽¹³⁾

Left Atrial Appendage Occlusion (LAAO)

- Evaluation of anatomy, potential cardiac source of emboli, and suitability for percutaneous occlusion device placement **(AUC Score 9)** ⁽⁸⁾
- Surveillance at 45 days and 1 year, or per FDA (U.S. Food and Drug Administration) guidance for follow-up, to assess device stability and device leak, and exclude migration, displacement, or erosion ⁽¹⁴⁾ **(AUC Score 8)** ⁽⁸⁾
 - Reassessment at 6 months if 45-day TEE shows incomplete closure of left atrial appendage ⁽¹⁴⁾

Percutaneous Mitral Valve Repair ⁽⁶⁾

- Determination of eligibility for percutaneous mitral valve procedure **(AUC Score 9)** ⁽⁶⁾
- Procedural evaluation for percutaneous mitral valve procedures, in addition to CT imaging ⁽¹⁵⁾
- To exclude the presence of intracardiac mass, thrombus, or vegetation prior to (within 3 days of) the procedure **(AUC Score 9)** ⁽⁶⁾

Hypertrophic Cardiomyopathy (HCM) ⁽¹⁵⁾

- Planning for myectomy, to exclude subaortic membrane or mitral regurgitation, or to assess need for septal ablation, when TTE is inconclusive

Adult Congenital Heart Disease ^(13,16)

- Imaging with provocative maneuvers (eg, Valsalva, cough) to assess the presence of right-to-left cardiac shunt **(AUC Score 7)** ⁽¹³⁾
- Evaluation prior to planned repair of any **ONE** of the following lesions, when TTE, CT, or MRI are not adequate:
 - Isolated secundum atrial septal defect **(AUC Score 7)** ⁽¹³⁾
 - Sinus venosus defect and/or partial anomalous pulmonary venous connection **(AUC Score 7)** ⁽¹³⁾
 - Congenital mitral stenosis or mitral regurgitation **(AUC Score 7)** ⁽¹³⁾
 - Subvalvular aortic stenosis **(AUC Score 7)** ⁽¹³⁾
 - Transposition of the Great Arteries **(AUC Score 8)** ⁽¹³⁾
- Evaluation postoperative or post catheter-based repair due to change in clinical status or new concerning signs or symptoms, when TTE, CT, or MRI are not adequate **(AUC Score 7)** ⁽¹³⁾

Ventricular Assist Devices (VADs)

- To determine candidacy for ventricular assist device (VAD) ⁽⁸⁾
- Re-evaluation for signs/symptoms suggestive of VAD-related complications, including, but not limited to **(AUC Score 7)** ^(8,17):
 - TIA or stroke
 - Infection
 - Murmur suggestive of aortic insufficiency
 - Worsening heart failure

CODING AND STANDARDS

Codes

Code	Description
93312	Echocardiography, transesophageal, real-time with image documentation (2D) (with or without M-mode recording); including probe placement, image acquisition, interpretation and report
93313	Echocardiography, transesophageal, real-time with image documentation (2D) (with or without M-mode recording); placement of transesophageal probe only

Code	Description
93314	Echocardiography, transesophageal, real-time with image documentation (2D) (with or without M-mode recording); image acquisition, interpretation and report only
93315	Transesophageal echocardiography for congenital cardiac anomalies; including probe placement, image acquisition, interpretation and report
93316	Transesophageal echocardiography for congenital cardiac anomalies; placement of transesophageal probe only
93317	Transesophageal echocardiography for congenital cardiac anomalies; image acquisition, interpretation and report only
93318	Echocardiography, transesophageal (TEE) for monitoring purposes, including probe placement, real time 2-dimensional image acquisition and interpretation leading to ongoing (continuous) assessment of (dynamically changing) cardiac pumping function and to therapeutic measures on an immediate time basis
96374	Therapeutic, prophylactic, or diagnostic injection (specify substance or drug); intravenous push, single or initial substance/drug
+93319	3D echocardiographic imaging and postprocessing during transesophageal echocardiography, or during transthoracic echocardiography for congenital cardiac anomalies, for the assessment of cardiac structure(s) (eg, cardiac chambers and valves, left atrial appendage, interatrial septum, interventricular septum) and function, when performed (List separately in addition to code for echocardiographic imaging)
+93320	Doppler echocardiography, pulsed wave and/or continuous wave with spectral display (List separately in addition to codes for echocardiographic imaging); complete
+93321	Doppler echocardiography, pulsed wave and/or continuous wave with spectral display (List separately in addition to codes for echocardiographic imaging); follow-up or limited study (List separately in addition to codes for echocardiographic imaging)
+93325	Doppler echocardiography color flow velocity mapping (List separately in addition to codes for echocardiography)

Applicable Lines of Business

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

BACKGROUND

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. ⁽⁴⁾

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

Acronyms/Abbreviations

AATS: American Association for Thoracic Surgery

ACC: American College of Cardiology

AHA: American Heart Association

ASE: American Society of Echocardiography

AR: Aortic regurgitation

AUC: Appropriate use criteria

CT: Computed tomography

HF: Heart failure

HRS: Heart Rhythm Society

IE: Infective endocarditis

LVDF: Left ventricular diastolic function

MR: Mitral regurgitation

MRI: Magnetic resonance imaging

SCAI: Society for Cardiovascular Angiography and Interventions

SCCT: Society of Cardiovascular Computed Tomography

SCMR: Society for Cardiovascular Magnetic Resonance

SLE: Systemic lupus erythematosus

STS: Society of Thoracic Surgeons

TAVR: Transcatheter aortic valve replacement/repair

TEE: Transesophageal echocardiography

TIA: Transient ischemic attack

TTE: Transthoracic echocardiography

VAD: Ventricular assist device

SUMMARY OF EVIDENCE

ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2017 Appropriate Use Criteria for Multimodality Imaging in Valvular Heart Disease ⁽⁶⁾

Study Design: This document presents the 2017 Appropriate Use Criteria (AUC) for multimodality imaging in valvular heart disease. It was developed by the American College of Cardiology and other related societies.

Target Population: The criteria apply to patients with valvular heart disease, including those undergoing initial evaluation, follow-up, and pre- and post-procedural assessments.

Key Factors: The document provides a comprehensive framework for the appropriate use of various imaging modalities such as transthoracic echocardiography (TTE), transesophageal echocardiography (TEE), cardiac magnetic resonance (CMR), and computed tomography (CT). It includes detailed tables outlining the indications for each modality based on clinical scenarios.

Transesophageal Versus Transthoracic Echocardiography for Assessment of Left Ventricular Diastolic Function ⁽⁷⁾

Study Design: This study compares transesophageal echocardiography (TEE) and transthoracic echocardiography (TTE) for the assessment of left ventricular diastolic function (LVDF) in patients with systemic lupus erythematosus (SLE) and healthy controls.

Target Population: The study included 66 patients with SLE (mean age 36 years, 91% women) and 26 age- and sex-matched healthy volunteers (mean age 34 years, 85% women).

Key Factors: The study found that LVDF parameters were worse in SLE patients than in controls by both TEE and TTE. Most LVDF parameters were similar within each group by TEE and TTE, and the parameters were significantly correlated between the two techniques. The study supports the use of TEE for assessing LVDF in appropriate clinical settings.

ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2019 Appropriate Use Criteria for Multimodality Imaging in the Assessment of Cardiac Structure and Function in Nonvalvular Heart Disease ⁽⁸⁾

Study Design: This document is the 2019 Appropriate Use Criteria for multimodality imaging in the assessment of cardiac structure and function in nonvalvular heart disease. It was developed by the American College of Cardiology and other related societies.

Target Population: The criteria apply to patients with nonvalvular heart disease, including those undergoing initial evaluation, follow-up, and pre- and post-procedural assessments.

Key Factors: The document provides a comprehensive framework for the appropriate use of various imaging modalities such as TTE, TEE, CMR, and CT. It includes detailed tables outlining the indications for each modality based on clinical scenarios. The document also addresses the evaluation of cardiac structure and function in patients undergoing transcatheter interventions .

ANALYSIS OF EVIDENCE

Analysis ^(6–8):

In summary, while all three documents support the use of TEE and TTE for cardiac imaging, Win et al. 2020 provides specific evidence for the use of TEE in assessing LVDF in SLE patients, demonstrating its diagnostic and prognostic value in this population. The Doherty et al. 2017 and 2019 documents offer comprehensive guidelines for the appropriate use of TEE and TTE in a wider range of cardiac conditions.

Shared Conclusions

- **TEE and TTE Utility:** All three documents highlight the utility of TEE and TTE in assessing cardiac function. Doherty et al. 2017 and 2019 emphasize the appropriate use of TEE and TTE in various clinical scenarios, while Win et al. 2020 specifically compares the two techniques for LVDF assessment.
- **Correlation of Parameters:** Win et al. 2020 found significant correlations between LVDF parameters assessed by TEE and TTE, suggesting that both techniques provide similar diagnostic value. This aligns with the general consensus in Doherty et al. 2017 and 2019 that TEE and TTE are valuable tools for cardiac imaging.

POLICY HISTORY

Date	Summary
April 2026	● Expanded indications under Valvular Disease and Ventricular Assist Devices sections
July 2025	● This guideline merges and replaces two Evolent guidelines with identical clinical criteria: Evolent Clinical Guideline 7336-01 for

Date	Summary
	Transesophageal Echocardiography and Evolent Clinical Guideline 066 for Transesophageal Echocardiography into Evolent Clinical Guideline 7336 for Transesophageal Echocardiogram (TEE) ○ This guideline also merges procedural codes from these two Evolent guidelines ● Added and updated AUC Scores ● Applicable Line of Business adjusted – Medicare checked ● Statement, general Information section added bullet regarding guideline criteria ● Added a Summary of Evidence and Analysis of Evidence

LEGAL AND COMPLIANCE

Guideline Approval

Committee

Reviewed / Approved by Evolent Specialty Services Clinical Guideline Review Committee

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Evolent Clinical Guideline 7337 for Transthoracic Echocardiogram (TTE)

Guideline Number: Evolent_CG_7337	<u>Applicable Codes</u>	
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TABLE OF CONTENTS

STATEMENT	3
GENERAL INFORMATION	3
PURPOSE	3
CLINICAL REASONING	3
INDICATIONS FOR TRANSTHORACIC ECHOCARDIOGRAPHY (TTE) — ADULTS	3
EVALUATION OF CARDIAC STRUCTURE AND FUNCTION	3
MURMUR OR CLICK	4
ARRHYTHMIAS	4
SYNCOPE	5
PLANNED SOLID ORGAN OR STEM CELL TRANSPLANTATION	5
PULMONARY HYPERTENSION (PH)	5
KNOWN VALVULAR HEART DISEASE	6
Valvular Stenosis	6
Valvular Regurgitation	6
Prosthetic Valves/Native Valve Repair	6
TRANSCATHETER HEART INTERVENTIONS	7
Transcatheter Aortic Valve Replacement (TAVR)	7
Transcatheter Mitral Valve Repair (TMVR)	7
Closure of Patent Foramen Ovale (PFO) or ASD	8
Left Atrial Appendage Occlusion (LAAO)	8
PERICARDIAL DISEASE	8
CARDIAC MASS OR SOURCE OF EMBOLI	8
INFECTIVE ENDOCARDITIS (NATIVE OR PROSTHETIC VALVES)	8
THORACIC AORTIC DISEASE	9
HYPERTENSION (HTN) (ADULT)	10
HYPERTENSION (HTN) (PEDIATRIC)	11
HEART FAILURE	11
CARDIOMYOPATHY	11
HYPERTROPHIC CARDIOMYOPATHY (HCM)	12
ARRHYTHMOGENIC RIGHT VENTRICULAR CARDIOMYOPATHY (ARVC)	13
SURVEILLANCE FOR CARDIOTOXIC EXPOSURES	13
SURVEILLANCE FOR RADIATION THERAPY WITH CARDIAC EXPOSURE	13

DEVICE CANDIDACY OR OPTIMIZATION (PACEMAKER, IMPLANTABLE CARDIOVERTER-DEFIBRILLATOR [ICD], OR CARDIAC RESYNCHRONIZATION THERAPY [CRT])	13
VENTRICULAR ASSIST DEVICES (VADs)	14
SURVEILLANCE POST HEART TRANSPLANT	14
CARDIOVASCULAR DISEASE IN PREGNANCY	14
ADULT CONGENITAL HEART DISEASE	15
INFLAMMATORY AND AUTOIMMUNE	16
COVID-19.....	16
SURVEILLANCE FOR NEUROMUSCULAR DISORDERS	17
INDICATIONS FOR TRANSTHORACIC ECHOCARDIOGRAPHY (TTE) — PEDIATRIC-SPECIFIC (< 18 YEARS OLD) ..	17
CONGENITAL HEART DISEASE FOLLOW-UP†* — ADULTS AND PEDIATRICS.....	19
TABLE 1: UNREPAIRED LESION FOLLOW-UP†	20
TABLE 2: POSTPROCEDURAL FOLLOW-UP†	24
CODING AND STANDARDS	31
CODES.....	31
APPLICABLE LINES OF BUSINESS	32
BACKGROUND	32
AUC SCORE	33
STAGED SURGERIES FOR SINGLE-VENTRICLE DISEASE	33
MYOCARDITIS STAGES.....	33
ACRONYMS / ABBREVIATIONS.....	34
SUMMARY OF EVIDENCE	37
ANALYSIS OF EVIDENCE.....	38
POLICY HISTORY	39
LEGAL AND COMPLIANCE	40
GUIDELINE APPROVAL	40
<i>Committee</i>	40
DISCLAIMER	40
REFERENCES.....	42

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.*

Purpose

Transthoracic echocardiography (TTE) uses ultrasound to image the structures of the heart providing two-dimensional, cross-sectional images. The addition of Doppler ultrasound derives hemodynamic data from flow velocity versus time measurements, as well as from color-coded two-dimensional representations of flow velocities.

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. ^(1–5)

INDICATIONS FOR TRANSTHORACIC ECHOCARDIOGRAPHY (TTE) — ADULTS ⁽⁶⁾

Evaluation of Cardiac Structure and Function

- When initial evaluation, including history, physical examination, electrocardiogram (ECG), remote monitor or other testing, suggests a cardiac etiology for symptoms,

including, but not limited to **(AUC Score 9)** ⁽⁷⁾:

- Chest pain, when another study is not planned to evaluate
- Shortness of breath
- Palpitations
- Hypotension suggestive of cardiac etiology, not due to other causes (eg, medications, dehydration, or infection) **(AUC Score 8)** ⁽⁷⁾
- Any **ONE** of the following ECG abnormalities:
 - Previously unevaluated pathological Q waves (in two contiguous leads), defined as the following:
 - 40 ms (1 mm) wide
 - > 2 mm deep
 - > 25% of depth of QRS complex
 - New left bundle branch block **(AUC Score 7)** ⁽⁷⁾
 - New second-degree Mobitz II atrioventricular (A-V) block, high grade A-V block, or third-degree A-V block ⁽⁸⁾
 - Previously unevaluated left ventricular hypertrophy (ie, concern for hypertrophic cardiomyopathy (HCM) [symptomatic or asymptomatic]) **(AUC Score 9)** ⁽⁷⁾

Murmur or Click

- Initial evaluation of a murmur or click, when there is a reasonable suspicion for valvular or structural heart disease based on any **ONE** of the following characteristics **(AUC Score 9)** ⁽⁹⁾:
 - High grade ($\geq 3/6$) or documented concern that murmur suggests a specific valve pathology (eg, 'aortic valve sclerosis/stenosis' or 'mitral regurgitation')
 - Holosystolic
 - Continuous
 - Diastolic

Arrhythmias

- Frequent premature ventricular contractions (PVCs) (> 30 per hour on remote monitoring or ≥ 1 PVC on 12-lead ECG) **(AUC Score 7)** ⁽⁷⁾
NOTE: Isolated premature atrial complexes (PACs) are **NOT** an indication for TTE ⁽¹⁰⁾
- Ventricular tachycardia (VT), ventricular fibrillation (VF), or ventricular bigeminy **(AUC Score 9)** ⁽⁷⁾
- New onset atrial fibrillation (as documented in provider notes and on ECG) which was not evaluated by a prior TTE ⁽¹¹⁾ **(AUC Score 8)** ⁽⁷⁾

- Initial evaluation of supraventricular tachycardia (SVT) seen on ECG or remote monitoring without other evidence of heart disease **(AUC Score 6)** ⁽⁷⁾
- Initial evaluation of inappropriate sinus tachycardia (average heart rate ≥ 90 beats/minute (bpm) on ambulatory monitoring, after other etiologies have been excluded [eg, anemia, hyperthyroidism])

Syncope ^(7,12)

- History, physical examination, or ECG consistent with a cardiac diagnosis known to cause presyncope or syncope, including, but not limited to **(AUC Score 9)** ⁽⁷⁾:
 - Structural heart disease, including, but not limited to:
 - HCM
 - Systolic heart failure
 - Exercise-induced syncope

AND not due to other causes (eg, vaso-vagal syncope, neurogenic orthostatic syncope, orthostasis related to medication or dehydration)

Planned Solid Organ or Stem Cell Transplantation ^(13,14)

- Preoperative left ventricular function assessment in patients who are candidates for stem cell ⁽¹⁵⁾ or solid organ transplantation **(AUC Score 7)** ⁽¹³⁾ (may be repeated annually prior to transplant)

Pulmonary Hypertension (PH)

- Evaluation of suspected PH, including evaluation of right ventricular function and estimated pulmonary artery pressure **(AUC Score 9)** ⁽⁷⁾
- Re-evaluation of known PH, if there is a change in clinical status or cardiac exam, or a need to change medications, ⁽¹⁶⁾ such as **(AUC Score 8)** ⁽⁷⁾:
 - New chest pain
 - Worsening shortness of breath
 - Syncope
 - Increased murmur
 - Worsening rales on lung examination
- Initial evaluation of patients with pulmonary embolism to risk stratify and initiate appropriate therapy ^(17,18)
 - Repeat TTE can be approved for persistent dyspnea 3-6 months after PE ⁽¹⁶⁾ to evaluate for possible chronic thromboembolic pulmonary hypertension (CTEPH)
- Annual screening for PH in patients with any **ONE** of the following ^(17,19):
 - Scleroderma or systemic sclerosis

- Portal hypertension (including evaluation prior to transjugular intrahepatic portosystemic shunt [TIPS] procedure)
- Carriers of Bone Morphogenic Protein Receptor 2 (BMP2) mutation
- Evaluation of worsening or unexplained signs or symptoms of possible PH in patients with sickle cell disease ^(20,21)

Known Valvular Heart Disease

Symptomatic

- New clinical signs and symptoms (eg, shortness of breath, fatigue) with known mild valvular heart disease or known moderate-to-severe valvular heart disease **(AUC Score 9)** ⁽⁹⁾

Valvular Stenosis ^(9,22)

Asymptomatic (Routine re-evaluation)

- Bicuspid aortic valve, aortic valve sclerosis, or mild valvular stenosis, every ≥ 3 years **(AUC Score 9)** ⁽⁹⁾
- Moderate stenosis, annually **(AUC Score 7)** ⁽⁹⁾
- Severe aortic stenosis (AS), every ≥ 6 months **(AUC Score 6)** ⁽⁹⁾
- Severe mitral stenosis, every 6 months to 1 year
- After control of hypertension in patients with low-flow/gradient severe AS **(AUC Score 7)** ⁽⁹⁾

Valvular Regurgitation ^(9,22)

Asymptomatic (Routine re-evaluation)

- Mild valvular regurgitation, every 3 years **(AUC Score 8)** ⁽⁹⁾
- Moderate valvular regurgitation, annually **(AUC Score 7)** ⁽⁹⁾
- Asymptomatic patient with severe valvular regurgitation, every 6 months **(AUC Score 7)** ⁽⁹⁾

Prosthetic Valves/Native Valve Repair ^(9,22)

- Initial evaluation of prosthetic valve or native valve repair, for establishment of baseline, typically 6 weeks to 3 months postoperative **(AUC Score 9)** ⁽⁹⁾

Asymptomatic (Normal functioning re-evaluation)

- Bioprosthetic surgical valve, 5 and 10 years post valvular **implantation**, then annually thereafter ⁽²²⁾ **(AUC Score 7)** ⁽⁹⁾
- Surgical mechanical valve, every 3 years post valvular **implantation** **(AUC Score 7)** ⁽⁹⁾

- Surgical valve **repair**, every 3 years post **repair** of mitral (**AUC Score 8**)⁽⁹⁾, aortic, tricuspid, or pulmonic valve

NOTE: For asymptomatic abnormal functioning evaluation, refer to **Valvular Stenosis** or **Valvular Regurgitation**.

Symptomatic

- Evaluation of prosthetic valve or native valve repair with suspected dysfunction, with symptoms including, but not limited to (**AUC Score 9**)⁽⁹⁾:
 - Chest pain
 - Shortness of breath
 - New or increased murmur on heart examination
 - New rales on lung examination
 - Elevated jugular venous pressure on exam

Transcatheter Heart Interventions

Transcatheter Aortic Valve Replacement (TAVR) ^(9,23)

- Pre-procedure evaluation
- Post-procedure evaluation at 30 days (**AUC Score 8**) (6 weeks to 3 months also acceptable) and annually⁽⁹⁾
- Post-procedure assessment when there is suspicion of valvular dysfunction, including, but not limited to (**AUC Score 8**)⁽⁹⁾:
 - Chest pain
 - Shortness of breath
 - New or increased murmur on heart examination
 - CVA (**AUC Score 7**)
- Post-procedure assessment of stroke (**AUC Score 7**)⁽⁹⁾

Transcatheter Mitral Valve Repair (TMVR) ^(9,24)

- Pre-procedure evaluation (**AUC Score 8**)⁽⁹⁾
- Reassessment for degree of MR and left ventricular function (1 month, 6 months, and annually) (**AUC Score 9**)⁽⁹⁾
- Post-procedure assessment when there is suspicion of valvular dysfunction, including, but not limited to: (**AUC Score 9**)⁽⁹⁾
 - Chest pain
 - Shortness of breath
 - New or increased murmur on heart examination

- CVA

Closure of Patent Foramen Ovale (PFO) or ASD ⁽²⁵⁾

- Pre-procedure evaluation (**AUC Score 9**)
- Routine post-procedure follow-up for device position and integrity (see **Table 2: Adult and Pediatric Congenital Heart Disease Follow-Up**) (**AUC Score 9**)
- Evaluation for clinical concern for infection, malposition, embolization, or persistent shunt (**AUC Score 9**)

NOTE: Routine surveillance of an asymptomatic patient with a PFO is **NOT** indicated

Left Atrial Appendage Occlusion (LAAO) ⁽⁷⁾

- Pre-procedure evaluation (**AUC Score 8**)

Pericardial Disease ^(7,26)

- Suspected pericarditis or pericardial effusion (**AUC Score 9**) ⁽⁷⁾
- Re-evaluation of a significant known pericardial effusion, when findings would change management (**AUC Score 7**) ⁽⁷⁾
- Suspected pericardial constriction or reevaluation of status, when findings would change management

Myocarditis ⁽²⁷⁾

- Suspected acute myocarditis
- Follow-up for myocarditis (see **Myocarditis Stages**):
 - Stage B and low-risk stage C: 2-4 weeks and 6 months
 - High-risk stage C and stage D: 2-4 weeks, and 6 months when no follow-up cardiac magnetic resonance imaging (MRI) is completed

Cardiac Mass or Source of Emboli ⁽⁷⁾

- Identification of embolic source in patients with recent transient ischemic attack (TIA), stroke, or peripheral vascular emboli (**AUC Score 9**)
- Evaluation of intracardiac mass or re-evaluation of known mass, with no TTE performed within the last 3 months ⁽²⁸⁾ (**AUC Score 8**)

Infective Endocarditis (Native or Prosthetic Valves) ^(9,22)

- Initial evaluation of suspected infective endocarditis with positive blood cultures or new murmur (**AUC Score 9**) ⁽⁹⁾
- Re-evaluation of infective endocarditis with, but not limited to (**AUC Score 9**) ⁽⁹⁾:

- Changing cardiac murmur
- Evidence of embolic phenomena (eg, TIA, CVA)
- New chest pain, shortness of breath, or syncope
- A need to change medications due to ongoing fever, positive blood cultures, or evidence of new A-V block on ECG
- At high risk of progression or complication (eg, extensive infective tissue/large vegetation, or staphylococcal, enterococcal, or fungal infections) **(AUC Score 7)** ⁽⁹⁾
- At completion of antimicrobial therapy and serial examinations at 1, 3, 6, and 12 months during the subsequent year ^(29,30)

Thoracic Aortic Disease ^(31,32)

In the absence of recent computed tomography (CT) or cardiovascular magnetic resonance (CMR), which are preferred for imaging beyond the proximal ascending aorta.

- Screening of first-degree relatives of individuals with any **ONE** of the following:
 - Thoracic aortic aneurysm ($\geq 50\%$ above normal) or dissection
 - Bicuspid aortic valve
 - Aortopathic syndrome (eg, Marfan, Ehlers-Danlos, Loeys-Dietz, or Turner)
- Screening of second-degree relatives of individuals, if one or more of their first-degree relatives with a known thoracic aortic aneurysm or dissection have thoracic aortic dilatation, aneurysm, or dissection
- Six-month follow-up after initial finding of a dilated thoracic aorta
- Annual follow-up of enlarged thoracic aorta that is above top normal for age, gender, and body surface area
- Biannual (twice/year) follow-up of enlarged thoracic aorta ≥ 4.5 cm, or showing growth rate ≥ 0.5 cm in 1 year or ≥ 0.3 cm/year in 2 consecutive years for sporadic aneurysms and ≥ 0.3 cm in 1 year for heritable thoracic aortic disease or bicuspid aortic valve ⁽³²⁾
- Biannual (twice/year) follow-up of bicuspid aortic valve and dilated thoracic aorta ≥ 4.0 cm but < 4.5 cm and first-degree relative with history of aortic dissection ⁽³²⁾
- Evaluation of the ascending aorta in known or suspected connective tissue disease or genetic conditions that predispose to aortic aneurysm or dissection (eg, Marfan, Ehlers-Danlos, or Loeys-Dietz syndromes) at time of diagnosis and 6 months thereafter for growth rate assessment, followed by annual imaging, or biannual (twice/year) if diameter ≥ 4.5 cm or expanding ≥ 0.3 cm/yr **(AUC Score 8)** ⁽⁷⁾
- Turner Syndrome:
 - Baseline evaluation at the time of diagnosis to assess bicuspid aortic valve, coarctation of the aorta, aortic root and ascending aortic dilatation, and other congenital defects
 - Surveillance imaging (initial imaging normal and no additional risk factors for

dissection such as hypertension (HTN) or bicuspid aortic valve):

- Children: every 5 years
- Adults: every 10 years
- Prior to planned pregnancy
- If an abnormality is found (eg, bicuspid aortic valve): annually
- Re-evaluation of known ascending aortic dilation or history of aortic dissection with any **ONE** of the following:
 - New chest pain
 - Shortness of breath
 - Syncope
 - TIA or CVA
 - New or increased aortic valve murmur on clinical examination
 - New rales on lung examination or increased jugular venous pressure
 - When findings would change management
- Follow-up of aortic disease when there has been no surgical intervention:
 - Acute dissection: 1 month, 6 months, 12 months, then annually
 - Chronic dissection: annually
- Follow-up of thoracic aortic aneurysm repair, in the absence of chest CTA or chest MRA (which are the preferred imaging modalities for follow-up)
- Post either root repair or AVR plus ascending aortic root/arch repair: baseline post-op, then annually
- Evaluation of sinus of Valsalva aneurysm and associated shunting secondary to rupture ⁽³¹⁾

Hypertension (HTN) (Adult) ^(7,32)

- Initial evaluation of suspected hypertensive heart disease including, but not limited to, the following (**AUC Score 8**) ⁽⁷⁾:
 - Left ventricular hypertrophy on ECG
 - S3 or S4 on cardiac examination
 - Cardiomegaly
 - Evidence of clinical heart failure
- Initial evaluation of uncontrolled, resistant HTN without symptoms on three or more anti-hypertensive drugs

Hypertension (HTN) (Pediatric) ^(33,34)

(AUC Score 9) ⁽³⁵⁾

- Initial evaluation at time of consideration of pharmacologic treatment of HTN
- Re-evaluation at 6–12-month intervals for:
 - Persistent HTN despite treatment
 - Concentric left ventricular hypertrophy (LVH) on prior study
 - Reduced LVEF on prior study
- Re-evaluation of patients without LVH on initial evaluation, at annual intervals, for:
 - Stage 2 HTN (BP $\geq$ 140/90 mmHg)
 - Secondary HTN
 - Chronic stage 1 HTN (BP between 130/80 mmHg and 139/89 mmHg) incompletely treated, including drug resistance and noncompliance

Heart Failure ^(7,36)

- Initial evaluation of suspected heart failure (systolic or diastolic) based on symptoms, signs, or abnormal test results, including, but not limited to **(AUC Score 9)** ⁽⁷⁾:
 - Dyspnea
 - Orthopnea
 - Paroxysmal nocturnal dyspnea
 - Worsening edema
 - Elevated B-type/brain natriuretic peptide (BNP)
- Re-evaluation of known heart failure (systolic or diastolic):
 - With a change in clinical status or cardiac exam (as listed above)
 - Asymptomatic patient with change in guideline-directed medical therapy (GDMT)

Cardiomyopathy

- Initial evaluation of suspected inherited or acquired cardiomyopathy (CM), including, but not limited to **(AUC Score 9)** ⁽⁷⁾:
 - Restrictive CM
 - Infiltrative/depositional CM (eg, hemochromatosis/iron overload, mucopolysaccharidoses, mitochondrial or metabolic storage disease (eg, Danone disease, Fabry disease))
 - Fabry disease: annual surveillance may be approved for patients receiving enzyme replacement ⁽²⁸⁾
 - Dilated CM

- Hypertrophic CM
- Re-evaluation of known CM if there is a need to monitor a change in medications or new symptoms (eg, chest pain, shortness of breath, palpitations, syncope)
- Heart failure (including Takotsubo cardiomyopathy) ⁽²⁸⁾ with recovered left ventricular ejection fraction (LVEF), meeting **ALL** of the following criteria:
 - Documentation of ongoing GDMT for heart failure
 - Documentation of a decreased LVEF < 40% at baseline
 - ≥ 10% absolute improvement in LVEF
 - A second measurement of LVEF > 40% ⁽³⁷⁾:
 - Repeat TTE every 6 months until 12-18 months after recovery of ejection fraction, then annually for 2 years, then every 3-5 years
 - Annual follow-up for higher-risk patient (eg, persistent left bundle branch block, genetic cardiomyopathy, higher biomarker profiles)
- Screening evaluation in first-degree relatives of a patient with an inherited cardiomyopathy (**AUC Score 9**) ⁽⁷⁾
- Suspected cardiac sarcoidosis, including for screening patients with biopsy-proven extracardiac sarcoidosis ⁽³⁸⁾
- Suspected cardiac amyloid and to monitor disease progression and/or response to therapy, and to guide initiation and management of anticoagulation (Transesophageal echocardiogram [TEE] may be preferred) ⁽³⁹⁾
 - Light chain amyloidosis (AL): TTE may be repeated every 3-6 months
 - Transthyretin amyloidosis (ATTR): TTE may be repeated every 6-12 months ⁽²⁸⁾

Hypertrophic Cardiomyopathy (HCM) ⁽⁴⁰⁾

- Initial evaluation of suspected HCM
- Re-evaluation of patients with HCM with a change in clinical status or new clinical event
- Re-evaluation in patients with no change in clinical status or event, to annually assess degree of myocardial hypertrophy, dynamic obstruction, MR, and myocardial function
- Evaluation of the result of surgical myomectomy or alcohol septal ablation
- Evaluation of patients with HCM who have undergone septal reduction therapy, within 3-6 months after the procedure
- Screening for patients who are clinically unaffected or subclinical (genotype-positive and phenotype-negative):
 - Children and adolescents: annually
 - Adults: every 3 years
- Screening of first-degree relatives at time of family member diagnosis, and follow-up:

- Children and adolescents from genotype-positive families and families with early onset disease: annually
- All other children and adolescents: every 2 years
- Adults: every 3 years
- To guide therapy with Camzyos (mevacamten): baseline prior to initiation, and repeat TTE during therapy at the discretion of the ordering specialist ⁽⁴¹⁾

Arrhythmogenic Right Ventricular Cardiomyopathy (ARVC) ⁽⁴²⁾

- Initial evaluation of suspected ARVC
- Annual follow-up in patients with established diagnosis of ARVC
- Screening for patients who are clinically unaffected or subclinical (genotype-positive and phenotype-negative):
 - Age < 60 years, annually
 - Age ≥ 60 years, every 3 years

Surveillance for Cardiotoxic Exposures ^(43,44)

- Evaluation of patients who will receive or have received cardiotoxic medication:
 - Baseline assessment prior to initiation of therapy **(AUC Score 9)** ⁽⁷⁾
 - Monitoring during therapy, at the discretion of the provider **(AUC Score 7)** ⁽⁷⁾
NOTE: The frequency of testing should be left to the discretion of the ordering physician, but in the absence of new abnormal findings, should generally be ≤ every 6 weeks while on active therapy.
 - Long-term surveillance after completion of therapy when necessary (eg, exposure to anthracycline medication), every 6-12 months or at the discretion of the provider **(AUC Score 7)** ⁽⁷⁾

Surveillance for Radiation Therapy with Cardiac Exposure ⁽⁴⁵⁾

- Long-term surveillance following radiation exposure, every 5 years post-exposure, with more frequent surveillance at the discretion of the provider

Device Candidacy or Optimization (Pacemaker, Implantable Cardioverter-Defibrillator [ICD], or Cardiac Resynchronization Therapy [CRT]) ⁽⁷⁾

- Initial evaluation or re-evaluation after revascularization (≥ 90 days), and/or myocardial infarction (MI) (≥ 40 days), and/or 3 months of GDMT when ICD is planned **(AUC Score 9)** ⁽⁷⁾

- Initial evaluation for CRT device optimization after implantation **(AUC Score 7)** ⁽⁷⁾
- Re-evaluation for CRT device optimization with worsening heart failure **(AUC Score 8)** ⁽⁷⁾
- Known implanted pacing device with symptoms possibly due to device complication or suboptimal device settings **(AUC Score 8)** ⁽⁷⁾

Ventricular Assist Devices (VADs) ^(7,46)

- To determine candidacy for VAD **(AUC Score 9)** ⁽⁷⁾
- Optimization of VAD settings and assessment of response to device **(AUC Score 8)** ⁽⁷⁾
- Re-evaluation for signs/symptoms suggestive of VAD-related complications, including, but not limited to **(AUC Score 8)** ⁽⁷⁾:
 - TIA or stroke
 - Infection
 - Murmur suggestive of aortic insufficiency
 - Worsening heart failure

Surveillance Post Heart Transplant ⁽⁴⁷⁾

- Monitoring for rejection in a cardiac transplant recipient, at the discretion of the transplant center **(AUC Score 8)** ⁽⁷⁾

Cardiovascular Disease in Pregnancy ⁽⁴⁸⁾

- Valvular stenosis
 - Mild: each trimester and prior to delivery
 - Moderate-to-severe: monthly
- Valvular regurgitation
 - Mild-to-moderate: each trimester and prior to delivery
 - Severe: monthly
- Congenital heart disease
 - ASD, VSD (unrepaired and uncomplicated): at 28-32 weeks gestation
 - Atrioventricular defect (AVSD) (unrepaired and uncomplicated): at 28-32 weeks gestation (more frequent surveillance for associated PH, valve regurgitation, reduced ventricular systolic function, heart failure symptoms)
 - For repaired AVSD with residual shunt, follow ASD and/or VSD recommendations based on location of residual shunt
 - Pulmonary valve and/or right ventricular outflow tract (RVOT) stenosis: at 28-32 weeks gestation (more frequent for severe stenosis)
 - Severe pulmonary valve regurgitation and reduced right ventricular ejection fraction

(RVEF): bimonthly

- Post pulmonary valve replacement (surgical or transcatheter), without severe stenosis or regurgitation: at 28-32 weeks gestation
- Repaired tetralogy of Fallot (TOF): first trimester and at 28-32 weeks gestation (more frequently if reduced functional status)
- Ebstein anomaly
 - Mild-to-moderate: baseline and at 28-32 weeks gestation
 - Severe: bimonthly
- Transposition of great arteries (TGA)
 - Post atrial switch: every 1-3 months depending on anatomical and functional status
 - Post arterial switch: at 20 weeks gestation (more frequently if reduced ventricular systolic function, aortic regurgitation, and/or aortic dilatation)
- Single ventricle physiology, after Fontan palliation: every 1-3 months depending on anatomical and functional status

NOTE: The above evaluation frequencies are appropriate for patients classified per the AHA Adult ACHD Anatomic and Physiological Classification System as CHD Anatomy I (Simple) and Physiological Stage A. ⁽⁴⁹⁾ Patients classified as CHD Anatomy II or III and/or Physiological Stages B-D may require more frequent evaluation (eg, once per trimester).

- Pre-pregnancy evaluation with mechanical or bioprosthetic heart valves, if not done within the previous year ⁽²²⁾ **(AUC Score 9)** ⁽⁹⁾
- Peripartum cardiomyopathy: at the end of the 1st and 2nd trimesters, 1 month prior to delivery, 1 month postpartum, and serially up to 6 months after normalization of ejection fraction ⁽⁵⁰⁾
- Aortopathic syndromes (eg, Marfan's, Ehlers-Danlos, Loeys-Dietz, or Turner syndromes) or known dilated aortic root or ascending aorta, for:
 - Pre-pregnancy planning
 - Monitoring each trimester during pregnancy and again several weeks post-partum

NOTE: More frequent imaging may be approved depending on aortic diameter, aortic growth rate, and comorbidities predisposing to dissection (eg, presence of an aortopathic syndrome, HTN) ⁽³²⁾

Adult Congenital Heart Disease ^(25,51)

- Initial evaluation, including history, physical examination, ECG, or other imaging modality, suggests adult congenital heart disease
- Known adult congenital heart disease with a change in clinical status or cardiac exam, including, but not limited to:

- Chest pain
- Shortness of breath
- New or increased murmur on physical exam
- Evaluation prior to surgical or transcatheter procedure

NOTE: For follow-up of specific lesions, see **Table 1** and **Table 2: Adult and Pediatric Congenital Heart Disease Follow-up**

Inflammatory and Autoimmune

- Suspected rheumatic fever ⁽⁵²⁾
- Systemic lupus erythematosus, when signs or symptoms suggest cardiac involvement ⁽⁵³⁾
- Takayasu's arteritis ⁽⁵⁴⁾
- Multisystem Inflammatory Syndrome (MIS): at baseline and for surveillance when there is documented concern for coronary involvement or other late sequelae ⁽⁵⁵⁾
- Kawasaki disease ⁽⁵⁶⁾
 - Upon diagnosis, and 1-2 and 4-6 weeks following diagnosis

NOTE: For patients with important and evolving coronary artery abnormalities during the acute illness, TTEs may need to be more frequent. In the setting of increasing size of coronary aneurysms, TTE can be performed up to twice per week until dimensions have stopped progressing, then at least once per week in the first 45 days of illness, and then monthly until the third month after onset.
 - For persistent coronary aneurysm after acute illness, based on the size of the aneurysm:
 - Small: at 6 months, then yearly
 - Medium: at 3, 6 and 12 months, then every 6-12 months
 - Large/Giant: at 3, 6, 9 and 12 months, then every 3-6 months

COVID-19 ⁽⁵⁷⁾

- Acute infection with cardiopulmonary signs or symptoms (eg, ECG abnormalities, elevated biomarkers, chest pain, dyspnea, syncope, or palpitations)
- Post-acute sequelae (PASC), defined as new or returning cardiopulmonary symptoms ≥ 4 weeks and persisting > 2 months following confirmed COVID-19 infection, not explained by an alternative diagnosis (World Health Organization definition)
- Post-vaccination with symptoms or signs of myocarditis (eg, ECG abnormalities, chest pain, elevated biomarkers)

Surveillance for Neuromuscular Disorders ^(58,59)

- Surveillance of asymptomatic individuals (genetically affected with no signs or symptoms of cardiac involvement) with any **ONE** of the following neuromuscular disorders:
 - Duchenne muscular dystrophy (DMD): heart MRI is the preferred non-invasive imaging modality. TTE is typically used for younger children (ie, < age 6-7 years) to avoid need for anesthesia.
 - Age < 6-7 years: at diagnosis and annually
 - Age ≥ 10 years: at least annually, when heart MRI cannot be done
 - Female carriers: baseline assessment early adulthood with continued surveillance (ie, initial imaging normal) every 3-5 years, when heart MRI cannot be done
 - Becker muscular dystrophy (BMD)
 - At diagnosis with continued surveillance every ≥ 5 years if initial imaging normal
 - Emery-Dreifuss muscular dystrophy (EDMD)
 - X-linked and autosomal dominant form: at diagnosis and at least annually
 - Autosomal recessive form: at diagnosis and annually
 - Myofibrillar myopathy (MFM): annually
 - Myotonic dystrophy (DM): at diagnosis and every 2-4 years
 - Barth syndrome (BTHS)-X linked recessive (only males develop disease)
 - Infant males: every 6 months
 - Age ≥ 1 year: annually
 - Limb-Girdle muscular dystrophy (LGMD): at diagnosis and every ≥ 2 years
 - Friedrich's ataxia (FA): at diagnosis and least annually

NOTE: Development of signs or symptoms of cardiac involvement necessitates more frequent assessment.

Indications for Transthoracic Echocardiography (TTE) — Pediatric-specific (< 18 Years Old) ⁽³⁵⁾

- Hypertension (see **Hypertension (Pediatric)**) (**AUC Score 9**) ⁽³⁵⁾
 - Initial evaluation: one time only
 - Persistent hypertension despite ≥ 2 medications: annually ⁽³³⁾
- Initial evaluation of renal failure (**AUC Score 7**) ⁽³⁵⁾
- Palpitations, if any **ONE** of the following criteria are met:
 - Family history at age < 50 of sudden cardiac death/arrest, pacemaker, or ICD (**AUC Score 7**) ⁽³⁵⁾

- History or family history of cardiomyopathy **(AUC Score 9)** ⁽³⁵⁾
- Chest pain, if any **ONE** of the following criteria are met:
 - Exertional chest pain **(AUC Score 8)** ⁽³⁵⁾
 - Abnormal ECG **(AUC Score 7)** ⁽³⁵⁾
 - Family history with unexplained sudden death or cardiomyopathy **(AUC Score 8)** ⁽³⁵⁾
- Syncope, if any **ONE** of the following criteria are met:
 - Abnormal ECG **(AUC Score 7)** ⁽³⁵⁾
 - Exertional syncope **(AUC Score 9)** ⁽³⁵⁾
 - Family history at age < 50 of sudden cardiac death/arrest, pacemaker, or ICD **(AUC Score 9)** ⁽³⁵⁾
 - Family history of cardiomyopathy
- Signs and/or symptoms of heart failure, including, but not limited to **(AUC Score 9)** ⁽³⁵⁾:
 - Respiratory distress
 - Poor peripheral pulses
 - Feeding difficulty
 - Decreased urine output
 - Edema
 - Hepatomegaly
- Abnormal physical findings, including any **ONE** of the following:
 - Clicks, snaps, or gallops
 - Fixed and/or abnormally split S2
 - Decreased pulses
 - Central cyanosis **(AUC Score 8)** ⁽³⁵⁾
- Arrhythmia, if supraventricular **(AUC Score 7)** or ventricular tachycardia **(AUC Score 9)** ⁽³⁵⁾
- Murmur, if meets any **ONE** of the following criteria ⁽³⁵⁾:
 - Pathologic sounding or harsh **(AUC Score 9)**
 - Diastolic **(AUC Score 9)**
 - Holosystolic or continuous **(AUC Score 9)**
 - Late systolic **(AUC Score 9)**
 - High grade ($\geq 3/6$) **(AUC Score 9)**
 - Provoked and becomes louder with changes in position **(AUC Score 9)**
 - Presumptively innocent, but in the presence of signs, symptoms, or findings of

cardiovascular disease (**AUC Score 7**)

- Abnormal basic data, including any **ONE** of the following ⁽³⁵⁾:
 - Abnormal ECG (**AUC Score 7**)
 - Abnormal cardiac biomarkers (**AUC Score 9**)
 - Desaturation on pulse oximetry (**AUC Score 9**)
 - Abnormal chest x-ray (**AUC Score 9**)
- Suspicion of structural disease, including any **ONE** of the following:
 - Premature birth where there is suspicion of a Patent Ductus Arteriosus
 - Vascular ring, based upon either difficulty breathing with stridor and eating solid foods or abnormal barium swallow or bronchoscopy (**AUC Score 7**) ⁽³⁵⁾
- Genetic & syndrome related, including any **ONE** of the following (**AUC Score 7**) ⁽³⁵⁾:
 - Genotype-positive for cardiomyopathy, family history of hypertrophic cardiomyopathy, or heritable pulmonary arterial hypertension
 - Known syndrome associated with congenital or acquired heart disease (eg, Down syndrome, Noonan syndrome, DiGeorge syndrome, Williams syndrome, Trisomy 13, Trisomy 18, Alagille syndrome, chromosomal abnormality associated with cardiovascular disease)
 - Abnormalities of visceral or cardiac situs
 - Suspected or known connective tissue diseases that are associated with congenital or acquired heart disease (eg, Marfan syndrome, Loeys-Dietz syndrome)
 - Patients with a first-degree relative with a genetic abnormality, such as cardiomyopathies (hypertrophic, dilated, arrhythmogenic right ventricular dysplasia, restrictive, left ventricular noncompaction)
- Maternal-fetal related, including any **ONE** of the following ⁽³⁵⁾:
 - Maternal infection during pregnancy or delivery with potential fetal/neonatal cardiac sequelae (**AUC Score 7**)
 - Maternal phenylketonuria (**AUC Score 7**)
 - Suspected cardiovascular abnormality on fetal echocardiogram (**AUC Score 9**)

Congenital Heart Disease Follow-Up†* — Adults and Pediatrics ⁽²⁵⁾

[†All surgical or catheter-based repairs allow **PREPROCEDURAL** evaluation and **POSTPROCEDURAL** evaluation (within 30 days)] (**AUC Score 9**)

- All lesions: for change in clinical status and/or development of new signs or symptoms (**AUC Score 9**)
- Subvalvular stenosis **plus** aortic regurgitation: dictated by the magnitude of the more significant abnormality (ie, mild stenosis with moderate regurgitation would have

surveillance interval as though stenosis were also moderate)

- Heart failure symptoms after any surgical or catheter-based repair: 3-12 months
- Incomplete or palliative repair (eg, Glenn shunt, Fontan procedure, and right ventricle-to-pulmonary artery [RV-PA] conduit): annually

NOTE: TTE may be unnecessary in a year when cardiac MRI is performed unless clinical indication warrants otherwise.

[*See tables below for specific surveillance intervals]

Infancy is defined as between birth and 2 years of age; childhood from 2-12 years of age; and adolescence from 12 to 21 years of age ⁽⁶⁰⁾

Table 1: Unrepaired Lesion Follow-Up† ⁽²⁵⁾

†Gray shading indicates lifetime surveillance interval

Unrepaired Lesion	Surveillance Intervals					
	1-4 weeks	1-3 months	3-6 months	6-12 months	1-2 years	3-5 years
Aortic Stenosis (AS) and/or aortic regurgitation (AR)	Infant with any degree of AS or AR			Child Asymptomatic ≥ moderate AS/AR (AUC Score 9)	Child Asymptomatic mild AS/AR	
Bicuspid aortic valve with ≤ mild AS/AR and no aortic dilation in a child						3 Years
Atrial septal defect (ASD)					Moderate size (6-12 mm) (AUC Score 8)	Small size (3-6 mm) (AUC Score 7)
Atrioventricular septal defect (AVSD): partial/transitional			Infant (AUC Score 9)		Child Asymptomatic (AUC Score 9)	
AVSD: complete		Infant (AUC Score 9)				

Unrepaired Lesion	Surveillance Intervals					
	1-4 weeks	1-3 months	3-6 months	6-12 months	1-2 years	3-5 years
Double outlet right ventricular (DORV): with balanced systemic and pulmonary circulation		Infant (AUC Score 9)	Child (AUC Score 9)			
Mitral regurgitation (MR)		Infant with ≥ moderate MR (AUC Score 9)		Infant with mild MR (AUC Score 9) Child with ≥ moderate MR (AUC Score 9)		Child with mild MR, with or without mitral valve prolapse (MVP) (2-5 years) (AUC Score 9)
Mitral Stenosis (MS)	Infant < 3 months with any degree MS (AUC Score 8)	Infant ≥ 3 months with ≥ moderate MS (AUC Score 9)	Infant ≥ 3 months with mild MS (AUC Score 8)		Child with mild MS (AUC Score 9)	
			3-12 months Child with ≥ moderate MS (AUC Score 9)			
Congenitally corrected transposition of the Great Arteries (ccTGA)			Infant (AUC Score 9)	≥ Moderate atrioventricular (A-V) valve regurgitation (AUC Score 9)	< Moderate A-V valve regurgitation (AUC Score 9)	
Ebstein Anomaly and Tricuspid Valve Dysplasia			Infant with ≥ moderate TR without hypoxemia (AUC Score 9)	Patient with ≥ moderate TR, stable RV size and/or function without hypoxemia (AUC Score 9)	Infant or child with mild TR (AUC Score 9)	

Unrepaired Lesion	Surveillance Intervals					
	1-4 weeks	1-3 months	3-6 months	6-12 months	1-2 years	3-5 years
Patent Ductus Arteriosus (PDA)			Infant (AUC Score 7)		Child (AUC Score 8)	Adult (AUC Score 9)
Pulmonary stenosis (PS)			Infant Mild PS (AUC Score 8) Moderate PS (AUC Score 9)		Child Mild PS (AUC Score 8) Moderate PS (AUC Score 9)	
Coarctation			Infant (AUC Score 9)		Child (AUC Score 9)	
					Adult (AUC Score 9)	
Ventricular septal defect (VSD)		Infant with $\geq$ moderate VSD (AUC Score 9)			Child with small non-muscular VSD (AUC Score 7)	Child with small muscular VSD (AUC Score 7)
						Adult small muscular VSD (AUC Score 7) small non-muscular VSD (AUC Score 8)

Unrepaired Lesion	Surveillance Intervals					
	1-4 weeks	1-3 months	3-6 months	6-12 months	1-2 years	3-5 years
Anomalous coronary arteries					Moderate to large coronary fistula (AUC Score 8)	2-5 years Small coronary fistula (AUC Score 8) Right coronary artery (RCA) arising from left coronary sinus (AUC Score 7)
Single-Ventricle Disease	Patient with balanced systemic and pulmonary circulation (AUC Score 9)					
Subvalvular AS See section above for information on surveillance intervals for stenosis plus regurgitation		Infant with any degree of stenosis (AUC Score 9)		Child with $\geq$ moderate stenosis (AUC Score 9)	Child with mild stenosis (AUC Score 9)	
				Adult with $\geq$ moderate stenosis (AUC Score 9)	Adult with mild stenosis (AUC Score 9)	
Supravalvular AS			Infant with any degree of stenosis	Child with $\geq$ moderate stenosis (AUC Score 9)	Child with mild stenosis (AUC Score 9)	2-5 years Adult with $\geq$ moderate stenosis

Unrepaired Lesion	Surveillance Intervals					
	1-4 weeks	1-3 months	3-6 months	6-12 months	1-2 years	3-5 years
			(AUC Score 9)	Adult with $\geq$ moderate stenosis (AUC Score 9)	Adult with mild stenosis (AUC Score 9)	(AUC Score 9)

Note: Despite surgical or catheter-based procedures, most patients with congenital heart disease are left with disorders or **sequelae** that are known consequences of the reparative intervention. These disorders can include arrhythmias, valvular and myocardial dysfunction, and vascular and non-cardiovascular abnormalities. These sequelae can be categorized as mild, moderate, or severe. Use clinical judgement to assess the nature of the sequelae when adjudicating cases based on the follow-up criteria below.

Table 2: Postprocedural Follow-Up† (25)

†Gray shading indicates lifetime surveillance interval

Post-procedure: Surgical or catheter-based	Surveillance Intervals					
	1-4 weeks	1-3 months	3-6 months	6-12 months	1-2 years	3-5 years
AVSD: no or mild sequelae				Within 1 st year (AUC Score 9)	After 1 st year (AUC Score 9)	
AVSD: heart failure symptoms, significant residual shunt, valvular or ventricular dysfunction, left ventricular outflow tract (LVOT) obstruction, arrhythmias and/or pulmonary hypertension			3-12 months (AUC Score 9)			
Post-procedural treatment of AS or AR with repair or replacement		Infant with $\geq$ moderate AS or AR or LV	Infant with $\leq$ mild AS or AR and no LV dysfunction	Child with $\geq$ moderate AS or AR	Child with $\leq$ mild AS or AR	

Post-procedure: Surgical or catheter-based	Surveillance Intervals					
	1-4 weeks	1-3 months	3-6 months	6-12 months	1-2 years	3-5 years
		dysfunction (AUC Score 9)	(AUC Score 9)	(AUC Score 9)	(AUC Score 9)	
ASD device closure: no or mild sequelae		Within 1 st year (AUC Score 9)	Within 1 st year (AUC Score 9)	At 1 year (AUC Score 9)		2-5 years (AUC Score 8)
ASD surgical repair: no or mild sequelae				Within 1 st year (AUC Score 9)		2-5 years (AUC Score 9)
ASD: device closure or surgical repair with residual shunt, valvular or ventricular dysfunction, arrhythmias, or pulmonary hypertension			3-12 months (AUC Score 9)			
DORV: no or mild sequelae				Within 1 st year (AUC Score 9)	1-2 Years (AUC Score 9)	
DORV: valvular or ventricular dysfunction, heart failure symptoms, outflow obstruction, arrhythmias, branch pulmonary artery stenosis, presence of RV-PA conduit			3-12 months (AUC Score 9)			
Ebstein Anomaly and Tricuspid Valve Dysplasia: no or mild sequelae					1-2 years (AUC Score 9)	

Post-procedure: Surgical or catheter-based	Surveillance Intervals					
	1-4 weeks	1-3 months	3-6 months	6-12 months	1-2 years	3-5 years
Ebstein Anomaly and Tricuspid Valve Dysplasia: valvular or ventricular dysfunction or arrhythmias				Child (AUC Score 9)	Adult (AUC Score 9)	
Ebstein Anomaly and Tricuspid Valve Dysplasia: heart failure symptoms and/or atrial arrhythmias			3-12 months (AUC Score 9)			
PS				Child with moderate or severe sequelae (AUC Score 9)	Child with no or mild sequelae (AUC Score 9)	Adult (AUC Score 9)
PS heart failure symptoms			3-12 months (AUC Score 9)			
Coarctation: no or mild sequelae			Within 1 st year (AUC Score 9)		After 1 st year (AUC Score 9)	
Coarctation: heart failure symptoms			3-12 months (AUC Score 9)			
PDA: no or mild sequelae					Annually within 1 st two years (AUC Score 8)	Five years after 1 st two years* (AUC Score 7)
PDA*:					1-2 years	

Post-procedure: Surgical or catheter-based	Surveillance Intervals					
	1-4 weeks	1-3 months	3-6 months	6-12 months	1-2 years	3-5 years
post-procedural left PA stenosis or aortic obstruction					(AUC Score 9)	
Tetralogy of Fallot (ToF): after transcatheter pulmonary valve replacement, with no or mild sequelae		1 month (AUC Score 9)	6 months (AUC Score 9)		Annually (AUC Score 9)	
ToF: conduit dysfunction valvular or ventricular dysfunction, pulmonary artery stenosis, or arrhythmias				6-12 months (AUC Score 9)		
ToF: heart failure symptoms			3-12 months (AUC Score 9)			
ccTGA: no or mild sequelae			Within 1 st year (AUC Score 9)		1-2 years (AUC Score 9)	
ccTGA: valvular or ventricular dysfunction, heart failure symptoms, outflow obstruction, or ventricular - PA conduit			3-12 months (AUC Score 9)			
D-loop transposition of the great arteries (d-TGA)		Infant with moderate sequelae (AUC Score 9)	Within 1 st year, no or mild sequelae (AUC Score 9)		1-2 years (AUC Score 9)	

Post-procedure: Surgical or catheter-based	Surveillance Intervals					
	1-4 weeks	1-3 months	3-6 months	6-12 months	1-2 years	3-5 years
d-TGA: moderate or greater valvular or ventricular dysfunction, outflow obstruction, branch pulmonary artery stenosis or arrhythmias, presence of RV-PA conduit or heart failure symptoms			3-12 months (AUC Score 9)			
d-TGA: dilated neo-aortic root and increasing Z-Score or neo-aortic regurgitation					1-2 years (AUC Score 9)	
Truncus Arteriosus (TA): no or mild sequelae		Within 1 st year (AUC Score 9)		6-12 months (AUC Score 9)		
TA: asymptomatic with moderate or greater truncal stenosis / regurgitation			3-6 months (AUC Score 9)			
TA: residual VSD, RV-PA conduit, branch pulmonary artery obstruction, or heart failure symptoms			3-12 months (AUC Score 9)			
VSD: no or mild sequelae or small residual shunt				Within 1 st year (AUC Score 8)		2-3 years (AUC Score 9)
VSD: significant residual shunt, valvular or ventricular			3-12 months (AUC Score 9)			

Post-procedure: Surgical or catheter- based	Surveillance Intervals					
	1-4 weeks	1-3 months	3-6 months	6-12 months	1-2 years	3-5 years
dysfunction, arrhythmias, or pulmonary hypertension						
Anomalous coronary arteries		Within 1 st year, no or mild sequelae (AUC Score 7)	Infant with or without ventricular or valvular dysfunction (AUC Score 9) Child or adult with ventricular or valvular dysfunction (AUC Score 9)		Annually (AUC Score 7)	
Single-Ventricle Disease: stage 1 (see <u>Staged Surgeries for Single-Ventricle Disease</u>)	Infant Asympt- omatic (AUC Score 9)					
Single-Ventricle Disease: stage 2 (see <u>Staged Surgeries for Single-Ventricle Disease</u>)		Infant or child Asympto- matic (AUC Score 9)			Adult Asympto- matic (AUC Score 9)	
Single-Ventricle Disease: stage 3 (see <u>Staged Surgeries for Single-Ventricle Disease</u>)			Within 1 st year, asympto- matic (AUC Score 9)			After 1 st year, asympto- matic (AUC Score 9)
			Patient with heart failure symptoms, or valvular or			

Post-procedure: Surgical or catheter-based	Surveillance Intervals					
	1-4 weeks	1-3 months	3-6 months	6-12 months	1-2 years	3-5 years
			ventricular dysfunction or arrhythmia (AUC Score 9)			
Subvalvular AS See section above for information on surveillance intervals plus regurgitation		Infant with $\geq$ moderate stenosis (AUC Score 9)	Infant with $\leq$ mild stenosis (AUC Score 9)		Child with $\leq$ mild stenosis and/or AR (AUC Score 9)	
					Adult with $\leq$ mild stenosis and/or AR (AUC Score 9)	
Subvalvular AS <i>continued</i>			3-12 months Child $\geq$ moderate stenosis (AUC Score 9)			
			3-12 months Adult $\geq$ moderate stenosis or heart failure symptoms (AUC Score 9)			
Supravalvular AS				Patient with $\geq$ moderate stenosis (AUC Score 9)		2-5 years Patient with $\leq$ mild stenosis

Post-procedure: Surgical or catheter-based	Surveillance Intervals					
	1-4 weeks	1-3 months	3-6 months	6-12 months	1-2 years	3-5 years
						(AUC Score 9)
APVC			Asymptomatic infant with mild or no sequelae (AUC Score 8)		Asymptomatic child with mild or no sequelae (not life-long) (AUC Score 8) Adult valvular or ventricular dysfunction, arrhythmia, residual shunt, pacemaker (life-long)	Asymptomatic adult with mild or no sequelae 3-5 years

*PDA lifetime surveillance applies only to device closure; PDA lifetime surveillance is not indicated for surgical closure.

CODING AND STANDARDS

Codes

Code	Description
93303	Transthoracic echocardiography for congenital cardiac anomalies; complete
93304	Transthoracic echocardiography for congenital cardiac anomalies; follow-up or limited study
93306	Echocardiography, transthoracic, real-time with image documentation (2D), includes M-mode recording, when performed, complete, with spectral Doppler echocardiography, and with color flow Doppler echocardiography

Code	Description
93307	Echocardiography, transthoracic, real-time with image documentation (2D), includes M-mode recording, when performed, complete, without spectral or color Doppler echocardiography
93308	Echocardiography, transthoracic, real-time with image documentation (2D), includes M-mode recording, when performed, follow-up or limited study
96374	Therapeutic, prophylactic, or diagnostic injection (specify substance or drug); intravenous push, single or initial substance/drug
+93320	Doppler echocardiography, pulsed wave and/or continuous wave with spectral display (List separately in addition to codes for echocardiographic imaging); complete
+93321	Doppler echocardiography, pulsed wave and/or continuous wave with spectral display (List separately in addition to codes for echocardiographic imaging); follow-up or limited study (List separately in addition to codes for echocardiographic imaging)
+93325	Doppler echocardiography color flow velocity mapping (List separately in addition to codes for echocardiography)
+93356	Myocardial strain imaging using speckle tracking-derived assessment of myocardial mechanics (List separately in addition to codes for echocardiography imaging)

Applicable Lines of Business

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

BACKGROUND

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

Staged Surgeries for Single-Ventricle Disease

- Stage 1 procedures include:
 - Systemic to PA shunt
 - PDA stent
 - Norwood procedure (neo-aorta construction, atrial septectomy, formation of shunt from subclavian artery or RV to PA) with systemic to PA shunt or RV to PA conduit
 - PA band or hybrid procedure including PA bands and PDA stent
- Stage 2 procedures include:
 - Superior cavopulmonary anastomosis (classic or bidirectional Glenn procedure)
 - Kawashima procedure (modified Glenn procedure)
- Stage 3 procedure: total cavopulmonary anastomosis (Fontan procedure)

Myocarditis Stages ⁽²⁷⁾

- Stage A: at risk for myocarditis (eg, cardiotoxic agent exposure, genetic predisposition, viral infection) but without symptoms and associated diagnosis
- Stage B: asymptomatic, with risk factors, and elevated troponin or evidence of myocarditis on MRI or by histopathology
- Stage C: symptomatic **and** elevated troponin **or** evidence of myocarditis on MRI **OR** by histopathology
 - Low-risk stage C characterized by meeting **ALL** the following criteria:
 - Normal LVEF
 - No late gadolinium enhancement (LGE) on cardiac magnetic resonance imaging (MRI)
 - Hemodynamic and electrical stability
 - High-risk stage C characterized by meeting **ANY** of the following criteria:
 - Reduced LVEF

- Non-sustained ventricular tachycardia (NSVT) or frequent ventricular ectopy
- Clinically significant bradyarrhythmia
- LGE on cardiac MRI
- Increased fluorodeoxyglucose (FDG) uptake on cardiac PET
- Hemodynamic instability or clinical heart failure
- Stage D: meets all criteria for high-risk stage C, **AND**:
 - Hemodynamic instability requiring vasopressors or temporary circulatory support **OR** electric instability requiring intervention

Acronyms / Abbreviations

AATS: American Association for Thoracic Surgery

ACC: American College of Cardiology

ACCF: American College of Cardiology Foundation

ACHD: Adult congenital heart disease

AHA: American Heart Association

AL: Light chain amyloidosis

AR: Aortic regurgitation

AS: Aortic stenosis

ASD: Atrial septal defect

ASE: American Society of Echocardiography

ASNC: American Society of Nuclear Cardiology

ATTR: Transthyretin amyloidosis

AUC: Appropriate use criteria

A-V: Atrioventricular

AVR: Aortic valve replacement

AVSD: Atrioventricular septal (or canal) defect

BMD: Becker muscular dystrophy

BMPR2: Bone Morphogenic Protein Receptor 2

BTBS: Barth syndrome

BNP: B-type natriuretic peptide or brain natriuretic peptide

BP: Blood pressure

CAD: Coronary artery disease

CCT: Cardiac computed tomography

ccTGA: Congenitally corrected transposition of the Great Arteries

CHD: Congenital heart disease
CMR: Cardiovascular magnetic resonance
CRT: Cardiac resynchronization therapy
CT: Computed tomography
CTA: Computed tomography angiography
CTEPH: Chronic thromboembolic pulmonary hypertension
CVA: Cerebrovascular accident
DM: Myotonic dystrophy
DMD: Duchenne muscular dystrophy
DORV: Double outlet right ventricle
d-TGA: D-Transposition of the Great Arteries
ECG: Electrocardiogram
EDMD: Emery-Dreifuss muscular dystrophy
EF: Ejection fraction
FA: Friedrich's ataxia
FDG: Fluorodeoxyglucose
GDMT: Guideline-directed medical therapy
HCM: Hypertrophic cardiomyopathy
HFrEF: Heart failure with reduced ejection fraction
HFSA: Heart Failure Society of America
HTN: Hypertension
HRS: Heart Rhythm Society
ICD: Implantable cardioverter-defibrillator
LGE: Late gadolinium enhancement
LAAO: Left atrial appendage occlusion
LGMD: Limb-Girdle muscular dystrophy
LV: Left ventricular/ventricle
LVEF: Left ventricular ejection fraction
LVH: Left ventricular hypertrophy
LVOT: Left ventricular outflow tract
MFM: Myofibrillar myopathy
MI: Myocardial infarction
MIS: Multisystem inflammatory syndrome

MR: Mitral regurgitation
MRA: Magnetic resonance angiography
MRI: Magnetic resonance imaging
MS: Mitral stenosis
MVP: Mitral valve prolapse
NSVT: Non-sustained ventricular tachycardia
PA: Pulmonary artery
PAC: Premature atrial complex
PASC: Post-acute sequelae
PET: Positron emission tomography
PDA: Patent ductus arteriosus
PFO: Patent foramen ovale
PH: Pulmonary hypertension
PS: Pulmonary stenosis
PVC: Premature ventricular contraction
RCA: Right coronary artery
RV: Right ventricular/ventricle
RVEF: Right ventricular ejection fraction
RVOT: Right ventricular outflow tract
RV-PA: Right ventricle—pulmonary artery
SCAI: Society for Cardiovascular Angiography and Interventions
SCCM: Society of Critical Care Medicine
SCCT: Society of Cardiovascular Computed Tomography
SCMR: Society for Cardiovascular Magnetic Resonance
STS: Society of Thoracic Surgeons
SVT: Supraventricular tachycardia
TA: Truncus arteriosus
TAPVC: Total anomalous pulmonary venous connection
TAVR: Transcatheter aortic valve replacement
TEE: Transesophageal echocardiogram
TGA: Transposition of great arteries
TIA: Transient ischemic attack
TIPS: Transjugular intrahepatic portosystemic shunt

TMVR: Transcatheter mitral valve repair

ToF: Tetralogy of Fallot

TTE: Transthoracic echocardiogram

VAD: Ventricular assist device

VF: Ventricular fibrillation

VSD: Ventricular septal defect

VT: Ventricular tachycardia

SUMMARY OF EVIDENCE

ACCF/ASE/AHA/ASNC/HFSA/HRS/SCAI/SCCM/SCCT/SCMR 2011 Appropriate Use Criteria for Echocardiography ⁽⁶⁾

Study Design: The study is a comprehensive report by the American College of Cardiology Appropriate Use Criteria Task Force, along with several other cardiovascular societies. It focuses on multimodality imaging in valvular heart disease, providing appropriate use criteria (AUC) for various imaging modalities.

Target Population: The target population includes patients with valvular heart disease, ranging from asymptomatic individuals at risk to those with severe symptomatic conditions. The study covers initial evaluations, follow-up testing, and imaging for surgical and transcatheter interventions.

Key Factors: The study outlines criteria for using imaging modalities like transthoracic echocardiography (TTE), transesophageal echocardiography (TEE), cardiac computed tomography (CCT), and cardiovascular magnetic resonance imaging (CMR) for initial evaluations of valvular heart disease. It provides guidelines for sequential or follow-up testing in asymptomatic or stable patients, as well as those with new or worsening symptoms. The study includes criteria for imaging before, during, and after procedures like transcatheter aortic valve replacement (TAVR) and percutaneous mitral valve repair.

ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2019 Appropriate Use Criteria for Multimodality Imaging in the Assessment of Cardiac Structure and Function in Nonvalvular Heart Disease ⁽⁷⁾

Study Design: This document is the second of two companion AUC documents, focusing on multimodality imaging in the assessment of cardiac structure and function in nonvalvular heart disease.

Target Population: The target population includes patients with structural heart disease, excluding valvular diseases. This encompasses conditions like heart failure, diseases of the aorta and pericardium, and congenital heart disease.

Key Factors: Initial Evaluation: Criteria for using imaging modalities like TTE, TEE, CMR, and CT for initial evaluations of cardiac structure and function. Guidelines for sequential or follow-up testing to clarify initial diagnostic testing, assess stability in asymptomatic patients, and evaluate

new or worsening symptoms. Criteria for imaging support in procedures like patent foramen ovale closure and left atrial appendage occlusion.

ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2017 Appropriate Use Criteria for Multimodality Imaging in Valvular Heart Disease ⁽⁹⁾

Study Design: This document presents the 2017 Appropriate Use Criteria (AUC) for multimodality imaging in valvular heart disease. It was developed by the American College of Cardiology and other related societies.

Target Population: Patients with valvular heart disease, including those undergoing initial evaluation, follow-up, and pre- and post-procedural assessments.

Key Factors: The document outlines various clinical scenarios and provides recommendations for the use of different imaging modalities such as transthoracic echocardiography (TTE), transesophageal echocardiography (TEE), cardiac computed tomography (CCT), and cardiovascular magnetic resonance imaging (CMR). The primary objective is to standardize physician decision-making and improve patient care by providing a comprehensive resource for multimodality imaging.

ANALYSIS OF EVIDENCE

Analysis ^(6,7,9):

In summary, while all three articles highlight the importance of TTE in the evaluation and management of cardiac conditions, they differ in their specific focus and scope. "Doherty et al 2017" focuses on valvular heart disease, "Doherty et al 2019" expands to nonvalvular heart disease, and "Douglas et al 2011" provides a comprehensive overview of the appropriate use of echocardiography. Each article provides valuable insights into the role of TTE in different clinical scenarios, emphasizing its importance in initial evaluation, guiding therapy, and ongoing management.

Shared Conclusions

- **Importance of TTE in Initial Evaluation:** All three articles emphasize the critical role of TTE in the initial evaluation of various cardiac conditions. TTE is considered appropriate for assessing symptoms potentially related to cardiac etiology, such as chest pain, shortness of breath, and palpitations. It is also used for evaluating suspected valvular heart disease, heart failure, and cardiomyopathies.
- **Guidance for Therapy and Management:** TTE is consistently highlighted as a valuable tool for guiding therapy and management decisions. This includes evaluating ventricular function, assessing the severity of valvular disease, and monitoring the effectiveness of treatments.
- **Follow-Up and Surveillance:** The articles agree on the importance of TTE for follow-up and surveillance in patients with known cardiac conditions. Regular TTE assessments are recommended to monitor disease progression and guide ongoing management.

POLICY HISTORY

Date	Summary
May 2026	• Updated/added AUC scores • Renamed the following sections: ○ Routine surveillance (Asymptomatic) to Asymptomatic (Normal functioning re-evaluation) ○ Perioperative Evaluation to Planned Solid Organ or Stem Cell Transplantation ○ Native Valvular Stenosis to Valvular Stenosis ○ Evaluation of Cardiac Source Cardiac Mass or Source of Emboli to Cardiac Mass or Source of Emboli ○ Ventricular Assist Devices (VADs) and Cardiac Transplantation to Ventricular Assist Devices (VADs) ○ Post Heart Failure Transplant Surveillance Imaging to Surveillance Post Heart Transplant • Clarified indications under Evaluation of Cardiac Structure and Function, Murmur or Click, Pulmonary Hypertension, and Cardiomyopathy sections • Expanded and clarified indications under Asymptomatic (Normal functioning re-evaluation), Thoracic Aortic Disease, Cardiovascular Disease in Pregnancy, and Surveillance for Neuromuscular Disorders sections • Added indications to Planned Solid Organ or Stem Cell Transplantation, Valvular Stenosis, and Hypertension (HTN) (Adult) sections, and new sections for Arrhythmogenic Right Ventricular Cardiomyopathy (ARVC) and Myocarditis • Removed redundant indication from Adult Congenital Heart Disease • Moved updated sickle cell disease indication from pediatric-specific section into Pulmonary Hypertension section • Expanded and updated Unrepaired Lesion and Postprocedural Follow-up surveillance tables; and moved several indication bullets from top of Congenital Heart Disease Follow-up section into tables • Added sections on Staged Surgeries for Single-Ventricle Disease and Myocarditis Stages to Background section

Date	Summary
July 2025	• This guideline merges and replaces two Evolent guidelines with identical clinical criteria: ECG 7337-01 for Transthoracic Echocardiogram and ECG 067 for Transthoracic Echocardiogram into Evolent Clinical Guideline 7337 for Transthoracic Echocardiogram (TTE) ◦ This guideline also merges Procedure Codes from these two Evolent guidelines • Added in general information statement regarding guideline criteria development by reputable sources, standard of care, and best practices • Updated/added AUC scores • Arrhythmias: added isolated PAC not indicated for TTE • Prosthetic/Native Valves Repair: ◦ Surgical mechanical valve: changed to every three years post implantation ◦ Surgical mitral valve repair: changed to every three years post repair • Applicable Line of Business adjusted – Medicare checked • Added a Summary of Evidence and Analysis of Evidence

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



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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 7346 for Heart Positron Emission Tomography (PET) with or without Computed Tomography (CT) for Attenuation

Guideline Number: Evolent_CG_7346	<u>Applicable Codes</u>	
<i>"Evolent" refers to Evolent Health LLC and Evolent Specialty Services, Inc.</i> <i>© 2027 Evolent. All rights Reserved.</i>		
Original Date: January 2027	Last Revised Date: June 2026	Implementation Date: January 2027

TABLE OF CONTENTS

STATEMENT	3
GENERAL INFORMATION	3
SPECIAL NOTE	3
CLINICAL REASONING	3
INDICATIONS FOR HEART PET WITH OR WITHOUT CT ATTENUATION	4
SUSPECTED CORONARY ARTERY DISEASE (CAD)	4
ABNORMAL CALCIUM SCORES	4
INCONCLUSIVE CAD EVALUATION AND OBSTRUCTIVE CAD	4
FOLLOW-UP OF POST-CORONARY REVASCULARIZATION: CORONARY ARTERY BYPASS GRAFT (CABG) OR PERCUTANEOUS CORONARY INTERVENTION (PCI)	5
FOLLOW-UP OF KNOWN CAD	6
SPECIAL DIAGNOSTIC CONDITIONS REQUIRING CORONARY EVALUATION	6
PRIOR TO ELECTIVE NON-CARDIAC SURGERY IN AN ASYMPTOMATIC PATIENT.....	8
PRIOR TO ORGAN OR STEM CELL TRANSPLANTATION.....	9
POST CARDIAC TRANSPLANTATION	9
CODING AND STANDARDS	9
CODES.....	9
APPLICABLE LINES OF BUSINESS	11
BACKGROUND	11
GENERAL OVERVIEW	11
AUC SCORE	11
DEFINITIONS.....	11
<i>Diamond Forrester Table</i>	12
<i>Global CAD Risk Calculators</i>	16
ACRONYMS/ABBREVIATIONS	16
SUMMARY OF EVIDENCE	17
ANALYSIS OF EVIDENCE.....	19

POLICY HISTORY	20
LEGAL AND COMPLIANCE	20
GUIDELINE APPROVAL	20
<i>Committee</i>	20
DISCLAIMER	20
REFERENCES.....	22

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

Indications for determining medical necessity for myocardial perfusion imaging (MPI) with appropriate preference for suitable alternatives, such as stress echocardiography (SE), when more suitable, unless otherwise stated (see **Definitions** section). Preference toward stress echocardiography will be denoted by 

Indicated when all the criteria for MPI are met **AND** there is likely to be equivocal imaging results because of body mass index (BMI), large breasts or implants, mastectomy, chest wall deformity, pleural or pericardial effusion, or prior thoracic surgery or results of a prior MPI. ^(1,2) **(AUC Score 7)** ⁽³⁾

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. ^(4–8)

INDICATIONS FOR HEART PET WITH OR WITHOUT CT ATTENUATION ⁽⁹⁾

Suspected Coronary Artery Disease (CAD) ^(10–12)

NOTE: The terms "typical," "atypical," and "non-anginal symptoms" can still be observed in medical records. However, the American College of Cardiology (ACC) has simplified its terminology to "Less likely anginal symptoms" and "Likely anginal symptoms" (see **Background**) and utilized below.

When neither SE nor MPI have provided or are expected to provide optimal imaging:

- Symptomatic patients without known CAD (**AUC Score 9**) ⁽³⁾
 - Intermediate pretest probability and unable to exercise
 - High pretest probability
 - Repeat testing in a patient with new or worsening symptoms and negative result at least one year ago **AND** meets one of the criteria above
- Asymptomatic patients without known CAD (**AUC Score 7**) ⁽³⁾
 - Previously unevaluated electrocardiogram (ECG) evidence of possible myocardial ischemia including substantial ischemic ST segment or T wave abnormalities (see **Background**) ⁽¹²⁾
 - Previously unevaluated pathologic Q waves (**AUC Score 6**) ⁽³⁾ (see **Background**)
 - Previously unevaluated complete left bundle branch block (LBBB) (**AUC Score 8**) ⁽³⁾

Abnormal Calcium Scores ^(3,10)

When neither SE nor MPI have provided, or are expected to provide, optimal imaging

- Symptomatic patient with a prior Coronary Calcium Agatston (CAC) Score of > 100. No prior MPI done within the last 12 months (**AUC Score 7**) ⁽¹⁰⁾
- Asymptomatic high global CAD risk patient with a prior CAC Score of > 100. No prior MPI done within the last 12 months ⁽¹³⁾
- Asymptomatic patient with any **ONE** of the following ⁽¹⁴⁾:
 - CAC Score > 400 ⁽¹⁵⁾
 - A qualitative assessment where 'severe' CAC 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

Inconclusive CAD Evaluation and Obstructive CAD

When neither SE nor MPI have provided or are expected to provide optimal imaging **AND** when any **ONE** of the following remains a concern:

- Exercise stress ECG with low-risk Duke Treadmill Score (DTS) ≥ 5 (see **Background**) but current symptoms indicate an intermediate or high pretest probability
- Exercise stress ECG with an intermediate DTS (**AUC Score 8**) ⁽³⁾
- Inconclusive/borderline coronary computed tomography angiography (CCTA) or Single Positron Emission Computed Tomography (SPECT) nuclear stress testing defined as 40 - 70% lesions (**AUC Score 8**) ^(3,10)
- Cardiac PET stress-rest perfusion and metabolic activity study (with F-FDG PET) is appropriate in patients with ischemic cardiomyopathy to determine myocardial viability prior to revascularization following an inconclusive SPECT ⁽¹⁰⁾ (**AUC Score 9**) ⁽³⁾
- Non-diagnostic exercise stress test with physical inability to achieve target heart rate (THR)
- Intermediate evaluation by prior stress imaging
- Coronary stenosis of unclear significance on previous coronary angiography ⁽¹⁰⁾ (**AUC Score 8**) ⁽³⁾

Follow-Up of Post-Coronary Revascularization: Coronary Artery Bypass Graft (CABG) or Percutaneous Coronary Intervention (PCI)

When neither SE nor MPI have provided, or are expected to provide, optimal imaging and **ANY** of the following ⁽¹⁰⁾:

- **Asymptomatic, follow-up stress imaging** at a minimum of 2 years post CABG, or PCI (whichever is most recent), for patients with **ONE** of the following **SE**:
 - High risk for (or with a history of) silent ischemia: Risk factors for silent ischemia include **ANY** of the following (**AUC Score 7**):
 - Diabetes with accelerated progression of CAD
 - Chronic Kidney Disease (CKD)
 - Peripheral artery disease (PAD)
 - Prior brachytherapy, in-stent restenosis (ISR)
 - Saphenous venous graft (SVG) intervention
 - Prior high-risk PCI (i.e., PCI of left main or of single remaining vessel) (**AUC Score 6**)
- Patients with high occupational risk (e.g., associated with public safety, airline and boat pilots, bus and train drivers, bridge and tunnel workers/toll collectors, police officers, and firefighters) ⁽¹⁶⁾
- New, recurrent, or worsening symptoms a patient on guideline-directed medical therapy (GDMT) (see **Background**) is an indication for stress imaging, if it will alter management ⁽¹⁰⁾

- Typical/likely angina or symptoms documented to be similar to those experienced prior to treatment (**AUC Score 8**)⁽¹⁰⁾
- Atypical/less likely angina or symptoms documented to be unlike those prior to revascularization⁽¹¹⁾ **SE**

NOTE: SE diversion is not required for post CABG patients

Follow-Up Of Known CAD⁽¹⁰⁾

When neither SE nor MPI have provided, or are expected to provide, optimal imaging 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 ($\geq 50\%$ left main coronary artery or $\geq 70\%$ left anterior descending (LAD), left circumflex (LCX) or right coronary artery (RCA)) without intervening coronary revascularization is an appropriate indication for stress imaging for:

- New, recurrent, or worsening symptoms in a patient that is medically managed and receiving GDMT (see **Background**)
 - Typical/likely anginal symptoms or symptoms documented to be similar to those prior to treatment
 - Atypical/less likely angina or symptoms documented to be unlike those prior to revascularization **SE**

Special Diagnostic Conditions Requiring Coronary Evaluation

When neither SE nor MPI have provided, or are expected to provide, optimal imaging:

- **Unevaluated Acute Coronary Syndrome**
 - Prior acute coronary syndrome (as documented in MD notes), without subsequent invasive or non-invasive coronary evaluation within the 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 or adequate stress imaging has been done within the last 12 months^(10,17) (**AUC Score 9**)⁽³⁾
- **Viability**
 - Reduced left ventricular ejection fraction (LVEF) $\leq 50\%$ requiring myocardial viability assessment to assist with decisions regarding coronary revascularization. (Diversion from PET not required when LVEF less than or equal to 40%) (**AUC Score 9**)⁽³⁾

- **Ischemia and Nonobstructive Coronary Artery Disease (INOCA)**
 - To diagnose microvascular dysfunction in patients with persistent stable anginal chest pain with suspected ischemia and nonobstructive coronary artery disease (INOCA), as documented in provider notes (no MPI diversion required).
- **Arrhythmias**
 - Ventricular arrhythmias
 - Sustained ventricular tachycardia (VT) > 100 bpm, ventricular fibrillation (VF), or exercise-induced VT, when invasive coronary arteriography is not the immediately planned test (**AUC Score 7**)⁽¹⁰⁾
 - Non-sustained VT, multiple episodes, each ≥ 3 beats at ≥ 100 bpm, frequent premature ventricular contractions (PVC) (defined as ≥ 30/hour on remote monitoring) without known cause or associated cardiac pathology, when an exercise ECG cannot be performed^(3,10)
- **Anti-arrhythmic Drug Therapy**
 - Class IC antiarrhythmic drug
 - In the intermediate (**AUC Score 6**)⁽³⁾ and high (**AUC Score 7**)⁽³⁾ global risk patient prior Class IC antiarrhythmic drug initiation (**AUC Score 7**)⁽¹⁰⁾
 - Annually for intermediate and high global risk patients taking Class IC antiarrhythmic drug (**AUC Score 7**)⁽³⁾
- **Coronary Anomaly and Aneurism**
 - Assessment of hemodynamic significance of one of the following documented conditions:
 - Anomalous coronary arteries⁽¹⁸⁾ (**AUC Score 7**)⁽³⁾
 - Muscle bridging of coronary artery⁽¹⁹⁾
 - Coronary aneurysms in Kawasaki's disease⁽²⁰⁾ (**AUC Score 8**)⁽³⁾ or due to atherosclerosis
- **Radiation**
 - Post radiation therapy to the anterior or left chest, every 5 years following initiation⁽²¹⁾
- **Cardiac Sarcoidosis**
 - May be approved as a combination study with MPI for the evaluation and treatment of sarcoidosis^(3,22,23)
 - Evaluation and therapy monitoring in patients with sarcoidosis, after documentation of suspected cardiac involvement by echo or ECG, when cardiac magnetic resonance imaging (CMR) has not been performed
 - Evaluation of suspected cardiac sarcoid, after CMR has shown equivocal or negative findings in the setting of a high clinical suspicion

- Evaluation of CMR findings showing highly probable cardiac sarcoidosis, when PET could serve to identify inflammation and the consequent potential role for immunosuppressive therapy ⁽²⁴⁾ **(AUC Score 9)** ⁽³⁾
- Initial and follow-up PET in monitoring therapy for cardiac sarcoid with immunosuppressive therapy, typically about 4 times over 2 years
- **Infective Endocarditis**
 - In suspected infective endocarditis with moderate to high probability (ie, staph bacteremia, fungemia, prosthetic heart valve, or intracardiac device), when transthoracic echocardiography (TTE) and transesophageal echocardiography (TEE) have been inconclusive with respect to diagnosis of infective endocarditis or characterization of paravalvular invasive complications ⁽²⁵⁾
- **Aortitis**
 - For diagnosis and surveillance of Aortitis, PET/Computed Tomography (CT) or PET/Magnetic Resonance Imaging (MRI) hybrid imaging ⁽²⁶⁾

NOTE: If PET/MRI study is requested, there is no specific CPT Code for this imaging study, and a Health Plan review will be required. When study is requested, there is no specific CPT Code for this imaging study and a Health Plan review will be required.

Prior To Elective Non-Cardiac Surgery in an Asymptomatic Patient ^(27,28)

When neither SE nor MPI have provided or are expected to provide optimal imaging

- 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 **(AUC Score 6)** ^(27,29–31)
 - **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 Risks:**
 - **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, and prostate surgery
 - **Low risk surgery:** Endoscopic procedures, superficial procedure, cataract surgery, and breast surgery

Prior to Organ or Stem Cell Transplantation

- Preoperative planning for organ or stem cell, 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⁾

Post Cardiac Transplantation

- Annual assessment for transplant vasculopathy, if other ischemia evaluation is not planned ⁽³³⁾

CODING AND STANDARDS

Codes

Code	Description
A9555	Rubidium Rb-82, diagnostic, per study dose, up to 60 mCi
78429	Myocardial imaging, positron emission tomography (PET), metabolic evaluation study (including ventricular wall motion[s] and/or ejection fraction[s], when performed), single study; with concurrently acquired computed tomography transmission scan
78430	Myocardial imaging, positron emission tomography (PET), perfusion study (including ventricular wall motion[s] and/or ejection fraction[s], when performed); single study, at rest or stress (exercise or pharmacologic), with concurrently acquired computed tomography transmission scan
78431	Myocardial imaging, positron emission tomography (PET), perfusion study (including ventricular wall motion[s] and/or ejection fraction[s], when performed); multiple studies at rest and stress (exercise or pharmacologic), with concurrently acquired computed tomography transmission scan
78432	Myocardial imaging, positron emission tomography (PET), combined perfusion with metabolic evaluation study (including ventricular wall motion[s] and/or ejection fraction[s], when performed), dual radiotracer (eg, myocardial viability)
78433	Myocardial imaging, positron emission tomography (PET), combined perfusion with metabolic evaluation study (including ventricular wall motion[s] and/or ejection fraction[s], when performed), dual radiotracer

Code	Description
	(eg, myocardial viability); with concurrently acquired computed tomography transmission scan
78459	Myocardial imaging, positron emission tomography (PET), metabolic evaluation study (including ventricular wall motion[s] and/or ejection fraction[s], when performed), single study
78472	Cardiac blood pool imaging, gated equilibrium; planar, single study at rest or stress (exercise and/or pharmacologic), wall motion study plus ejection fraction, with or without additional quantitative processing
78491	Myocardial imaging, positron emission tomography (PET), perfusion study (including ventricular wall motion[s] and/or ejection fraction[s], when performed); single study, at rest or stress (exercise or pharmacologic)
78492	Myocardial imaging, positron emission tomography (PET), perfusion study (including ventricular wall motion[s] and/or ejection fraction[s], when performed); multiple studies at rest and stress (exercise or pharmacologic)
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
+78434	Absolute quantitation of myocardial blood flow (AQMBF), positron emission tomography (PET), rest and pharmacologic stress (List separately in addition to code for primary procedure)

Applicable Lines of Business

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

BACKGROUND

General Overview ^(1,2)

A PET study is a diagnostic test used to evaluate blood flow to the heart. During the test, a small amount of radioactive tracer is injected into a vein. A special camera, called a gamma camera, detects the radiation released by the tracer to produce computer images of the heart. Combined with a medication, the test can help determine if there is adequate blood flow to the heart during activity versus at rest. The medication simulates exercise for patients unable to exercise on a treadmill or stationary cycle.

PET perfusion studies illustrate myocardial blood flow by demonstrating tracer uptake. PET metabolic evaluation studies are used to demonstrate inflammation produced by infiltrative disease such as sarcoidosis, but also enhance the detection of viable (hibernating) myocardium. Hybrid PET-CT scanning combines anatomical information with blood flow assessment and is useful for assessing viable myocardium, especially in chronic heart failure patients with global ischemia, or in patients with multivessel diffuse coronary artery disease as opposed to focal stenotic lesions.

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. ⁽⁵⁾

- 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 ^(10–12):

- **Asymptomatic**, for whom global risk of CAD events can be determined from coronary risk factors, using calculators available online (see **Global CAD Risk Calculators**).
- **Symptomatic**, for whom we estimate the pretest probability that their chest-related symptoms are due to clinically significant CAD (see below)
- **Angina:**
 - Beginning in 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 ⁽¹⁰⁾ to **Less Likely Anginal Symptoms** and **Likely Anginal Symptoms**.
 - **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).
 - 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.

Diamond Forrester Table ⁽³⁴⁾

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

- **Typical Angina (Definite)** is defined as including all **3** characteristics:
 - Substernal chest pain or discomfort with characteristic quality and duration
 - Provoked by exertion or emotional stress
 - Relieved by rest and/or nitroglycerine
- **Atypical Angina (Probable)** has only **2** of the above characteristics
- **Nonanginal Chest Pain/Discomfort** has only **0 - 1** of the above characteristics
- An uninterpretable baseline ECG includes ⁽¹¹⁾:
 - 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)
 - Left ventricular hypertrophy (LVH) with repolarization abnormalities, Wolff-Parkinson-White (WPW) syndrome, ventricular paced rhythm, or left bundle branch block (LBB)
 - Digitalis use with associated ST – T segment abnormalities
 - Resting HR under 50 bpm on a medication on a beta-blocker and an anticipated suboptimal workload
 - Bundle Branch Blocks (BBB)
 - Left BBB
 - Right BBB or intraventricular conduction delay (IVCD), either containing ST or T wave abnormalities (see above)

NOTE: Right bundle branch block (RBBB) with less than 1 mm ST depression at rest may be suitable for ECG treadmill testing
- 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 Without Imaging versus Stress Testing with Imaging**
 - An ECG stress test **WITHOUT** imaging (i.e., exercise treadmill ECG test) requires 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. Examples of eligible patients include ⁽¹⁰⁾:
 - The symptomatic low or intermediate pretest probability patient who can exercise

and has an interpretable ECG ⁽¹⁰⁾

- 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
- The patient requiring evaluation of syncope or presyncope during exertion ⁽³⁵⁾

NOTE: When exercise cannot be performed, pharmacologic stress can be considered.

- **Duke Exercise ECG Treadmill Score (DTS)** ⁽³⁶⁾
 - Calculates risk from ECG treadmill alone:
 - $DTS = \text{exercise time in minutes} - (5 \times \text{ST deviation in mm or } 0.1 \text{ mV increments}) - (4 \times \text{exercise angina score})$
 - Angina score being 0 = none, 1 = non-limiting, and 2 = exercise-limiting
 - The score ranges from - 25 to + 15
 - Low-risk $\geq + 5$
 - Intermediate risk from - 10 to + 4
 - High-risk $\leq - 11$
- Coronary application of PET includes evaluation of stable patients without known CAD, who fall into two categories ^(3,10,11)
 - **Asymptomatic**, for whom global risk of CAD events can be determined from coronary risk factors, using calculators available online (see Global Cardiovascular Risk Calculators).
 - **Symptomatic**, for whom we estimate the pretest probability that their chest-related symptoms are due to clinically significant ($\geq 50\%$) CAD (below)
- **Definitions of Coronary Artery Disease** ⁽¹¹⁾
 - **Coronary artery calcification (CAC)** is a marker of risk, as measured by Agatston score on coronary artery calcium imaging. It is not a diagnostic tool so much as it is a risk stratification tool. Its incorporation into global risk can be achieved by using the Multi-Ethnic Study of Atherosclerosis (MESA) risk calculator.
 - **Coronary Artery Disease (CAD)**: narrowing or blockage of the coronary arteries (blood vessels that carry blood and oxygen to the heart), usually caused by atherosclerosis (a buildup of fatty material and plaque inside the coronary arteries) which may cause chest pain, shortness of breath during exercise, and heart attacks.
 - **Ischemia-producing disease** (also called hemodynamically or functionally significant disease, for which revascularization might be appropriate) generally implies at least one of the following:
 - Demonstrable ischemic findings on stress testing (ECG or stress imaging), that are at least mild in degree ⁽³⁷⁾
 - Suggested by percentage diameter stenosis $\geq 70\%$ by angiography; intermediate

lesions are 50 – 69% ⁽³⁸⁾

- For a left main artery, suggested by a percentage stenosis $\geq 50\%$ or minimum lumen cross-sectional area on IVUS ≤ 6 square mm ^(11,39)
- Fractional flow reserve (FFR) ≤ 0.80 for a major vessel ⁽³⁷⁾
 - FFR is the distal to proximal pressure ratio across a coronary lesion during maximal hyperemia induced by either intravenous or intracoronary adenosine. Less than or equal to 0.80 is considered a significant reduction in coronary flow.
- Instantaneous Wave-Free Ratio (iFR) ≤ 0.89 for a major vessel ^(40,41)
 - iFR measures the ratio of distal coronary to aortic pressure during the wave free period of diastole, with a value ≤ 0.89 considered hemodynamically significant. ^(40,41)
- **Ischemic symptoms (angina pectoris):** tightness, heaviness, pressure, squeezing, or other discomfort in the chest or adjacent areas. Ischemia may also present with fatigue, faintness, or dyspnea.
- **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).
- Anginal Equivalent ^(11,35)
 - 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), by presentation of clinical data, such as respiratory rate, oximetry, lung exam, etc. (as well as d-dimer, chest CT(A), and/or PFTs, when appropriate), and then incorporated into the evaluation of coronary artery disease as would chest discomfort. Most syncope per se is not an anginal equivalent.
- **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.
 - **CAD Risk—Low**
 - 10-year absolute coronary or cardiovascular risk $< 10\%$
 - **CAD Risk—Moderate**
 - 10-year absolute coronary or cardiovascular risk between 10% and 20%
 - **CAD Risk—High**
 - 10-year absolute coronary or cardiovascular risk $> 20\%$

Global CAD Risk Calculators

- Framingham Cardiovascular Risk
- Reynolds Risk Score
 - Can use if there is no history of diabetes. Unique for use of family history
- Pooled Cohort Equation
- ACC/AHA Risk Calculator
- MESA Risk Calculator
 - With addition of coronary artery calcium score, for CAD-only risk

Acronyms/Abbreviations

ADLs: Activities of daily living

BMI: Body mass index

CABG: Coronary artery bypass grafting

CAC: Coronary artery calcium

CAD: Coronary artery disease

CKD: Chronic Kidney Disease

CCTA: Coronary computed tomography angiography

CMR: Cardiac magnetic resonance imaging

CT(A): Computed tomography (angiography)

DTS: Duke Treadmill Score

ECG: Electrocardiogram

FFR: Fractional flow reserve

INOCA: Ischemia and nonobtrusive coronary artery disease

ISR: In-stent restenosis

IVUS: Intravascular ultrasound

LAD: Left anterior descending

LCX: Left circumflex

LBBB: Left bundle-branch block

LVEF: Left ventricular ejection fraction

LVH: Left ventricular hypertrophy

MESA: Multi-Ethnic Study of Atherosclerosis

MET: Estimated metabolic equivalent of exercise

MI: Myocardial infarction
MPI: Myocardial perfusion imaging
MR(I): Magnetic resonance (imaging)
PCI: Percutaneous coronary intervention
PET: Positron emission tomography
PFT: Pulmonary function test
PVCs: Premature ventricular contractions
RCA: Right coronary artery
SE: Stress echocardiography
SPECT: Single-Positron Emission Computed Tomography
TEE: Transesophageal echocardiography
THR: Target heart rate
TTE: Transthoracic echocardiography
VF: Ventricular fibrillation
VT: Ventricular tachycardia
WPW: Wolff-Parkinson-White

SUMMARY OF EVIDENCE

American Society of Nuclear Cardiology and Society of Nuclear Medicine and Molecular Imaging Joint Position Statement on the Clinical Indications for Myocardial Perfusion PET⁽¹⁾

Study Design: The document is a joint position statement that summarizes the properties and clinical indications of myocardial perfusion PET. It is based on extensive clinical investigations and meta-analyses that demonstrate the advantages of PET over other noninvasive cardiac imaging modalities.

Target Population: The target population includes patients with known or suspected coronary artery disease (CAD) who meet appropriate criteria for a stress imaging test. This includes:

- Patients unable to complete a diagnostic-level exercise stress imaging study.
- Patients with prior stress imaging studies of poor quality or inconclusive results.
- High-risk patients, such as those with chronic kidney disease, diabetes mellitus, or suspected high-risk CAD.
- Young patients with established CAD who require repeated radiation-associated cardiac imaging procedures.

Key Factors:

- **High Diagnostic Accuracy:** Myocardial perfusion PET has high sensitivity and specificity for detecting obstructive CAD, outperforming other noninvasive approaches.
- **Consistent High-Quality Images:** PET images have high myocardial counts, spatial and contrast resolution, and accurate correction for tissue attenuation and scatter.
- **Low Radiation Exposure:** PET scans expose patients to less than 5 mSv, significantly lower than other radiation-based cardiac assessments.
- **Short Acquisition Protocols:** Complete rest-stress studies can be acquired in less than one hour, making it convenient for acutely ill or high-risk patients.
- **Quantification of Myocardial Blood Flow:** PET allows for the measurement of myocardial flow reserve, improving interpretation confidence and patient selection for interventions.
- **Strong Prognostic Power:** PET provides high discrimination between different levels of risk in all patient populations, including obese and non-obese individuals, men and women, diabetics, and patients with renal dysfunction.

Appropriate Use Criteria for PET Myocardial Perfusion Imaging ⁽³⁾

Study Design: The document is a consensus guideline developed by a multidisciplinary workgroup representing several medical specialty societies. It is based on a systematic review of the literature, expert opinion, and clinical practice guidelines. The study design includes the development of clinical scenarios, systematic synthesis of available evidence, individual and group ratings of clinical indications, and recommendations based on final group ratings and discussions.

Target Population: The target population includes patients with suspected or known coronary artery disease (CAD), asymptomatic patients, patients with diagnosed heart failure, patients with known or suspected cardiac sarcoidosis, patients with arrhythmias, patients with syncope, patients with coronary microvascular disease (CMD), specific populations such as those with advanced obesity or familial hypercholesterolemia, patients undergoing prior testing or procedures, patients undergoing preoperative evaluation for noncardiac surgery, and patients requiring determination of exercise level before initiation of exercise prescription or cardiac rehabilitation.

Key Factors

- **Appropriate Use Criteria (AUC):** The document outlines AUC for PET MPI in 11 sections, covering various clinical scenarios and patient populations.
- **Diagnostic and Prognostic Value:** PET MPI is highlighted for its high diagnostic accuracy, sensitivity, and specificity in detecting CAD and CMD. It provides incremental prognostic information that affects clinical decision-making and treatment options.
- **Clinical Scenarios:** The document includes detailed clinical scenarios with appropriateness scores, ranging from rarely appropriate to appropriate, based on the likelihood of PET MPI affecting clinical management and outcomes.

- **Methodology:** The AUC development process follows the RAND/UCLA Appropriateness Method, including systematic review, evidence synthesis, individual and group ratings, and consensus recommendations.
- **Outcome Data:** The document emphasizes the importance of outcome data in guiding the use of PET MPI, particularly in high-risk populations and specific clinical contexts.

ACC/AHA/ASE/ASNC/ASPC/HFSA/HRS/SCAI/SCCT/SCMR/STS 2023 Multimodality Appropriate Use Criteria for the Detection and Risk Assessment of Chronic Coronary Disease ⁽¹⁰⁾

Study Design: The study is a report by the American College of Cardiology (ACC) Solution Set Oversight Committee, in collaboration with several other cardiovascular societies. It updates the prior AUC for various cardiovascular imaging modalities, including radionuclide imaging, stress echocardiography, calcium scoring, coronary computed tomography angiography (CCTA), stress cardiac magnetic resonance (CMR), and invasive coronary angiography.

Target Population: The target population includes patients with known or suspected CCD, which encompasses stable ischemic heart disease (SIHD). The clinical scenarios cover both symptomatic and asymptomatic patients, with and without prior testing or revascularization.

Key Factors:

- **Clinical Scenarios:** The document outlines 64 clinical scenarios for the detection and risk assessment of CCD, drawn from common applications and current clinical practice guidelines.
- **Rating Process:** The clinical scenarios were rated by an independent panel using a modified Delphi process. Ratings were categorized as Appropriate (7-9), May Be Appropriate (4-6), or Rarely Appropriate (1-3).
- **Updates and Changes:** Key changes include the removal of preoperative testing scenarios, simplification of clinical scenario tables, and incorporation of new evidence and guidelines.
- **Assumptions:** The study assumes that each test is performed and interpreted by trained professionals, and that patients are receiving optimal standard care.
- **Advantages and Limitations:** The document provides a table outlining the advantages and limitations of various imaging modalities, such as echocardiography, SPECT, PET, CMR, CCTA, and invasive angiography.

ANALYSIS OF EVIDENCE

Shared Conclusions ^(1,3,10):

- **Importance of PET MPI:** All three articles emphasize the significance of PET myocardial perfusion imaging (MPI) in diagnosing and managing coronary artery disease (CAD). They highlight its high diagnostic accuracy, ability to quantify myocardial blood flow, and prognostic value.

- **Diagnostic Accuracy:** The articles agree on the high sensitivity and specificity of PET MPI for detecting obstructive CAD. They also note its superiority over other noninvasive imaging modalities in certain clinical scenarios.
- **Prognostic Value:** The prognostic power of PET MPI is a common theme. The ability to predict future cardiovascular events and guide clinical decision-making is emphasized across all three studies.
- **Clinical Utility:** The articles discuss the clinical utility of PET MPI in various patient populations, including those with suspected or known CAD, heart failure, and other cardiovascular conditions.

POLICY HISTORY

Date	Summary
June 2026	● This guideline merges and replaces Evolent Clinical Guidelines 7294 for Heart PET Scan and 7298 for Heart PET with CT for Attenuation. ● This guideline also merges the procedure codes from the above Evolent guidelines.

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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