carelon

Status: Revised

Effective Date: 10/20/2024

Doc ID: CAR01-1024.3

Last Review Date: 01/23/2024

Approval and implementation dates for specific health plans may vary. Please consult the applicable health plan for more details.

Clinical Appropriateness Guidelines

Advanced Imaging

Appropriate Use Criteria: Imaging of the Heart

Proprietary

Table of Contents

Description and Application of the Guidelines 4
General Clinical Guideline 5
Abbreviations 7
ADVANCED CARDIAC IMAGING 8
Cardiac CT with Quantitative Evaluation of Coronary Calcification 8
- Codes 8
- General Information 8
- Clinical Indications 9
- Rationale 10
- References 10

Cardiac CT for Structure and Morphology 12
- Codes 12
- General Information 12
- Clinical Indications 13
- References 15

Coronary CT Angiography (CCTA) and CT Derived Fractional Flow Reserve (FFR-CT) 18
- Codes 18
- General Information 18
- Clinical Indications 20
- References 24

MRI Cardiac 28
- Codes 28
- General Information 28
- Clinical Indications 30
- References 38

PET Myocardial Imaging 41
- Codes 41
- General Information 41
- Clinical Indications 44
- References 49

NUCLEAR CARDIOLOGY 51
Myocardial Perfusion Imaging 51
- Codes 51
- General Information 51
- Clinical Indications 53
- Rationale 56
- References 57

Infarct Imaging 60
- Codes 60
- General Information 60

Clinical Indications 61
References 61
Cardiac Blood Pool Imaging includes MUGA and First Pass Radionuclide Ventriculography 62
Codes 62
General Information 62
Clinical Indications 63
References 65
ECHOCARDIOGRAPHY 67
Resting Transthoracic Echocardiography (TTE) 67
Codes 67
General Information 67
Clinical Indications 68
References 77
Transesophageal Echocardiography (TEE) 80
Codes 80
General Information 80
Clinical Indications 81
Rationale 81
References 82
Stress Echocardiography 83
Codes 83
General Information 83
Clinical Indications 85
References 89
History 91

Description and Application of the Guidelines

The Carelon Clinical Appropriateness Guidelines (hereinafter “the Carelon Clinical Appropriateness Guidelines” or the “Guidelines”) are designed to assist providers in making the most appropriate treatment decision for a specific clinical condition for an individual. The Guidelines establish objective and evidence-based criteria for medical necessity determinations, where possible, that can be used in support of the following:

- To establish criteria for when services are medically necessary
- To assist the practitioner as an educational tool
- To encourage standardization of medical practice patterns
- To curtail the performance of inappropriate and/or duplicate services
- To address patient safety concerns
- To enhance the quality of health care
- To promote the most efficient and cost-effective use of services

The Carelon guideline development process complies with applicable accreditation and legal standards, including the requirement that the Guidelines be developed with involvement from appropriate providers with current clinical expertise relevant to the Guidelines under review and be based on the most up-to-date clinical principles and best practices. Resources reviewed include widely used treatment guidelines, randomized controlled trials or prospective cohort studies, and large systematic reviews or meta-analyses. Carelon reviews all of its Guidelines at least annually.

Carelon makes its Guidelines publicly available on its website. Copies of the Guidelines are also available upon oral or written request. Additional details, such as summaries of evidence, a list of the sources of evidence, and an explanation of the rationale that supports the adoption of the Guidelines, are included in each guideline document.

Although the Guidelines are publicly available, Carelon considers the Guidelines to be important, proprietary information of Carelon, which cannot be sold, assigned, leased, licensed, reproduced or distributed without the written consent of Carelon.

Carelon applies objective and evidence-based criteria, and takes individual circumstances and the local delivery system into account when determining the medical appropriateness of health care services. The Carelon Guidelines are just guidelines for the provision of specialty health services. These criteria are designed to guide both providers and reviewers to the most appropriate services based on a patient’s unique circumstances. In all cases, clinical judgment consistent with the standards of good medical practice should be used when applying the Guidelines. Guideline determinations are made based on the information provided at the time of the request. It is expected that medical necessity decisions may change as new 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 and for justifying and demonstrating the existence of medical necessity for the requested service. The Guidelines are not a substitute for the experience and judgment of a physician or other health care professionals. Any clinician seeking to apply or consult the Guidelines is expected to use independent medical judgment in the context of individual clinical circumstances to determine any patient’s care or treatment.

The Guidelines do not address coverage, benefit or other plan specific issues. Applicable federal and state coverage mandates take precedence over these clinical guidelines, and in the case of reviews for Medicare Advantage Plans, the Guidelines are only applied where there are not fully established CMS criteria. If requested by a health plan, Carelon will review requests based on health plan medical policy/guidelines in lieu of the Carelon Guidelines. Pharmaceuticals, radiotracers, or medical devices used in any of the diagnostic or therapeutic interventions listed in the Guidelines must be FDA approved or conditionally approved for the intended use. However, use of an FDA approved or conditionally approved product does not constitute medical necessity or guarantee reimbursement by the respective health plan.

The Guidelines may also be used by the health plan or by Carelon for purposes of provider education, or to review the medical necessity of services by any provider who has been notified of the need for medical necessity review, due to billing practices or claims that are not consistent with other providers in terms of frequency or some other manner.

General Clinical Guideline

Clinical Appropriateness Framework

Critical to any finding of clinical appropriateness under the guidelines for a specific diagnostic or therapeutic intervention are the following elements:

- Prior to any intervention, it is essential that the clinician confirm the diagnosis or establish its pretest likelihood based on a complete evaluation of the patient. This includes a history and physical examination and, where applicable, a review of relevant laboratory studies, diagnostic testing, and response to prior therapeutic intervention.
- The anticipated benefit of the recommended intervention is likely to outweigh any potential harms, including from delay or decreased access to services that may result (net benefit).
- Widely used treatment guidelines and/or current clinical literature and/or standards of medical practice should support that the recommended intervention offers the greatest net benefit among competing alternatives.
- There exists a reasonable likelihood that the intervention will change management and/or lead to an improved outcome for the patient.

Providers may be required to submit clinical documentation in support of a request for services. Such documentation must a) accurately reflect the clinical situation at the time of the requested service, and b) sufficiently document the ordering provider's clinical intent.

If these elements are not established with respect to a given request, the determination of appropriateness will most likely require a peer-to-peer conversation to understand the individual and unique facts that would justify a finding of clinical appropriateness. During the peer-to-peer conversation, factors such as patient acuity and setting of service may also be taken into account to the extent permitted by law.

Simultaneous Ordering of Multiple Diagnostic or Therapeutic Interventions

Requests for multiple diagnostic or therapeutic interventions at the same time will often require a peer-to-peer conversation to understand the individual circumstances that support the medical necessity of performing all interventions simultaneously. This is based on the fact that appropriateness of additional intervention is often dependent on the outcome of the initial intervention.

Additionally, either of the following may apply:

- Current literature and/or standards of medical practice support that one of the requested diagnostic or therapeutic interventions is more appropriate in the clinical situation presented; or
- One of the diagnostic or therapeutic interventions requested is more likely to improve patient outcomes based on current literature and/or standards of medical practice.

Repeat Diagnostic Intervention

In general, repeated testing of the same anatomic location for the same indication should be limited to evaluation following an intervention, or when there is a change in clinical status such that additional testing is required to determine next steps in management. At times, it may be necessary to repeat a test using different techniques or protocols to clarify a finding or result of the original study.

Repeated testing for the same indication using the same or similar technology may be subject to additional review or require peer-to-peer conversation in the following scenarios:

- Repeated diagnostic testing at the same facility due to technical issues
- Repeated diagnostic testing requested at a different facility due to provider preference or quality concerns

- Repeated diagnostic testing of the same anatomic area based on persistent symptoms with no clinical change, treatment, or intervention since the previous study
- Repeated diagnostic testing of the same anatomic area by different providers for the same member over a short period of time

Repeat Therapeutic Intervention

In general, repeated therapeutic intervention in the same anatomic area is considered appropriate when the prior intervention proved effective or beneficial and the expected duration of relief has lapsed. A repeat intervention requested prior to the expected duration of relief is not appropriate unless it can be confirmed that the prior intervention was never administered. Requests for on-going services may depend on completion of previously authorized services in situations where a patient's response to authorized services is relevant to a determination of clinical appropriateness.

Abbreviations

ASCVD, atherosclerotic cardiovascular disease

BMI, body mass index

CABG, coronary artery bypass grafting

CAD, coronary artery disease

CCTA, coronary CT angiography

CHF, congestive heart failure

CRT, cardiac resynchronization therapy

EKG, electrocardiogram

FFR-CT, fractional flow reserve derived from CCTA

ICD, implantable cardioverter defibrillator

LBBB, left bundle branch block

LV, left ventricular

MPI, myocardial perfusion imaging

NYHA, New York Heart Association

PCI, percutaneous coronary intervention

RBBB, right bundle branch block

SE, stress echocardiography

TEE, transesophageal echocardiogram

TTE, transthoracic echocardiogram

ADVANCED CARDIAC IMAGING

Cardiac CT with Quantitative Evaluation of Coronary Calcification

Codes

The following code list is not meant to be all-inclusive. Authorization requirements will vary by health plan. Please consult the applicable health plan for guidance on specific procedure codes.

Specific CPT codes for services should be used when available. Nonspecific or not otherwise classified codes may be subject to additional documentation requirements and review.

CPT/HCPCS

75571	Computed tomography, heart, without contrast material, with quantitative evaluation of coronary artery calcium
S8092	Electron beam CT (also known as ultrafast CT, cine CT)

General Information

Standard Anatomic Coverage

- Coronary artery imaging

Imaging Considerations

Advantages of cardiac CT for quantitative evaluation of coronary artery calcification

- Rapidly acquired exams
- Coronary artery calcification has been shown to correlate with the presence of atheromatous coronary artery disease (CAD)

Disadvantages of cardiac CT for quantitative evaluation of coronary artery calcification

- Exposure to ionizing radiation
- No role in the evaluation of patients with symptoms potentially due to CAD
- Not clear that risk stratification data provided by quantitative evaluation of coronary artery calcification impacts patient outcomes

Biosafety issues

- Ordering and imaging providers are responsible for considering safety issues prior to performing quantitative evaluation of coronary artery calcification.

Ordering issues

- Cardiac CT for quantitative evaluation of coronary artery calcification is not covered by most healthcare insurers as a screening study.
- Selection of the optimal diagnostic work-up for cardiac evaluation should be made within the context of other available studies (which include treadmill stress test, stress myocardial perfusion imaging [MPI], stress echocardiography [SE], cardiac MRI, cardiac PET imaging, and invasive cardiac/coronary

angiography), so that the resulting information facilitates patient management decisions and does not merely add a new layer of testing.

- This guideline pertains to cardiac CT for quantitative evaluation of coronary artery calcification using either electron beam CT (EBCT) or multi-detector CT (MDCT).
- This guideline does not apply to coronary CT angiography (CPT 75574).
- This guideline does not apply to cardiac CT for evaluation of cardiac structure and function (CPT 75572 and 75573).

Risk assessment

- The clinical indication listed for quantitative evaluation of coronary artery calcification includes risk assessment using the ASCVD Pooled Cohort Equations. This risk calculation tool includes consideration of the following factors.

Factors included in ASCVD Pooled Cohort Equations

Age	Sex	Race	Lipid profile	Diabetes mellitus	Hypertension	Antihypertensive medication use	Tobacco use

ASCVD = atherosclerotic cardiovascular disease

- Other coronary risk factors such as family history of premature CAD, coronary artery calcification, C-reactive protein levels, obesity, etc., are not included in the risk calculation but are thought to contribute to CAD risk.

Clinical Indications

Coronary artery calcium (CAC) testing is considered medically necessary to assist with decisions regarding management of hypercholesterolemia when ALL of the following apply:

- No known atheromatous vascular disease
- Not diabetic
- Age ≥ 40 years and ≤ 75 years
- Low-density lipoprotein (LDL) cholesterol ≥ 70 mg/dL and ≤ 190 mg/dL
- 10-year risk (using ASCVD Pooled Cohort Equations) ≥ 5% and ≤ 20%
- Patient does not have **ANY** of the following:
    - Family history of premature atherosclerotic cardiovascular disease
    - Persistently elevated low-density lipoprotein (≥ 160 mg/dL)
    - Persistently elevated triglyceride (> 175mg/dL)
    - Metabolic syndrome
    - Chronic kidney disease (eGFR 15-59 mL/min/1.73 m^2)
    - Chronic inflammatory condition
    - History of menopause before age 40 years
    - History of preeclampsia
    - High risk race/ethnicity (e.g., South Asian ancestry)
    - Markers associated with increased risk of atherosclerotic cardiovascular disease (if measured):
        - Elevated high-sensitivity C-reactive protein (≥ 2.0 mg/L)
        - Elevated lipoprotein(a) (> 50mg/dL)
        - Apolipoprotein B > 130mg/dL

- Ankle-brachial index less than 0.9

Rationale

Professional society guidelines indicate that, while coronary artery evaluation is not generally indicated in the immediate evaluation of acute chest pain in patients at low risk of CAD, coronary artery calcium scoring in low-risk patients with stable chest pain and no known CAD "is reasonable as a first-line test for excluding calcified plaque and identifying patients with a low likelihood of obstructive CAD."[8] These guidelines suggest a role for the addition of coronary artery calcium scoring in patients undergoing stress testing, but the potential benefits of this approach are based on observational registry data.[8]

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Cardiac CT for Structure and Morphology

Codes

The following code list is not meant to be all-inclusive. Authorization requirements will vary by health plan. Please consult the applicable health plan for guidance on specific procedure codes.

Specific CPT codes for services should be used when available. Nonspecific or not otherwise classified codes may be subject to additional documentation requirements and review.

CPT/HCPCS

75572	Computed tomography, heart, with contrast material, for evaluation of cardiac structure and morphology (including 3-D image post-processing, 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 3-D post-processing, assessment of left ventricular [LV] cardiac function, right ventricular [RV] structure and function and evaluation of vascular structures, if performed)

General Information

Standard Anatomic Coverage

- Heart and great vessels within the thorax

Imaging Considerations

Advantages of cardiac CT

- Rapidly acquired exams, with excellent anatomic detail afforded by most multi-detector CT scanners with 64 or more active detector rows

Disadvantages of cardiac CT

- Potential complications from use of intravascular iodinated contrast administration (see biosafety issues, below)
- Exposure to ionizing radiation
- Potential factors that may limit the image quality during acquisition of cardiac CT, such as:
    - Uncontrolled atrial or ventricular arrhythmias
    - Inability to image at a desired heart rate, which may occur despite beta blocker administration
    - Inability of the patient to comply with the requirements of scanning (patient motion during image acquisition, inability to comply with breath hold requirements, inability to lie supine, claustrophobia)
    - Because of the radiation exposure issues careful consideration should be given to other imaging modalities in pregnant women and children

Biosafety issues

- Ordering and imaging providers are responsible for considering safety issues prior to the cardiac CT exam. One of the most significant considerations is the requirement for intravascular iodinated contrast material, which may have an adverse effect on patients with a history of documented allergic contrast reactions or atopy, as well as on individuals with renal impairment, who are at greater risk for contrast-

induced nephropathy. In addition, radiation safety issues including cumulative exposure to ionizing radiation should be considered.

Ordering issues

- This guideline does not apply to coronary CT angiography (CPT 75574).
- This guideline does not apply to cardiac CT for quantitation of coronary artery calcification (CPT 75571).
- Selection of the optimal diagnostic work-up for cardiac evaluation should be made within the context of other available studies (which include transthoracic echocardiography [TTE], transesophageal echocardiography [TEE], and cardiac MRI), so that the resulting information facilitates patient management decisions and does not merely add a new layer of testing.
- There are uncommon circumstances when both cardiac CT and cardiac MRI should be ordered for the same clinical presentation. The specific rationale must be delineated at the time of request.
- In general, follow-up cardiac CT exams should be performed only when there is a clinical change, with new signs or symptoms, or specific finding(s) requiring imaging surveillance.

Clinical Indications

Congenital heart disease

Cardiac CT is considered medically necessary in **ANY** of the following scenarios:

- Evaluation of suspected or established congenital heart disease in patients whose echocardiogram is technically limited or non-diagnostic
- Further evaluation of patients whose echocardiogram suggests a new diagnosis of complex congenital heart disease
- Evaluation of complex congenital heart disease in patients who are less than one year post-surgical correction
- Evaluation of complex congenital heart disease in patients who have new or worsening symptoms and/or a change in physical examination
- Assist in surgical planning for patients with complex congenital heart disease
- Surveillance in asymptomatic patients with complex congenital heart disease who have not had cardiac MRI or cardiac CT within the preceding year
    - Cardiac MRI or transesophageal echocardiography may be preferable to cardiac CT in order to avoid radiation exposure.

Cardiomyopathy

Cardiac CT is considered medically necessary in **ANY** of the following scenarios:

- Evaluation of patients with suspected arrhythmogenic right ventricular dysplasia (ARVD) who have **ANY** of the following:
    - Severe right ventricular dysfunction on another cardiac imaging study
    - Precordial T wave inversion not associated with RBBB
    - First-degree relative with established ARVD or unexplained sudden cardiac death at age younger than 35 years
    - Ventricular tachycardia or frequent PVCs (> 500 in 24 hours or > 30 per hour)
- To assess left ventricular (LV) function in patients with suspected or established cardiomyopathy when all other noninvasive imaging is not feasible or technically suboptimal

    - Other modalities providing noninvasive evaluation of LV function include transthoracic and transesophageal echocardiography, blood pool imaging (MUGA or First pass), and cardiac MRI
- To assess right ventricular function in patients with suspected right ventricular dysfunction when all other noninvasive imaging is not feasible or technically suboptimal
    - Other modalities providing noninvasive evaluation of right ventricular function include transthoracic and transesophageal echocardiography, blood pool imaging (MUGA or First pass), and cardiac MRI

Valvular heart disease

Cardiac CT is considered medically necessary in **EITHER** of the following scenarios:

- Evaluation of suspected dysfunction of native or prosthetic cardiac valves when all other cardiac imaging options are not feasible or technically suboptimal
    - Other modalities providing noninvasive evaluation of native or prosthetic valves include transthoracic and transesophageal echocardiography, and cardiac MRI
- Evaluation of established dysfunction of native or prosthetic cardiac valves when all other cardiac imaging options are not feasible or technically suboptimal
    - Other modalities providing noninvasive evaluation of native or prosthetic valves include transthoracic and transesophageal echocardiography, and cardiac MRI

Evaluation of patients with established CAD

Cardiac CT is considered medically necessary for the following:

- Noninvasive localization of coronary bypass grafts or potential grafts (including internal mammary artery) and/or evaluation of retrosternal anatomy in patients undergoing repeat surgical revascularization

Intra-cardiac and para-cardiac masses and tumors

Cardiac CT is considered medically necessary in **ANY** of the following scenarios:

- Patients with a suspected cardiac or para-cardiac mass (thrombus, tumor, etc.) suggested by transthoracic echocardiography, transesophageal echocardiography, blood pool imaging or contrast ventriculography who have not undergone cardiac CT or cardiac MRI within the preceding 60 days
- Patients with established cardiac or para-cardiac mass (thrombus, tumor, etc.) who are clinically unstable
- Patients with established cardiac or para-cardiac mass (thrombus, tumor, etc.) who are clinically stable and have not undergone cardiac CT or cardiac MRI within the preceding year
- Patients with established cardiac or para-cardiac mass (thrombus, tumor, etc.) who have undergone treatment (chemotherapy, radiation therapy, thrombolysis, anticoagulation or surgery) within the preceding year and have not had cardiac CT or cardiac MRI within the preceding 60 days

Left atrial appendage closure device

Cardiac CT is considered medically necessary in **EITHER** of the following scenarios:

- Evaluation of cardiac anatomy prior to implantation of a left atrial appendage closure device
- Following placement of a left atrial appendage closure device, a single study may be performed as an alternative to TEE to assess for intracardiac thrombus

Cardiac aneurysm and pseudoaneurysm

Cardiac CT is considered medically necessary for evaluation of cardiac aneurysm or pseudoaneurysm.

Evaluation of pericardial conditions (pericardial effusion, constrictive pericarditis, or congenital pericardial diseases)

Cardiac CT is considered medically necessary in **ANY** of the following scenarios:

- Patients with suspected pericardial constriction
- Patients with suspected congenital pericardial disease
- Patients with suspected pericardial effusion who have undergone echocardiography deemed to be technically suboptimal in evaluation of the effusion
- Patients whose echocardiogram shows a complex pericardial effusion (loculated, containing solid material)

Evaluation of cardiac venous anatomy

Cardiac CT is considered medically necessary in **EITHER** of the following scenarios:

- For localization of the pulmonary veins in patients with chronic or paroxysmal atrial fibrillation/flutter who are being considered for ablation
- Coronary venous localization prior to implantation of a biventricular pacemaker

Evaluation of the thoracic aorta

Cardiac CT is considered medically necessary in **ANY** of the following scenarios:

- Patients with suspected thoracic aortic aneurysm/dilation who have not undergone CT or MRI of the thoracic aorta within the preceding 60 days
- Patients with confirmed thoracic aortic aneurysm/dilation with new or worsening signs/symptoms
- Ongoing surveillance of stable patients with confirmed thoracic aortic aneurysm/dilation who have not undergone surgical repair and have not had imaging of the thoracic aorta within the preceding 6 months
- Patients with suspected aortic dissection
- Patients with confirmed aortic dissection who have new or worsening symptoms
- Patients with confirmed aortic dissection in whom surgical repair is anticipated (to assist in preoperative planning)
- Ongoing surveillance of stable patients with confirmed aortic dissection who have not undergone imaging of the thoracic aorta within the preceding year
- Patients with confirmed aortic dissection or thoracic aortic aneurysm/dilation who have undergone surgical repair within the preceding year and have not undergone imaging of the thoracic aorta within the preceding 6 months
- Patients who have sustained blunt chest trauma, penetrating aortic trauma or iatrogenic trauma as a result of aortic instrumentation
- Patients being evaluated for potential transcatheter aortic valve implantation/replacement (TAVI or TAVR) provided that the patient has not undergone cardiac CT or cardiac MRI within the preceding 60 days

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Coronary CT Angiography (CCTA) and CT Derived Fractional Flow Reserve (FFR-CT)

Codes

The following code list is not meant to be all-inclusive. Authorization requirements will vary by health plan. Please consult the applicable health plan for guidance on specific procedure codes.

Specific CPT codes for services should be used when available. Nonspecific or not otherwise classified codes may be subject to additional documentation requirements and review.

CPT/HCPCS

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

General Information

Scope

- This guideline addresses the appropriate application of coronary CT angiography (CCTA) and CT derived fractional flow reserve (FFR-CT) in elective, non-emergent settings.
- It is anticipated that, consistent with current guidelines, the evaluation of patients with acute coronary syndromes (myocardial infarction and unstable angina) will occur in the emergency room or in an inpatient setting. CCTA or FFR-CT performed in these practice settings is not included in this preauthorization program and is therefore not addressed in these guidelines.

Pretest Probability and CAD Risk Assessment

Reliability of noninvasive testing in accurately diagnosing or excluding CAD is dependent upon the likelihood of disease, which takes into account both **pretest probability** and **atherosclerotic disease risk**.

In those with low likelihood of disease, there is an unacceptably high rate of false-positive results, thus rendering these tests unreliable and potentially harmful.

Pretest probability may be estimated based on the quality of symptoms, age, and gender.

- Cardiac chest pain is centrally located, provoked by stress (exercise or emotional), and relieved by rest
- Possible cardiac chest pain has two of the three characteristics associated with cardiac chest pain
- Non-cardiac chest pain has one (or none) of the three characteristics associated with cardiac chest pain

Table 1 below shows the pretest probability of obstructive CAD for patients presenting with chest pain and dyspnea stratified by age, gender, and the nature of the symptoms.

Table 1. Pretest Probability (%) of CAD by Age, Gender, and Symptoms

	Cardiac	Cardiac	Possible cardiac	Possible cardiac	Noncardiac	Noncardiac	Dyspnea[#]	Dyspnea[#]

Age (years)	Male	Female	Male	Female	Male	Female	Male	Female
30-39	3	5	4	3	1	1	0	3
40-49	22	10	10	6	3	2	12	3
50-59	32	13	17	6	11	3	20	9
60-69	44	16	26	11	22	6	27	14
70+	52	27	34	19	24	10	32	12

#Applies to patients who have dyspnea without chest pain

Adapted from Knuuti J, Wijns W, Saraste A, et al. 2019 ESC guidelines for the diagnosis and management of chronic coronary syndromes. Eur Heart J. 2020;41: 407–477.

Atherosclerotic disease risk

The atherosclerotic cardiovascular disease (ASCVD) pooled cohort equations risk calculation tool is used to estimate risk of atherosclerotic cardiovascular disease. This tool, which is endorsed by several professional societies, incorporates age, gender, race, several clinical conditions known to affect ASCVD risk (including diabetes, dyslipidemia, hypertension), and tobacco use.

Uses of CCTA

- CCTA provides direct images of the coronary arteries (anatomical imaging); as such, it differs from more established noninvasive approaches to evaluation of the coronary arteries. Both stress myocardial perfusion imaging (MPI) and stress echocardiography (SE), for example, do not directly image the coronary arteries, but instead evaluate a parameter which is thought to reflect coronary blood flow to the myocardium and thereby infer the presence (or absence) of coronary stenosis (physiological imaging). In the case of MPI, myocardial uptake of an isotope is evaluated; whereas with SE, decreased myocardial contractile reserve is assumed to be ischemic and therefore indicative of coronary stenosis.
- CCTA is one of several noninvasive approaches to the evaluation of the patient with suspected or established coronary artery disease (CAD). In addition to the clinical scenario leading to the need for noninvasive CAD evaluation, clinicians should consider regional variation in availability, technical expertise and interpretive proficiency in selecting the optimal approach to testing.
- The primary use of CCTA is in the diagnosis, exclusion or evaluation of obstructive CAD.
- CCTA is also used for management of established CAD.
- CCTA is the approach of choice in patients with suspected anomalous coronary arteries.

Imaging Considerations

- A recent electrocardiogram (EKG) is strongly recommended, preferably within 30 days of request for CCTA. The findings on the resting EKG may be important in determining the need for imaging, the selection of the appropriate imaging protocol, and may also show evidence of ischemia at rest or interval myocardial infarction.
- CCTA has been compared to both SE and MPI and has been found to be non-inferior, or superior, depending on the study and the endpoints evaluated.
- CCTA offers advantages over older approaches including shorter patient throughput times and lower radiation exposure (in the case of MPI). Furthermore, the negative predictive value of CCTA is very high (93%-100%).
- Limitations of CCTA include
    - Exposure to ionizing radiation
    - Need to use iodinated contrast agents (which may limit use in patients with renal impairment)

    - Reduction of image quality in morbidly obese patients, those with heavy coronary calcium burdens and those with smaller coronary stents
    - Beta blockers are frequently required to slow heart rate
    - Claustrophobic patients may have difficulty with scanning protocols
- FFR-CT adds a physiological dimension to CCTA such that coronary stenosis can be visualized anatomically and then evaluated for flow-limiting significance. This has the potential to expand the clinical application of CCTA and to assist with decisions regarding subsequent care including the need for coronary angiography, the likelihood of benefit from revascularization, etc. Recent literature comparing CCTA combined with FFR-CT to traditional noninvasive CAD evaluation has signaled that the former approach is non-inferior in terms of clinical endpoints and may offer advantages in terms of cost of care and radiation exposure.

Clinical Indications

Indications are organized as follows:

CCTA

Suspected CAD in symptomatic patients

Established CAD in symptomatic patients

Established or suspected CAD

Patients who have undergone cardiac transplantation

New onset arrhythmia

CHF or LV systolic dysfunction

Request prompted by abnormal or inconclusive test:

Abnormal resting EKG

Abnormal exercise EKG test

Abnormal stress imaging test

Preoperative evaluation for cardiac valve surgery

Preoperative cardiac evaluation for non-cardiac surgery (includes surveillance prior to solid organ transplant)

Miscellaneous indications for CCTA

Inability to perform exercise treadmill test

Kawasaki disease

Congenital coronary anomalies

FFR-CT

Indications for CCTA

Suspected CAD in symptomatic patients who have not had evaluation for CAD within the preceding 60 days

CCTA is considered medically necessary in **ANY** of the following scenarios:

- Chest pain with or without other symptoms of myocardial ischemia
    - With pretest probability of CAD > 15% (Table 1)
- Patients without chest pain whose predominant symptom is dyspnea
    - With pretest probability of CAD > 15% (Table 1)

- Patients with any cardiac symptom who have diseases/conditions with which CAD commonly coexists, such as **ANY** of the following:
    - Abdominal aortic aneurysm
    - Established and symptomatic peripheral vascular disease
    - Prior history of stroke, transient ischemic attack (TIA), carotid endarterectomy (CEA), or high-grade carotid stenosis (> 70%)
    - Chronic kidney disease

Established flow-limiting CAD in patients who have new or worsening symptoms

CCTA is considered medically necessary in the following scenario:

- Patients whose symptoms persist despite maximal anti-ischemic medical therapy or contraindication thereto
    - Patients with established CAD and typical angina pectoris despite maximal anti-ischemic therapy may be better served with invasive coronary angiography

Established or suspected CAD

CCTA is considered medically necessary in **ANY** of the following scenarios:

Patients who have undergone cardiac transplantation

- With new or worsening cardiac symptoms
- With new or worsening physical examination abnormalities
- Clinically stable patients who have not had evaluation for CAD in the preceding year

Patients (symptomatic or asymptomatic) with ANY of the following new onset arrhythmias who have not had evaluation for CAD since the arrhythmia was recognized

- Sustained (lasting more than 30 seconds) or nonsustained (more than 3 beats but terminating within 30 seconds) ventricular tachycardia
- Atrial fibrillation or flutter and high or intermediate risk of CAD (using ASCVD Pooled Cohort Equations)
- Atrial fibrillation or flutter and established CAD
- Frequent premature ventricular contractions (PVC) defined as more than 30 PVCs per hour on ambulatory EKG (Holter) monitoring
    - CCTA is not clinically indicated for evaluation of infrequent premature atrial or ventricular depolarizations

Patients (symptomatic or asymptomatic) with new onset congestive heart failure (CHF) or recently recognized LV systolic dysfunction who have not had evaluation for CAD since the onset of LV dysfunction/CHF

- For patients in this category with established CAD, or those with suspected CAD whose CAD risk (using ASCVD Pooled Cohort Equations) is high, coronary angiography may be more appropriate than noninvasive evaluation

Abnormal resting EKG

- Patients with **ANY** of the following newly recognized and not previously evaluated resting EKG changes:
    - Left bundle branch block
    - ST depression ≥ 1 mm
    - Left ventricular (LV) hypertrophy with repolarization abnormality

- Patients who would otherwise undergo exercise EKG testing (without imaging) but have **ANY** of the following resting EKG findings that would render the interpretation of an exercise EKG test difficult or impossible:
    - Left bundle branch block
    - Ventricular paced rhythm
    - Left ventricular hypertrophy with repolarization abnormality
    - Digoxin effect
    - ST depression ≥ 1 mm on a recent EKG (within the past 30 days)
    - Pre-excitation syndromes (e.g., Wolff-Parkinson-White syndrome)

Patients with abnormal exercise treadmill test (performed without imaging) who have not undergone evaluation for CAD since the treadmill test

- Abnormal findings on an exercise treadmill test include chest pain, ST segment change, abnormal blood pressure response, or complex ventricular arrhythmias

Patients who have undergone recent (within the past 60 days) stress testing with adjunctive imaging (MPI, SE, perfusion PET, stress MRI)

- When the stress imaging test is technically suboptimal, technically limited, inconclusive, indeterminate, or equivocal, such that myocardial ischemia cannot be adequately excluded
    - A stress imaging test is deemed to be abnormal when there are abnormalities on the imaging portion of the test. Electrocardiographic abnormalities without imaging evidence of ischemia do not render a stress imaging test abnormal.
- When the stress imaging test is abnormal and **ALL** of the following apply:
    - The stress test demonstrates moderate or severe ischemia
    - CCTA is requested to exclude left main CAD
    - In the absence of left main CAD GDMT will be instituted
    - Invasive coronary angiography will be reserved for persistent symptoms on GDMT

Preoperative evaluation of patients undergoing non-coronary cardiac valve surgery

- Patients undergoing evaluation for transcatheter aortic valve implantation/replacement (TAVI or TAVR) at low risk for CAD (using ASCVD Pooled Cohort Equations) to avoid invasive angiography, where all the necessary preoperative information can be obtained using cardiac CT
- Patients undergoing evaluation for valve surgery (not including TAVR) at low or intermediate risk for CAD (using ASCVD Pooled Cohort Equations)

Preoperative cardiac evaluation of patients undergoing non-emergency non-cardiac surgery (includes surveillance for CAD in those awaiting solid organ transplant)

Note: It is assumed that those who require emergency surgery will undergo inpatient preoperative evaluation.

Prior to considering elective surgery, patients with active cardiac conditions such as unstable coronary syndromes (unstable angina), decompensated heart failure (NYHA class IV, worsening or new onset heart failure), significant arrhythmias (third degree AV block Mobitz II AV block, uncontrolled supraventricular arrhythmia, symptomatic ventricular arrhythmias, ventricular tachycardia), symptomatic bradycardia or severe stenotic valvular lesions should be evaluated and managed per ACC/AHA guidelines. That evaluation may include CCTA.

- **Low-risk surgery** (endoscopic procedures, superficial procedures, cataract surgery, breast surgery, ambulatory surgery)
    - Provided that there are no active cardiac conditions (as outlined above), CCTA prior to low-risk surgery is considered **not medically necessary**

- **Intermediate-risk surgery (including but not limited to intraperitoneal and intrathoracic surgery, carotid** endarterectomy, head and neck surgery, orthopedic surgery, prostate surgery, gastric bypass surgery) or **high-risk surgery** (including but not limited to aortic and other major vascular surgery, peripheral vascular surgery) when **BOTH** of the following apply:
    - Patient has not had a negative evaluation for CAD or a coronary revascularization procedure within the previous one (1) year
    - At least **ONE** of the following applies:
        - Patient has established CAD (prior MI, prior PCI or CABG) or presumed CAD (Q waves on EKG, abnormal MPI, SE, or cardiac PET)
        - Patient has compensated heart failure or prior history of CHF
        - Patient has diabetes mellitus
        - Patient has chronic kidney disease
        - Patient has a history of cerebrovascular disease (TIA, stroke, or documented carotid stenosis requiring carotid endarterectomy)
        - Patient is unable to walk on a treadmill for reasons other than obesity
- **Patients awaiting solid organ transplant**
    - Asymptomatic patients who have not undergone evaluation for CAD within the preceding one (1) year
    - Patients with symptoms consistent with myocardial ischemia

Miscellaneous indications for CCTA

CCTA is considered medically necessary in **ANY** of the following scenarios:

Inability to perform exercise EKG test

- Patients who would otherwise undergo exercise EKG testing (without imaging) but are unable (for reasons other than obesity) to perform exercise to a degree that would yield a diagnostic test. This provision includes patients with musculoskeletal, neurological or pulmonary limitation.

Established Kawasaki disease

- Periodic surveillance up to one year following diagnosis when previous imaging study reveals **ANY** of the following:
    - Coronary abnormalities
    - Left ventricular dysfunction
    - Pericardial effusion
    - Valvular regurgitation (other than trace or trivial regurgitation)
    - Aortic dilation
- Annual evaluation in patients who have small or medium-sized coronary artery aneurysms
- Semiannual evaluation (every 6 months) in patients who have large or giant coronary artery aneurysms, or coronary artery obstruction

Congenital coronary artery anomalies

- Evaluation of suspected congenital anomalies of the coronary arteries in **ANY** of the following scenarios:
    - Exertional syncope
    - History of anomalous coronary artery in a first-degree relative

- Following coronary angiography which failed to adequately define the origin or course of a coronary artery
- Coronary ostia appear to be abnormally positioned on echocardiography

Indications for FFR-CT

FFR-CT is considered medically necessary when **ALL** of the following criteria are met:

- Patient has symptoms consistent with myocardial ischemia
- Symptoms persist despite maximal GDMT
- CCTA has been performed in the preceding 90 days
- There is at least one 40%-90% coronary stenosis located in the proximal or middle segment of a major native coronary artery or a named branch thereof

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MRI Cardiac

Codes

The following code list is not meant to be all-inclusive. Authorization requirements will vary by health plan. Please consult the applicable health plan for guidance on specific procedure codes.

Specific CPT codes for services should be used when available. Nonspecific or not otherwise classified codes may be subject to additional documentation requirements and review.

CPT/HCPCS

75557	Cardiac MRI for morphology and function, without contrast material
75559	Cardiac MRI for morphology and function, without contrast material; with stress imaging
75561	Cardiac MRI for morphology and function, without contrast material, followed by contrast material
75563	Cardiac MRI for morphology and function, without contrast material, followed by contrast material; with stress imaging
75565	Cardiac MRI for velocity flow mapping (List separately in addition to code for primary procedure)

General Information

Coding Considerations

- Only one procedure in the series 75557-75563 is appropriately reported per session.

Scope

- This guideline addresses the appropriate use of cardiac MR imaging in elective, non-emergent settings.
- It is anticipated that, consistent with current guidelines, the evaluation of patients with acute coronary syndromes (myocardial infarction and unstable angina) will occur in the emergency room or in an inpatient setting. Cardiac MRI performed in these practice settings is not included in this preauthorization program and is therefore not addressed in these guidelines.

Pretest Probability and CAD Risk Assessment

Reliability of noninvasive testing in accurately diagnosing or excluding CAD is dependent upon the likelihood of disease, which takes into account both **pretest probability** and **atherosclerotic disease risk.**

In those with low likelihood of disease, there is an unacceptably high rate of false-positive results, thus rendering these tests unreliable and potentially harmful.

Pretest probability may be estimated based on the quality of symptoms, age, and gender.

- Cardiac chest pain is centrally located, provoked by stress (exercise or emotional), and relieved by rest
- Possible cardiac chest pain has two of the three characteristics associated with cardiac chest pain
- Non-cardiac chest pain has one (or none) of the three characteristics associated with cardiac chest pain

Table 1 below shows the pretest probability of obstructive CAD for patients presenting with chest pain and dyspnea stratified by age, gender, and the nature of the symptoms.

Table 1. Pretest Probability (%) of CAD by Age, Gender, and Symptoms

	Cardiac	Cardiac	Possible cardiac	Possible cardiac	Noncardiac	Noncardiac	Dyspnea[#]	Dyspnea[#]
Age (years)	Male	Female	Male	Female	Male	Female	Male	Female
30-39	3	5	4	3	1	1	0	3
40-49	22	10	10	6	3	2	12	3
50-59	32	13	17	6	11	3	20	9
60-69	44	16	26	11	22	6	27	14
70+	52	27	34	19	24	10	32	12

#Applies to patients who have dyspnea without chest pain

Adapted from Knuuti J, Wijns W, Saraste A, et al. 2019 ESC guidelines for the diagnosis and management of chronic coronary syndromes. Eur Heart J. 2020;41: 407–477.

Atherosclerotic disease risk

The ASCVD Pooled Cohort Equations risk calculation tool is used to estimate risk of atherosclerotic cardiovascular disease. This tool, which is endorsed by several professional societies, incorporates age, gender, race, several clinical conditions known to affect ASCVD risk (including diabetes, dyslipidemia, hypertension), and tobacco use.

Uses of Cardiac MRI

- Stress Cardiac MRI is used in the diagnosis, exclusion or evaluation of obstructive CAD.
- Stress Cardiac MRI is one of several noninvasive approaches to the evaluation of the patient with suspected or established CAD. In addition to the clinical scenario leading to the need for noninvasive CAD evaluation, clinicians should consider regional variation in availability, technical expertise and interpretive proficiency in selecting the optimal approach to testing.
- Cardiac MRI is also used in the evaluation of cardiac structure and function including assessment of ventricular size and function, evaluation of valvular disease, congenital heart disease, myocardial viability, infiltrative diseases, and cardiac masses.
- In many scenarios, MRI is indicated following inconclusive echocardiography although some disease states are best evaluated using MRI as the initial approach.

Imaging Considerations

- Whenever possible and clinically appropriate, exercise stress testing should be used in preference to pharmacological testing. However, for patients who are unable to exercise or who have baseline EKG abnormalities which make pharmacological testing preferable, stress MRI imaging becomes an acceptable first-line testing strategy
- A resting EKG is strongly recommended, preferably within 30 days of the request for stress cardiac MRI, as the findings may determine the optimal diagnostic approach. For example, resting ischemic changes or evidence of recent myocardial infarction may significantly alter the testing strategy
- As with other cardiac imaging modalities, the acquisition of images is frequently gated to the electrocardiogram. Thus, in patients with irregular heart rhythms, image quality may be suboptimal.
- Selection of the optimal noninvasive testing should be made so that the resulting information facilitates patient management decisions and does not simply add a new layer of testing
- Ordering and imaging providers are responsible for considering biosafety issues prior to MRI examination, to ensure patient safety. Among the generally recognized contraindications to MRI exam performance are permanent pacemakers (some newer models are MRI compatible) or implantable

cardioverter defibrillators (ICD), intracranial aneurysm surgical clips that are not compatible with MR imaging, as well as other devices considered unsafe in MRI scanners (including certain implanted materials in the patient as well as external equipment, such as portable oxygen tanks).

- Contrast utilization is at the discretion of the ordering and imaging providers.

Clinical Indications

Indications are organized as follows:

Stress Cardiac MRI

Suspected CAD in symptomatic patients

Established CAD in asymptomatic patients

Surveillance following revascularization

Follow-up to acute coronary syndrome

Evaluation of myocardial viability

Established CAD in symptomatic patients

Established or suspected CAD

Patients who have undergone cardiac transplantation

New onset arrhythmia

CHF or LV systolic dysfunction

Request prompted by abnormal or inconclusive test:

Abnormal resting EKG

Abnormal exercise EKG test

Abnormal stress imaging test

Preoperative cardiac evaluation for non-cardiac surgery (includes surveillance prior to solid organ transplant)

Miscellaneous indications

Inability to perform exercise treadmill test

Kawasaki disease

Prior to initiation of Interleukin-2

Resting MRI

Myocarditis

Cardiomyopathy

Cardiac aneurysm and pseudoaneurysm

Congenital heart disease

Valvular heart disease

Intra-cardiac and para-cardiac masses and tumors

Evaluation of cardiac venous anatomy

Evaluation of pericardial conditions

Evaluation of the thoracic aorta

Indications for Stress Cardiac MRI

Stress cardiac MRI is appropriate as the initial noninvasive stress imaging test when pharmacological testing would be preferable (scenarios in which this applies are defined above).

Suspected CAD in symptomatic patients who have not had evaluation for CAD within the preceding 60 days

Cardiac MRI is considered medically necessary in **ANY** of the following scenarios:

- Chest pain with or without other symptoms of myocardial ischemia
    - With pretest probability of CAD > 15% (Table 1)
- Patients without chest pain whose predominant symptom is dyspnea
    - With pretest probability of CAD > 15% (Table 1)
- Patients with any cardiac symptom who have diseases/conditions with which CAD commonly coexists, such as **ANY** of the following:
    - Abdominal aortic aneurysm
    - Established and symptomatic peripheral vascular disease
    - Prior history of stroke, transient ischemic attack (TIA), carotid endarterectomy (CEA), or high-grade carotid stenosis (> 70%)
    - Chronic kidney disease

Established flow-limiting CAD in asymptomatic patients

Cardiac MRI is considered medically necessary in **ANY** of the following scenarios:

- Surveillance following coronary revascularization as follows
    - Evaluation of stable patients who have undergone CABG more than 5 years previously and have not had an evaluation for CAD within the past 2 years
        - Stable patients whose revascularization has been incomplete may undergo Cardiac MRI 3 years following the procedure and every 2 years thereafter
- Patients who have had acute coronary syndrome within the preceding 90 days, did not undergo coronary angiography at the time of the acute event, and have not had evaluation for CAD since
- To establish myocardial viability in patients who are candidates for revascularization and have left ventricular (LV) systolic dysfunction (LV ejection fraction < 55%)

Established flow-limiting CAD in patients who have new or worsening symptoms

Cardiac MRI is considered medically necessary in **EITHER** of the following scenarios:

- Patients whose symptoms persist despite maximal anti-ischemic medical therapy or contraindication thereto
    - Patients with established CAD and typical angina pectoris despite maximal anti-ischemic therapy may be better served with invasive coronary angiography
- To establish myocardial viability in patients who are candidates for revascularization and have LV systolic dysfunction (LV ejection fraction < 55%)

Established or suspected CAD

Cardiac MRI is considered medically necessary in **ANY** of the following scenarios:

Patients who have undergone cardiac transplantation

- With new or worsening cardiac symptoms
- With new or worsening physical examination abnormalities
- Clinically stable patients who have not had evaluation for CAD in the preceding year

Patients (symptomatic or asymptomatic) with ANY of the following new onset arrhythmias who have not had evaluation for CAD since the arrhythmia was recognized

- Sustained (lasting more than 30 seconds) or nonsustained (more than 3 beats but terminating within 30 seconds) ventricular tachycardia
- Atrial fibrillation or flutter and high or intermediate risk of CAD (using ASCVD Pooled Cohort Equations)
- Atrial fibrillation or flutter and established CAD
- Frequent premature ventricular contractions (PVC) defined as more than 30 PVCs per hour on ambulatory EKG (Holter) monitoring
    - Cardiac MRI is not clinically indicated for evaluation of infrequent premature atrial or ventricular depolarizations

Patients (symptomatic or asymptomatic) with new onset CHF or recently recognized LV systolic dysfunction who have not had evaluation for CAD since the onset of LV dysfunction/CHF

- For patients in this category with established CAD, or those with suspected CAD whose CAD risk (using ASCVD Pooled Cohort Equations) is high, coronary angiography may be more appropriate than noninvasive evaluation

Abnormal resting EKG

- Patients with **ANY** of the following newly recognized and not previously evaluated resting EKG changes
    - Left bundle branch block
    - ST depression ≥ 1 mm
    - Left ventricular hypertrophy with repolarization abnormality
- Patients who would otherwise undergo exercise EKG testing (without imaging) but have **ANY** of the following resting EKG findings that would render the interpretation of an exercise EKG test difficult or impossible:
    - Left bundle branch block
    - Ventricular paced rhythm
    - Left ventricular hypertrophy with repolarization abnormality
    - Digoxin effect
    - ST depression ≥ 1 mm on a recent EKG (within the past 30 days)
    - Pre-excitation syndromes (e.g., Wolff-Parkinson-White syndrome)

Patients with abnormal exercise treadmill test (performed without imaging) who have not undergone evaluation for CAD since the treadmill test

- Abnormal findings on an exercise treadmill test include chest pain, ST segment change, abnormal blood pressure response, or complex ventricular arrhythmias

Patients who have undergone recent (within the past 60 days) stress testing with adjunctive imaging (SE, MPI, Perfusion PET)

- When the stress imaging test is technically suboptimal, technically limited, inconclusive, indeterminate, or equivocal, such that myocardial ischemia cannot be adequately excluded
    - Cardiac MRI is not appropriate for patients who have had a recent normal or abnormal stress imaging test
    - A stress imaging test is deemed to be abnormal when there are abnormalities on the imaging portion of the test. Electrocardiographic abnormalities without imaging evidence of ischemia do not render a stress imaging test abnormal.

Preoperative cardiac evaluation of patients undergoing non-emergency non-cardiac surgery (includes surveillance for CAD in patients awaiting solid organ transplant)

Note: It is assumed that those who require emergency surgery will undergo inpatient preoperative evaluation.

Prior to considering elective surgery, patients with active cardiac conditions such as unstable coronary syndromes (unstable angina), decompensated heart failure (NYHA class IV, worsening or new onset heart failure), significant arrhythmias (third degree AV block Mobitz II AV block, uncontrolled supraventricular arrhythmia, symptomatic ventricular arrhythmias, ventricular tachycardia), symptomatic bradycardia or severe stenotic valvular lesions should be evaluated and managed per ACC/AHA guidelines. That evaluation may include Cardiac MRI.

- **Low-risk surgery** (endoscopic procedures, superficial procedures, cataract surgery, breast surgery, ambulatory surgery)
    - Provided that there are no active cardiac conditions (as outlined above), Cardiac MRI prior to low-risk surgery is considered **not medically necessary**
- **Intermediate-risk surgery** (including but not limited to intraperitoneal and intrathoracic surgery, carotid endarterectomy, head and neck surgery, orthopedic surgery, prostate surgery, gastric bypass surgery) or **high-risk surgery** (including but not limited to aortic and other major vascular surgery, peripheral vascular surgery) when **BOTH** of the following apply:
    - Patient has not had a negative evaluation for CAD or a coronary revascularization procedure within the previous one (1) year
    - At least **ONE** of the following applies:
        - Patient has established CAD (prior MI, prior PCI or CABG) or presumed CAD (Q waves on EKG, abnormal MPI, SE, or cardiac PET)
        - Patient has compensated heart failure or prior history of CHF
        - Patient has diabetes mellitus
        - Patient has chronic kidney disease
        - Patient has a history of cerebrovascular disease (TIA, stroke, or documented carotid stenosis requiring carotid endarterectomy)
        - Patient is unable to walk on a treadmill for reasons other than obesity
- **Patients awaiting solid organ transplant**
    - Asymptomatic patients who have not undergone evaluation for CAD within the preceding one (1) year
    - Patients with symptoms consistent with myocardial ischemia

Miscellaneous indications for stress cardiac MRI

Cardiac MRI is considered medically necessary in **ANY** of the following scenarios:

Inability to perform exercise EKG test

- Patients who would otherwise undergo exercise EKG testing (without imaging) but are unable (for reasons other than obesity) to perform exercise to a degree that would yield a diagnostic test. This provision includes patients with musculoskeletal, neurological or pulmonary limitation.

Established Kawasaki disease

- Periodic surveillance up to one year following diagnosis when previous imaging study reveals **ANY** of the following:
    - Coronary abnormalities
    - Left ventricular dysfunction
    - Pericardial effusion

    - Valvular regurgitation (other than trace or trivial regurgitation)
    - Aortic dilation
- Annual evaluation in patients who have small or medium-sized coronary artery aneurysms
- Semiannual evaluation (every 6 months) in patients who have large or giant coronary artery aneurysms, or coronary artery obstruction

Prior to initiation of Interleukin-2

- When a decision has been made to treat the patient with Interleukin-2

Rationale

Stress testing with imaging (which includes SPECT myocardial perfusion imaging, perfusion PET, stress cardiac MRI, and stress echocardiography) is useful in select patients with suspected or established CAD. In general, the choice of modality is at the discretion of the ordering provider, although imaging modalities which cannot be combined with exercise stress (PET and MRI) should be reserved for those unable to exercise and therefore require pharmacological testing. Cardiac MRI may be considered in the evaluation of suspected CAD in symptomatic patients with pretest probability > 15% or in those with established diagnosis of other conditions commonly associated with CAD. In evaluation of patients with established CAD, surveillance following CABG (but not PCI), evaluation of myocardial viability, and evaluation following acute coronary syndrome (when coronary angiography has not been performed at the time of the acute event) are reasonable indications for stress testing with adjunctive imaging. Symptomatic patients with established CAD should be treated with GDMT before stress testing with imaging. Carelon Guidelines for the use of stress cardiac MRI in CAD are in concordance with guidelines developed by multiple professional societies.[19,54]

A multicenter, randomized trial evaluated routine functional testing compared with standard care for guiding follow-up of high-risk patients after PCI. There were no significant differences between the two groups in mortality, myocardial infarction, or hospitalizations for unstable angina at two years. Routine stress testing was also associated with a higher rate of coronary angiography and repeat revascularization after one year, though this did not result in a significant reduction in mortality or major cardiac events.[37]

In the setting of Kawasaki disease, criteria for stress cardiac MRI are in concordance with a statement from the American Heart Association.[31]

Indications for Resting Cardiac MRI

Myocarditis

Cardiac MRI is considered medically necessary in **EITHER** of the following scenarios:

- Evaluation of patients with suspected myocarditis who have **ALL** of the following:
    - Symptoms such as chest pain, dyspnea, or palpitation
    - Recent negative evaluation for CAD or low pretest probability of CAD
    - Myocardial injury as evidenced by **ANY** of the following:
        - Elevated troponin
        - Ventricular dysfunction
        - EKG changes (ventricular tachycardia or fibrillation, new Q waves, LBBB, or AV block)
- Follow-up evaluation left ventricular function of patients with an established diagnosis of myocarditis whose transthoracic echocardiogram is technically suboptimal

Rationale

Cardiac MRI is central to the diagnosis of myocarditis, which usually presents some combination of symptoms and evidence of myocardial injury. Coronary artery disease should be excluded unless pretest probability is low. For patients with an established diagnosis of myocarditis, follow-up should be with echocardiography, with MRI reserved for those situations in which echo is technically challenging.[42]

Cardiomyopathy

Cardiac MRI is considered medically necessary in **ANY** of the following scenarios:

- To assess left ventricular function in symptomatic patients with suspected or established cardiomyopathy when there is discordant information from other studies or when other studies are technically suboptimal
- Annual surveillance for cardiomyopathy in clinically stable patients when **BOTH** of the following apply:
    - Prior diagnosis of a chronic and progressive disease (excluding CAD) which may result in cardiomyopathy, e.g., sarcoidosis; amyloidosis; hemochromatosis; hypertrophic obstructive cardiomyopathy (HOCM) and non-compaction cardiomyopathy
    - Cardiomyopathy is not evident on recent (within preceding year) imaging study using a modality other than MRI
- Annual study to quantify cardiac iron load in patients with chronic diseases requiring frequent blood transfusion (e.g., thalassemia)
- Evaluation of patients with suspected arrhythmogenic right ventricular dysplasia (ARVD) who have **ANY** of the following:
    - Severe right ventricular dysfunction on another cardiac imaging study
    - Precordial T wave inversion not associated with RBBB
    - First-degree relative with established ARVD or unexplained sudden cardiac death at age younger than 35 years
    - Ventricular tachycardia or frequent PVCs (> 500 in 24 hours or > 30 per hour)
- Evaluation and management of patients with Fabry disease to differentiate from other cardiomyopathies, facilitate treatment decisions or monitor impact of treatment on disease progress

Rationale

In general, cardiac MRI is not the initial imaging study in the evaluation of cardiomyopathy. Transthoracic echocardiography is often sufficient to establish the presence and degree of ventricular dysfunction. Further imaging studies depend on the likelihood of particular etiologies based on history, family history, presence of other diseases likely to cause cardiomyopathy, and laboratory testing. Exclusion of CAD as an etiology is often required except if the pretest probability is low. MRI may be useful in periodic surveillance for particular cardiomyopathies in patients with an established diagnosis of a disease known to cause cardiomyopathy.[7]

Cardiac aneurysm and pseudoaneurysm

Cardiac MRI is considered medically necessary for evaluation of cardiac aneurysm or pseudoaneurysm.

Congenital heart disease

Cardiac MRI is considered medically necessary in **ANY** of the following scenarios:

- Congenital coronary artery anomalies
    - Evaluation of suspected congenital anomalies of the coronary arteries in **ANY** of the following scenarios:
        - Exertional syncope

        - History of anomalous coronary artery in a first-degree relative
        - Following coronary angiography which failed to adequately define the origin or course of a coronary artery
        - Coronary ostia appear to be abnormally positioned on echocardiography
- Further evaluation of patients whose echocardiogram suggests a new diagnosis of complex congenital heart disease
- Evaluation of complex congenital heart disease in patients who are less than one year post-surgical correction
- Evaluation of complex congenital heart disease in patients who have new or worsening symptoms and/or a change in physical examination
- Assist in surgical planning for patients with complex congenital heart disease
- Surveillance in asymptomatic patients with complex congenital heart disease who have not had cardiac MRI or cardiac CT within the preceding year

Valvular heart disease

Cardiac MRI is considered medically necessary in **EITHER** of the following scenarios:

- Following inconclusive echocardiography or when echocardiography is not feasible
- When moderate or severe valvular disease diagnosed using other imaging modalities requires further definition and that information is likely to affect subsequent management of the patient
    - To assess valvular lesions and measure regurgitant volume, regurgitant fraction, ejection fraction and ventricular volumes
    - To help determine the timing for valvular surgery

Rationale

Cardiac MRI is rarely appropriate in the evaluation of asymptomatic patients or as a first-line test in the evaluation of those with symptoms concerning for valvular heart disease. When transthoracic echocardiography is inconclusive or when the diagnosis under consideration is endocarditis, transesophageal echocardiography should be considered before MRI. MRI is useful in patients with severe valvular disease for whom valvular intervention is being considered.[11]

Intra-cardiac and para-cardiac masses and tumors

Cardiac MRI is considered medically necessary in **ANY** of the following scenarios:

- Patients with a suspected cardiac or para-cardiac mass (thrombus, tumor, etc.) suggested by transthoracic echocardiography, transesophageal echocardiography, blood pool imaging or contrast ventriculography who have not undergone cardiac MRI or cardiac CT within the preceding 60 days
- Patients with established cardiac or para-cardiac mass (thrombus, tumor, etc.) who are clinically unstable
- Patients with established cardiac or para-cardiac mass (thrombus, tumor, etc.) who are clinically stable and have not undergone cardiac MRI or cardiac CT within the preceding year
- Patients with established cardiac or para-cardiac mass (thrombus, tumor, etc.) who have undergone treatment (chemotherapy, radiation therapy, thrombolysis, anticoagulation or surgery) within the preceding year and have not had cardiac MRI or cardiac CT within the preceding 60 days

Evaluation of cardiac venous anatomy

Cardiac MRI is considered medically necessary in **EITHER** of the following scenarios:

- For localization of the pulmonary veins in patients with chronic or paroxysmal atrial fibrillation/flutter who are being considered for ablation
- Coronary venous localization prior to implantation of a biventricular pacemaker

Evaluation of pericardial conditions (pericardial effusion, constrictive pericarditis, or congenital pericardial diseases)

Cardiac MRI is considered medically necessary in **ANY** of the following scenarios:

- Patients with suspected pericardial constriction
- Patients with suspected congenital pericardial disease
- Patients with suspected pericardial effusion (including hemopericardium) who have undergone echocardiography deemed to be technically suboptimal in evaluation of the effusion
- Patients whose echocardiogram shows a complex pericardial effusion (loculated, containing solid material)

Evaluation of the thoracic aorta

Cardiac MRI is considered medically necessary in **ANY** of the following scenarios:

- Patients with suspected thoracic aortic aneurysm/dilation who have not undergone CT or MRI of the thoracic aorta within the preceding 60 days
- Patients with confirmed thoracic aortic aneurysm/dilation with new or worsening signs/symptoms
- Ongoing surveillance of stable patients with confirmed thoracic aortic aneurysm/dilation who have not undergone imaging of the thoracic aorta within the preceding 6 months
- Patients with suspected aortic dissection
- Patients with confirmed aortic dissection who have new or worsening symptoms
- Patients with confirmed aortic dissection in whom surgical repair is anticipated (to assist in preoperative planning)
- Ongoing surveillance of stable patients with confirmed aortic dissection who have not undergone imaging of the thoracic aorta within the preceding year
- Patients with confirmed aortic dissection or thoracic aortic aneurysm/dilation who have undergone surgical repair within the preceding year and have not undergone imaging of the thoracic aorta within the preceding 6 months
- Patients who have sustained blunt chest trauma, penetrating aortic trauma or iatrogenic trauma as a result of aortic instrumentation
- Patients being evaluated for potential transcatheter aortic valve implantation/replacement (TAVI or TAVR) provided that the patient has not undergone cardiac CT or cardiac MRI within the preceding 60 days

Rationale

Cardiac MRI is a useful tool in the evaluation of the thoracic aorta. In those with acute aortic syndromes, rapid diagnosis and surgical repair (if feasible) are of paramount importance and choice of imaging technique is often based on immediate availability. MRI may also be used in surveillance of those with established disease of the thoracic aorta to determine optimal timing and planning of surgical approach. Following surgical repair, MRI may be used for periodic evaluation. CT is often the preferred modality due to more widespread availability, rapid image acquisition, and compatibility with implanted devices and equipment needed to treat those who are acutely ill.[27]

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PET Myocardial Imaging

Codes

The following code list is not meant to be all-inclusive. Authorization requirements will vary by health plan. Please consult the applicable health plan for guidance on specific procedure codes.

Specific CPT codes for services should be used when available. Nonspecific or not otherwise classified codes may be subject to additional documentation requirements and review.

CPT/HCPCS

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 (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
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)
S8085	Fluorine-18 fluorodeoxyglucose (f-18 fdg) imaging using dual-head coincidence detection system (non-dedicated PET scan)

General Information

Commonly Used Radiopharmaceuticals

- Ammonia (13NH3)
- Rubidium Chloride (82 RbCl)
- 2-(18F) FLURO-2DEOXY-D-GLUCOSE (FDG)

Scope

- This guideline addresses the appropriate use of cardiac PET imaging in elective, non-emergent settings.
- It is anticipated that, consistent with current guidelines, the evaluation of patients with acute coronary syndromes (myocardial infarction and unstable angina) will occur in the emergency room or in an inpatient setting. Cardiac PET performed in these practice settings is not included in this preauthorization program and is therefore not addressed in these guidelines.

Pretest Probability and CAD Risk Assessment

Reliability of noninvasive testing in accurately diagnosing or excluding CAD is dependent upon the likelihood of disease, which takes into account both **pretest probability** and **atherosclerotic disease risk.**

In those with low likelihood of disease, there is an unacceptably high rate of false-positive results, thus rendering these tests unreliable and potentially harmful.

Pretest probability may be estimated based on the quality of symptoms, age, and gender.

- Cardiac chest pain is centrally located, provoked by stress (exercise or emotional), and relieved by rest
- Possible cardiac chest pain has two of the three characteristics associated with cardiac chest pain
- Non-cardiac chest pain has one (or none) of the three characteristics associated with cardiac chest pain

Table 1 below shows the pretest probability of obstructive CAD for patients presenting with chest pain and dyspnea stratified by age, gender, and the nature of the symptoms.

Table 1. Pretest Probability (%) of CAD by Age, Gender, and Symptoms

	Cardiac	Cardiac	Possible cardiac	Possible cardiac	Noncardiac	Noncardiac	Dyspnea[#]	Dyspnea[#]
Age (years)	Male	Female	Male	Female	Male	Female	Male	Female
30-39	3	5	4	3	1	1	0	3
40-49	22	10	10	6	3	2	12	3
50-59	32	13	17	6	11	3	20	9
60-69	44	16	26	11	22	6	27	14
70+	52	27	34	19	24	10	32	12

#Applies to patients who have dyspnea without chest pain

Adapted from Knuuti J, Wijns W, Saraste A, et al. 2019 ESC guidelines for the diagnosis and management of chronic coronary syndromes. Eur Heart J. 2020;41: 407–477.

Atherosclerotic disease risk

The ASCVD Pooled Cohort Equations risk calculation tool is used to estimate risk of atherosclerotic cardiovascular disease. This tool, which is endorsed by several professional societies, incorporates age, gender, race, several clinical conditions known to affect ASCVD risk (including diabetes, dyslipidemia, hypertension), and tobacco use.

Uses of Cardiac PET Imaging

- Cardiac PET perfusion imaging is one of several noninvasive approaches to the evaluation of the patient with suspected or established CAD. In addition to the clinical scenario leading to the need for noninvasive CAD evaluation, clinicians should consider regional variation in availability, technical expertise and interpretive proficiency in selecting the optimal approach to testing.
- The primary use of PET perfusion imaging is in the diagnosis, exclusion or evaluation of obstructive CAD.
- PET perfusion imaging is also used for management of established CAD.
- PET metabolic imaging may be used for assessment of myocardial viability in patients who have had myocardial infarction

Imaging Considerations

- Whenever possible and clinically appropriate, exercise stress testing should be used in preference to pharmacological testing. However, for patients who are unable to exercise or who have baseline EKG abnormalities which make pharmacological testing preferable, PET imaging becomes an acceptable first-line testing strategy.
- A resting EKG is strongly recommended, preferably within 30 days of the request for perfusion PET, as the findings may determine the optimal diagnostic approach. For example, resting ischemic changes or evidence of recent myocardial infarction may significantly alter the testing strategy.
- Selection of the optimal noninvasive testing should be made so that the resulting information facilitates patient management decisions and does not simply add a new layer of testing
- Contraindications to PET
    - Pregnancy or breastfeeding
    - Inability to remain motionless for several minutes or comprehend simple instructions
- When noninvasive imaging is required in morbidly obese patients (BMI ≥ 40 kg/m2), with suspected or established CAD, perfusion PET imaging may be considered as the initial test (because of a higher likelihood of technically suboptimal image quality on nuclear stress testing and SE in this patient subgroup).
- Cardiac PET has the ability to quantify regional myocardial blood flow and myocardial flow reserve, and this information may be useful in determining optimal management
- Metabolic evaluation (to determine myocardial viability) is performed using PET flurodeoxyglucose (FDG) imaging. Metabolic PET imaging has been shown to be useful in identification of patients who are likely to benefit from revascularization.
- Occasionally, it may be appropriate to perform both perfusion PET imaging and metabolic PET imaging in the evaluation of myocardial pathologic processes other than CAD (e.g., sarcoidosis).

Scenarios in which pharmacological testing is preferable:

- Resting EKG abnormalities
    - Complete left bundle branch block (LBBB)
    - Electronically paced ventricular rhythm
    - Resting ST depression ≥ 1 mm
    - Left ventricular hypertrophy (LVH) with secondary repolarization abnormalities
    - Digoxin effect
    - Pre-excitation (e.g., Wolff-Parkinson-White syndrome)
    - Previous false positive EKG stress test
- Conditions limiting exercise capacity such that target heart rate is unlikely to be achieved
    - Orthopedic or neurological impairment
    - Severe chronic obstructive pulmonary disease (COPD)
    - Severe heart failure
    - Severe claudication
    - Prior failure to achieve target heart rate
    - Use of negatively chronotropic medications which cannot be temporarily withheld for testing
- Severe valvular stenosis

- Presence of an implantable cardioverter defibrillator (ICD)

Relative contraindications to conventional nuclear imaging (using Technetium or Thallium):

- Morbid obesity (BMI ≥ 40 kg/m^2)
- Breast implant(s) in situ
- Previous suboptimal conventional nuclear perfusion imaging which was suboptimal due to attenuation artifact
- Previous conventional nuclear imaging discordant with coronary angiographic findings
- Known pericardial or pleural effusion
- Prior mastectomy
- Chest wall deformity

Clinical Indications

Indications are organized as follows:

PET Perfusion Imaging

Suspected CAD in symptomatic patients

Established CAD in asymptomatic patients

Surveillance following revascularization

Follow-up to acute coronary syndrome

Evaluation of myocardial viability

Established CAD in symptomatic patients

Established or suspected CAD

Patients who have undergone cardiac transplantation

New onset arrhythmia

CHF or LV systolic dysfunction

Request prompted by abnormal or inconclusive test:

Abnormal resting EKG

Abnormal exercise EKG test

Abnormal stress imaging test

Preoperative cardiac evaluation for non-cardiac surgery (includes surveillance prior to solid organ transplant)

Miscellaneous indications for PET perfusion

Inability to perform exercise EKG test

Kawasaki disease

Prior to initiation of Interleukin-2

PET perfusion performed in conjunction with metabolic PET imaging

Cardiac sarcoidosis

PET Metabolic Imaging

Evaluation of myocardial viability

Cardiac sarcoidosis

Indications for PET Perfusion Imaging

Except for indications pertaining to myocardial viability or non-coronary cardiac disease (e.g., sarcoidosis), PET perfusion imaging is appropriate as the initial noninvasive stress imaging test when EITHER of the following applies:

- There is at least one relative contraindication to conventional nuclear imaging (using Technetium or Thallium) as defined above
- Pharmacological testing would be preferable (scenarios in which this applies are defined above)

Suspected CAD in symptomatic patients who have not had evaluation for CAD within the preceding 60 days

PET perfusion imaging is considered medically necessary in **ANY** of the following scenarios:

- Chest pain with or without other symptoms of myocardial ischemia
    - With pretest probability of CAD > 15% (Table 1)
- Patients without chest pain whose predominant symptom is dyspnea
    - With pretest probability of CAD > 15% (Table 1)
- Patients with any cardiac symptom who have diseases/conditions with which CAD commonly coexists, such as **ANY** of the following:
    - Abdominal aortic aneurysm
    - Established and symptomatic peripheral vascular disease
    - Prior history of stroke, transient ischemic attack (TIA), carotid endarterectomy (CEA), or high-grade carotid stenosis (> 70%)
    - Chronic kidney disease

Established flow-limiting CAD in asymptomatic patients

Perfusion PET is considered medically necessary in **ANY** of the following scenarios:

- Surveillance following coronary revascularization as follows:
    - Evaluation of stable patients who have undergone CABG more than 5 years previously and have not had an evaluation for CAD within the past 2 years
        - Stable patients whose revascularization has been incomplete may undergo Perfusion PET 3 years following the procedure and every 2 years thereafter
- Patients who have had acute coronary syndrome within the preceding 90 days, did not undergo coronary angiography at the time of the acute event, and have not had evaluation for CAD since
- To establish myocardial viability in patients who are candidates for revascularization and have left ventricular systolic dysfunction (LV ejection fraction < 55%)

Established flow-limiting CAD in patients who have new or worsening symptoms

Perfusion PET is considered medically necessary in **EITHER** of the following scenarios:

- Patients whose symptoms persist despite maximal anti-ischemic medical therapy or contraindication thereto
    - Patients with established CAD and typical angina pectoris despite maximal anti-ischemic therapy may be better served with invasive coronary angiography
- To establish myocardial viability in patients who are candidates for revascularization and have left ventricular systolic dysfunction (LV ejection fraction < 55%)

Established or suspected CAD

Perfusion PET is considered medically necessary in **ANY** of the following scenarios:

Patients who have undergone cardiac transplantation

- With new or worsening cardiac symptoms
- With new or worsening physical examination abnormalities
- Clinically stable patients who have not had evaluation for CAD in the preceding year

Patients (symptomatic or asymptomatic) with ANY of the following new onset arrhythmias who have not had evaluation for CAD since the arrhythmia was recognized

- Sustained (lasting more than 30 seconds) or nonsustained (more than 3 beats but terminating within 30 seconds) ventricular tachycardia
- Atrial fibrillation or flutter and high or intermediate risk of CAD (using ASCVD Pooled Cohort Equations)
- Atrial fibrillation or flutter and established CAD
- Frequent premature ventricular contractions (PVC) defined as more than 30 PVCs per hour on ambulatory EKG (Holter) monitoring
    - Perfusion PET is not clinically indicated for evaluation of infrequent premature atrial or ventricular depolarizations

Patients (symptomatic or asymptomatic) with new onset CHF or recently recognized LV systolic dysfunction who have not had evaluation for CAD since the onset of LV dysfunction/CHF

- For patients in this category with established CAD, or those with suspected CAD whose CAD risk (using ASCVD Pooled Cohort Equations) is high, coronary angiography may be more appropriate than noninvasive evaluation

Abnormal resting EKG

- Patients with any of the following newly recognized and not previously evaluated resting EKG changes
    - Left bundle branch block
    - ST depression ≥ 1 mm
    - Left ventricular hypertrophy with repolarization abnormality
- Patients who would otherwise undergo exercise EKG testing (without imaging) but have **ANY** of the following resting EKG findings that would render the interpretation of an exercise EKG test difficult or impossible:
    - Left bundle branch block
    - Ventricular paced rhythm
    - Left ventricular hypertrophy with repolarization abnormality
    - Digoxin effect
    - ST depression ≥ 1 mm on a recent EKG (within the past 30 days)
    - Pre-excitation syndromes (e.g., Wolff-Parkinson-White syndrome)

Patients with abnormal exercise treadmill test (performed without imaging) who have not undergone evaluation for CAD since the treadmill test

- Abnormal findings on an exercise treadmill test include chest pain, ST segment change, abnormal blood pressure response, or complex ventricular arrhythmias

Patients who have undergone recent (within the past 60 days) stress testing with adjunctive imaging (SE, MPI, stress MRI)

- When the stress imaging test is technically suboptimal, technically limited, inconclusive, indeterminate, or equivocal, such that myocardial ischemia cannot be adequately excluded
    - Perfusion PET is not appropriate for patients who have had a recent normal or abnormal stress imaging test
    - A stress imaging test is deemed to be abnormal when there are abnormalities on the imaging portion of the test. Electrocardiographic abnormalities without imaging evidence of ischemia do not render a stress imaging test abnormal.

Preoperative cardiac evaluation of patients undergoing non-emergency non-cardiac surgery (includes surveillance for CAD in patients awaiting solid organ transplant)

Note: It is assumed that those who require emergency surgery will undergo inpatient preoperative evaluation.

Prior to considering elective surgery, patients with active cardiac conditions such as unstable coronary syndromes (unstable angina), decompensated heart failure (NYHA class IV, worsening or new onset heart failure), significant arrhythmias (third degree AV block Mobitz II AV block, uncontrolled supraventricular arrhythmia, symptomatic ventricular arrhythmias, ventricular tachycardia), symptomatic bradycardia or severe stenotic valvular lesions should be evaluated and managed per ACC/AHA guidelines. That evaluation may include Perfusion PET.

- **Low-risk surgery** (endoscopic procedures, superficial procedures, cataract surgery, breast surgery, ambulatory surgery)
    - Provided that there are no active cardiac conditions (as outlined above), Perfusion PET prior to low-risk surgery is considered **not medically necessary**
- **Intermediate-risk surgery** (including but not limited to intraperitoneal and intrathoracic surgery, carotid endarterectomy, head and neck surgery, orthopedic surgery, prostate surgery, gastric bypass surgery) or high-risk surgery (including but not limited to aortic and other major vascular surgery, peripheral vascular surgery) when **BOTH** of the following apply:
    - Patient has not had a negative evaluation for CAD or a coronary revascularization procedure within the previous one (1) year
    - At least **ONE** of the following applies:
        - Patient has established CAD (prior MI, prior PCI or CABG) or presumed CAD (Q waves on EKG, abnormal MPI, SE, or cardiac PET)
        - Patient has compensated heart failure or prior history of CHF
        - Patient has diabetes mellitus
        - Patient has chronic kidney disease
        - Patient has a history of cerebrovascular disease (TIA, stroke, or documented carotid stenosis requiring carotid endarterectomy)
        - Patient is unable to walk on a treadmill for reasons other than obesity
- **Patients awaiting solid organ transplant**
    - Asymptomatic patients who have not undergone evaluation for CAD within the preceding one (1) year
    - Patients with symptoms consistent with myocardial ischemia

Miscellaneous indications for PET perfusion imaging

Perfusion PET is considered medically necessary in the following scenarios:

Inability to perform exercise EKG test

- Patients who would otherwise undergo exercise EKG testing (without imaging) but are unable (for reasons other than obesity) to perform exercise to a degree that would yield a diagnostic test. This provision includes patients with musculoskeletal, neurological or pulmonary limitation.

Established Kawasaki disease with coronary artery involvement

- Evaluation every 2 years for confirmed small to medium-sized coronary artery aneurysm
- Annual evaluation for confirmed large (giant) coronary artery aneurysm, multiple or complex aneurysms, or coronary artery obstruction confirmed by angiography

Prior to initiation of Interleukin-2

- When a decision has been made to treat the patient with Interleukin-2

Rationale

Stress testing with imaging (which includes SPECT myocardial perfusion imaging, perfusion PET, stress cardiac MRI, and echocardiography) is useful in select patients with suspected or established CAD. In general, the choice of modality is at the discretion of the ordering provider although imaging modalities which cannot be combined with exercise stress (PET and MRI) should be reserved for those unable to exercise and therefore requiring pharmacological testing. Cardiac imaging may be considered in the evaluation of suspected CAD in symptomatic patients with pretest probability > 15% or in those with established diagnosis of other conditions commonly associated with CAD. In evaluation of patients with established CAD, surveillance following CABG (but not PCI), evaluation of myocardial viability and evaluation following acute coronary syndrome (when coronary angiography has not been performed at the time of the acute event) are reasonable indications for stress testing with adjunctive imaging. Symptomatic patients with established CAD should be treated with GDMT before stress testing with imaging. Carelon Guidelines for the use of myocardial PET imaging in CAD are in concordance with guidelines developed by multiple professional societies.[15,41]

A multicenter, randomized trial evaluated routine functional testing compared with standard care for guiding follow-up of high-risk patients after PCI. There were no significant differences between the two groups in mortality, myocardial infarction, or hospitalizations for unstable angina at two years. Routine stress testing was also associated with a higher rate of coronary angiography and repeat revascularization after one year, though this did not result in a significant reduction in mortality or major cardiac events.[29,24]

In the setting of Kawasaki disease, criteria for myocardial PET imaging are in concordance with a statement from the American Heart Association.[24]

Indication for PET Perfusion performed in conjunction with Metabolic PET

Cardiac sarcoidosis

PET perfusion imaging is considered medically necessary in the evaluation of patients with suspected or established cardiac sarcoidosis when performed in conjunction with metabolic PET imaging.

Indications for Metabolic PET Imaging

Evaluation of myocardial viability

Metabolic PET imaging is considered medically necessary for evaluation of myocardial viability when **ALL** of the following criteria are met:

- Patient has established CAD
- Left ventricular systolic dysfunction
- Viability status is not defined by other testing
- Revascularization is being considered

Rationale

Although the role of viability assessment in decisions regarding revascularization has recently been questioned, the notion that the benefit of revascularization is proportional to the degree and extent of viability is still engrained in clinical practice. In terms of imaging modality selection for assessment of viability, PET has the most robust supporting evidence base.[35]

Cardiac sarcoidosis

Metabolic PET imaging (with or without perfusion imaging) is considered medically necessary.

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NUCLEAR CARDIOLOGY

Myocardial Perfusion Imaging

Codes

The following code list is not meant to be all-inclusive. Authorization requirements will vary by health plan. Please consult the applicable health plan for guidance on specific procedure codes.

Specific CPT codes for services should be used when available. Nonspecific or not otherwise classified codes may be subject to additional documentation requirements and review.

CPT/HCPCS

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

General Information

Commonly Used Radiopharmaceuticals

- Technetium-99m Sestamibi
- Technetium-99m Tetrofosmin
- Thallium-201 Chloride

Scope

- This guideline addresses the appropriate use of MPI in elective, non-emergent settings.
- It is anticipated that, consistent with current guidelines, the evaluation of patients with acute coronary syndromes (myocardial infarction and unstable angina) will occur in the emergency room or in an inpatient setting. MPI performed in these practice settings is not included in this preauthorization program and is therefore not addressed in these guidelines.

Pretest Probability and CAD Risk Assessment

Reliability of noninvasive testing in accurately diagnosing or excluding CAD is dependent upon the likelihood of disease, which takes into account both **pretest probability** and **atherosclerotic disease risk.**

In those with low likelihood of disease, there is an unacceptably high rate of false-positive results, thus rendering these tests unreliable and potentially harmful.

Pretest probability may be estimated based on the quality of symptoms, age, and gender.

- Cardiac chest pain is centrally located, provoked by stress (exercise or emotional), and relieved by rest
- Possible cardiac chest pain has two of the three characteristics associated with cardiac chest pain
- Non-cardiac chest pain has one (or none) of the three characteristics associated with cardiac chest pain

Table 1 below shows the pretest probability of obstructive CAD for patients presenting with chest pain and dyspnea stratified by age, gender, and the nature of the symptoms.

Table 1. Pretest Probability (%) of CAD by Age, Gender, and Symptoms

	Cardiac	Cardiac	Possible cardiac	Possible cardiac	Noncardiac	Noncardiac	Dyspnea#	Dyspnea#
Age (years)	Male	Female	Male	Female	Male	Female	Male	Female
30-39	3	5	4	3	1	1	0	3
40-49	22	10	10	6	3	2	12	3
50-59	32	13	17	6	11	3	20	9
60-69	44	16	26	11	22	6	27	14
70+	52	27	34	19	24	10	32	12

#Applies to patients who have dyspnea without chest pain

Adapted from Knuuti J, Wijns W, Saraste A, et al. 2019 ESC guidelines for the diagnosis and management of chronic coronary syndromes. Eur Heart J. 2020;41: 407–477.

Atherosclerotic disease risk

The ASCVD Pooled Cohort Equations risk calculation tool is used to estimate risk of atherosclerotic cardiovascular disease. This tool, which is endorsed by several professional societies, incorporates age, gender, race, several clinical conditions known to affect ASCVD risk (including diabetes, dyslipidemia, hypertension), and tobacco use.

Uses of Myocardial Perfusion Imaging

- MPI is one of several noninvasive approaches to the evaluation of the patient with suspected or established CAD. In addition to the clinical scenario leading to the need for noninvasive CAD evaluation, clinicians should consider regional variation in availability, technical expertise and interpretive proficiency in selecting the optimal approach to testing.
- The primary use of MPI is in the diagnosis, exclusion or evaluation of obstructive CAD.
- MPI is also used for management of established CAD.
- MPI may be used for assessment of myocardial viability in patients who have had myocardial infarction.

Imaging Considerations

- A resting EKG is strongly recommended, preferably within 30 days of the request for MPI, as the findings may determine the optimal diagnostic approach. For example, resting ischemic changes or evidence of recent myocardial infarction may significantly alter the testing strategy.
- Selection of the optimal noninvasive testing should be made so that the resulting information facilitates patient management decisions and does not simply add a new layer of testing.
- Exercise should be used rather than pharmacological agents in those capable performing an exercise test, unless there are EKG findings (such as left bundle branch block) that would make pharmacological testing preferable

- Contraindications to MPI
    - Pregnancy or breastfeeding
    - Inability to remain motionless for several minutes or comprehend simple instructions
- Morbid obesity (BMI > 40) may impact image quality, and other testing modalities should be considered in those patients.
- If imaging studies using other radioactive tracers have been recently performed, adequate time must elapse to allow for clearance of activity from the heart and surrounding regions.

Clinical Indications

Indications are organized as follows:

Suspected CAD in symptomatic patients

Established flow-limiting CAD in asymptomatic patients

Surveillance following revascularization

Follow-up to acute coronary syndrome

Evaluation of myocardial viability

Established flow-limiting CAD in symptomatic patients

Established or suspected CAD

Patients who have undergone cardiac transplantation

New onset arrhythmia

CHF or LV systolic dysfunction

Request prompted by abnormal or inconclusive test:

Abnormal resting EKG

Abnormal exercise EKG test

Abnormal stress imaging test

Preoperative cardiac evaluation for non-cardiac surgery (includes surveillance prior to solid organ transplant)

Miscellaneous indications

Inability to perform exercise EKG test

Kawasaki disease

Prior to initiation of Interleukin-2

Suspected CAD in symptomatic patients who have not had evaluation for CAD within the preceding 60 days

MPI is considered medically necessary in **ANY** of the following scenarios:

- Chest pain with or without other symptoms of myocardial ischemia
    - With pretest probability of CAD > 15% (Table 1)
- Patients without chest pain whose predominant symptom is dyspnea
    - With pretest probability of CAD > 15% (Table 1)
- Patients with any cardiac symptom who have diseases/conditions with which CAD commonly coexists, such as **ANY** of the following:
    - Abdominal aortic aneurysm
    - Established and symptomatic peripheral vascular disease

- Prior history of stroke, transient ischemic attack (TIA), carotid endarterectomy (CEA), or high-grade carotid stenosis (> 70%)
- Chronic kidney disease

Established flow-limiting CAD in asymptomatic patients

MPI is considered medically necessary in **ANY** of the following scenarios:

- Surveillance following coronary revascularization as follows
  - Evaluation of stable patients who have undergone CABG more than 5 years previously and have not had an evaluation for CAD within the past 2 years
    - Stable patients whose revascularization has been incomplete may undergo MPI 3 years following the procedure and every 2 years thereafter
- Patients who have had acute coronary syndrome within the preceding 90 days, did not undergo coronary angiography at the time of the acute event, and have not had evaluation for CAD since
- To establish myocardial viability in patients who are candidates for revascularization and have left ventricular systolic dysfunction (LV ejection fraction < 55%)

Established flow-limiting CAD in patients who have new or worsening symptoms

MPI is considered medically necessary in **EITHER** of the following scenarios:

- Patients whose symptoms persist despite maximal anti-ischemic medical therapy or contraindication thereto
  - Patients with established CAD and typical angina pectoris despite maximal anti-ischemic therapy may be better served with invasive coronary angiography
- To establish myocardial viability in patients who are candidates for revascularization and have left ventricular systolic dysfunction (LV ejection fraction < 55%)

Established or suspected CAD

MPI is considered medically necessary in **ANY** of the following scenarios:

Patients who have undergone cardiac transplantation

- With new or worsening cardiac symptoms
- With new or worsening physical examination abnormalities
- Clinically stable patients who have not had evaluation for CAD in the preceding year

Patients (symptomatic or asymptomatic) with ANY of the following new onset arrhythmias who have not had evaluation for CAD since the arrhythmia was recognized

- Sustained (lasting more than 30 seconds) or nonsustained (more than 3 beats but terminating within 30 seconds) ventricular tachycardia
- Atrial fibrillation or flutter and high or intermediate risk of CAD (using ASCVD Pooled Cohort Equations)
- Atrial fibrillation or flutter and established CAD
- Frequent premature ventricular contractions (PVC) defined as more than 30 PVCs per hour on ambulatory EKG (Holter) monitoring
  - MPI is not clinically indicated for evaluation of infrequent premature atrial or ventricular depolarizations

Patients (symptomatic or asymptomatic) with new onset CHF or recently recognized LV systolic dysfunction who have not had evaluation for CAD since the onset of LV dysfunction/CHF

- For patients in this category with established CAD, or those with suspected CAD whose CAD risk (using ASCVD Pooled Cohort Equations) is high, coronary angiography may be more appropriate than noninvasive evaluation

Abnormal resting EKG

- Patients with **ANY** of the following newly recognized and not previously evaluated resting EKG changes:
    - Left bundle branch block
    - ST depression ≥ 1 mm
    - Left ventricular hypertrophy with repolarization abnormality
- Patients who would otherwise undergo exercise EKG testing (without imaging) but have **ANY** of the following resting EKG findings that would render the interpretation of an exercise EKG test difficult or impossible:
    - Left bundle branch block
    - Ventricular paced rhythm
    - Left ventricular hypertrophy with repolarization abnormality
    - Digoxin effect
    - ST depression ≥ 1 mm on a recent EKG (within the past 30 days)
    - Pre-excitation syndromes (e.g., Wolff-Parkinson-White syndrome)

Patients with abnormal exercise treadmill test (performed without imaging) who have not undergone evaluation for CAD since the treadmill test

- Abnormal findings on an exercise treadmill test include chest pain, ST segment change, abnormal blood pressure response, or complex ventricular arrhythmias

Patients who have undergone recent (within the past 60 days) stress testing with adjunctive imaging (SE, perfusion PET, stress MRI)

- When the stress imaging test is technically suboptimal, technically limited, inconclusive, indeterminate, or equivocal, such that myocardial ischemia cannot be adequately excluded
    - MPI is not appropriate for patients who have had a recent normal or abnormal stress imaging test
    - A stress imaging test is deemed to be abnormal when there are abnormalities on the imaging portion of the test. Electrocardiographic abnormalities without imaging evidence of ischemia do not render a stress imaging test abnormal.

Preoperative cardiac evaluation of patients undergoing non-emergency non-cardiac surgery (includes surveillance for CAD in patients awaiting solid organ transplant)

Note: It is assumed that those who require emergency surgery will undergo inpatient preoperative evaluation.

Prior to considering elective surgery, patients with active cardiac conditions such as unstable coronary syndromes (unstable angina), decompensated heart failure (NYHA class IV, worsening or new onset heart failure), significant arrhythmias (third degree AV block Mobitz II AV block, uncontrolled supraventricular arrhythmia, symptomatic ventricular arrhythmias, ventricular tachycardia), symptomatic bradycardia or severe stenotic valvular lesions should be evaluated and managed per ACC/AHA guidelines. That evaluation may include MPI.

- **Low-risk surgery** (endoscopic procedures, superficial procedures, cataract surgery, breast surgery, ambulatory surgery)
    - Provided that there are no active cardiac conditions (as outlined above), MPI prior to low-risk surgery is considered **not medically necessary**
- **Intermediate-risk surgery** (including but not limited to intraperitoneal and intrathoracic surgery, carotid endarterectomy, head and neck surgery, orthopedic surgery, prostate surgery, gastric bypass surgery) or

high-risk surgery (including but not limited to aortic and other major vascular surgery, peripheral vascular surgery) when **BOTH** of the following apply:

- Patient has not had a negative evaluation for CAD or a coronary revascularization procedure within the previous one (1) year
- At least **ONE** of the following applies:
  - Patient has established CAD (prior MI, prior PCI or CABG) or presumed CAD (Q waves on EKG, abnormal MPI, SE, or cardiac PET)
  - Patient has compensated heart failure or prior history of CHF
  - Patient has diabetes mellitus
  - Patient has chronic kidney disease
  - Patient has a history of cerebrovascular disease (TIA, stroke, or documented carotid stenosis requiring carotid endarterectomy)
  - Patient is unable to walk on a treadmill for reasons other than obesity

- **Patients awaiting solid organ transplant**
  - Asymptomatic patients who have not undergone evaluation for CAD within the preceding one (1) year
  - Patients with symptoms consistent with myocardial ischemia

Miscellaneous indications

MPI is considered medically necessary in the following scenarios:

Inability to perform exercise EKG test

- Patients who would otherwise undergo exercise EKG testing (without imaging) but are unable (for reasons other than obesity) to perform exercise to a degree that would yield a diagnostic test. This provision includes patients with musculoskeletal, neurological or pulmonary limitation.

Established Kawasaki disease with coronary artery involvement

- Evaluation every 2 years for confirmed small to medium-sized coronary artery aneurysm
- Annual evaluation for confirmed large (giant) coronary artery aneurysm, multiple or complex aneurysms, or coronary artery obstruction confirmed by angiography

Prior to initiation of Interleukin-2

- When a decision has been made to treat the patient with Interleukin-2

Rationale

Stress testing with imaging (which includes SPECT myocardial perfusion imaging, perfusion PET, stress cardiac MRI, and echocardiography) is useful in select patients with suspected or established CAD. In general, the choice of modality is at the discretion of the ordering provider although imaging modalities which cannot be combined with exercise stress (PET and MRI) should be reserved for those unable to exercise and therefore requiring pharmacological testing. Cardiac imaging may be considered in the evaluation of suspected CAD in symptomatic patients with pretest probability > 15% or in those with established diagnosis of other conditions commonly associated with CAD. In evaluation of patients with established CAD, surveillance following CABG (but not PCI), evaluation of myocardial viability and evaluation following acute coronary syndrome (when coronary angiography has not been performed at the time of the acute event) are reasonable indications for stress testing with adjunctive imaging. Symptomatic patients with established CAD should be treated with GDMT before stress testing with imaging. Carelon Guidelines for the use of myocardial perfusion imaging in CAD are in concordance with guidelines developed by multiple professional societies.[47]

A multicenter, randomized trial evaluated routine functional testing compared with standard care for guiding follow-up of high-risk patients after PCI. There were no significant differences between the two groups in mortality, myocardial infarction, or hospitalizations for unstable angina at two years. Routine stress testing was also associated with a higher rate of coronary angiography and repeat revascularization after one year, though this did not result in a significant reduction in mortality or major cardiac events.[31]

In the setting of Kawasaki disease, criteria for myocardial perfusion imaging are in concordance with a statement from the American Heart Association.[25]

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Infarct Imaging

Codes

The following code list is not meant to be all-inclusive. Authorization requirements will vary by health plan. Please consult the applicable health plan for guidance on specific procedure codes.

Specific CPT codes for services should be used when available. Nonspecific or not otherwise classified codes may be subject to additional documentation requirements and review.

CPT/HCPCS

78466	Planar, infarct avid; qualitative or quantitative
78468	Planar, infarct avid; with ejection fraction by first pass technique
78469	SPECT, infarct avid; with or without quantification

General Information

Commonly Used Radiopharmaceuticals

- Technetium-99m pyrophosphate

Imaging Considerations

- Infarct imaging is typically optimal at 48-72 hours post-event
- False positive findings have been attributed to the following conditions:
    - Amyloidosis
    - Cardiac valvular and pericardial calcification
    - Cardiomyopathy
    - Doxorubicin (Adriamycin) treatment
    - Myocarditis and pericarditis
    - Prior myocardial infarction that remains persistently positive
    - Radiation therapy
    - Ventricular aneurysm
- Selection of the optimal diagnostic imaging for cardiac evaluation should be made within the context of other available studies (which include treadmill stress test, stress myocardial perfusion imaging [MPI], stress echocardiography [SE], cardiac MRI, cardiac PET imaging and invasive cardiac/coronary angiography), so that the resulting information facilitates patient management decisions and does not merely add a new layer of testing.

Clinical Indications

Infarct imaging is considered medically necessary for ANY of the following indications:

Suspected acute myocardial infarction, which likely occurred within the last 7 days, including interrogation of the following:

- Negative (past expected peak) cardiac enzymes
- Abnormal baseline ECG, due to prior myocardial infarction
- Left bundle branch block

Differentiation of subendocardial (non Q-wave) infarction versus ischemia

Post-cardioversion

Following significant chest trauma or major surgical procedure, with chest pain

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Cardiac Blood Pool Imaging includes MUGA and First Pass Radionuclide Ventriculography

Codes

The following code list is not meant to be all-inclusive. Authorization requirements will vary by health plan. Please consult the applicable health plan for guidance on specific procedure codes.

Specific CPT codes for services should be used when available. Nonspecific or not otherwise classified codes may be subject to additional documentation requirements and review.

CPT/HCPCS

78414	Determination of central c-v hemodynamic
78428	Cardiac shunt detection
78472	Gated equilibrium; planar, single study, wall motion plus ejection fraction
78473	Gated equilibrium; planar, multiple studies, wall motion study plus ejection fraction
78481	First pass technique; single study, wall motion study plus ejection fraction
78483	First pass technique; multiple studies, wall motion study plus ejection fraction
78494	Gated equilibrium: SPECT, at rest, wall motion study plus ejection fraction
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)

General Information

Commonly Used Radiopharmaceuticals

- Technetium-99m

Imaging Considerations

- Primarily used to evaluate global and regional ventricular function and to determine ejection fraction(s)
- May be used in the evaluation of intracardiac shunting or diastolic function
- First-pass studies display initial transit of the radiotracer bolus passing through the cardiopulmonary and central systemic circulations. Right and/or left ventricular function may be evaluated.
- Equilibrium studies display gated data (MUGA) which is acquired over many cardiac cycles, using a blood pool radiotracer. Both right and left ventricles may be evaluated.
- First pass studies should be acquired on a high count-rate camera in order that images have sufficient temporal resolution. High count-rate cameras are not required for MUGA.
- Studies may be performed at rest and/or during exercise.
- MUGA studies are technically more difficult in patients with irregular heart rhythms. Imaging times may have to be prolonged to acquire adequate data.
- Selection of the optimal diagnostic imaging for cardiac evaluation should be made within the context of other available studies (which include transthoracic echocardiography [TTE], transesophageal echocardiography [TEE], stress myocardial perfusion imaging [MPI], stress echocardiography [SE], cardiac MRI, cardiac CT, cardiac PET imaging, and invasive cardiac/coronary angiography), so that the

resulting information facilitates patient management decisions and does not merely add a new layer of testing.

- Some disease states and medications interfere with red blood cell labeling and should be considered when selecting the optimal imaging modality.
- For interpretation of the guidelines, the term “clinically stable” means that the patient has no new or worsening cardiac symptoms and there are no changes on cardiovascular examination.

Clinical Indications

Evaluation of left ventricular function

Note: It is assumed that left ventricular function will be evaluated using a single imaging modality. Thus, if left ventricular function has been evaluated recently by echocardiography, reevaluation using blood pool imaging is not necessary.

Cardiac blood pool imaging is considered medically necessary in **ANY** of the following scenarios:

- Initial evaluation of known or suspected heart failure
- Reevaluation of patients with known left ventricular dysfunction (systolic or diastolic) in a patient with a deterioration in clinical status
- Evaluation of patients with resting EKG abnormalities (LBBB, RBBB with left anterior or posterior hemiblock, LVH, RVH, Q waves suggestive of prior infarction)
- Reevaluation of patients with known heart failure (systolic or diastolic) in a patient with a change in clinical status
- Evaluation of ventricular function prompted by treatment with cardiotoxic agents (examples including but not limited to some chemotherapeutic agents for cancer, Novantrone [mitoxantrone] for multiple sclerosis, etc.) at **ANY** of the following times:
    - Baseline evaluation prior to starting treatment
    - Serial evaluation during treatment or within 6 months of completion of treatment
    - Surveillance annually thereafter
- Screening study for left ventricular dysfunction every 2 years in clinically stable and first-degree relatives of patients with inherited cardiomyopathy
- Evaluation of suspected restrictive, infiltrative or genetic cardiomyopathy
- Evaluation of patients with diagnosed or suspected myocarditis
- Evaluation of left ventricular function in a patient with known cardiomyopathy being considered for cardiac resynchronization therapy (CRT), implantable defibrillator (ICD) or ventricular assist device (VAD)
- Initial evaluation for cardiac resynchronization therapy (CRT) device optimization following implantation
- Evaluation of a patient being treated with cardiac resynchronization therapy (CRT) with new or persistent signs or symptoms of heart failure for device optimization
- Blood pool imaging is indicated for optimization of device settings in patients with ventricular assist device (VAD)
- When left ventricular dysfunction is suggested by other testing (chest x-ray, elevated B-type natriuretic peptide [BNP]) and left ventricular function has not been evaluated by another modality since that testing was performed

- Where a clinically significant discrepancy that might influence patient management exists in the evaluation of left ventricular dysfunction by two other imaging modalities, MUGA/First Pass can be used as an arbiter
- Precardiac transplant evaluation
- Post-cardiac transplant evaluation when **EITHER** of the following applies:
    - Evaluation of new or worsening cardiac signs, symptoms or new EKG abnormalities
    - Surveillance of a stable patient (no new or worsening cardiac signs or symptoms) at **ANY** of the following times:
        - Within the first 6 months post-transplant
        - 3-month intervals between 6 and 24 months post-transplant
        - 6-month intervals more than 24 months post-transplant

Evaluation of right ventricular function

Cardiac blood pool imaging is considered medically necessary in **ANY** of the following scenarios:

- Patients suspected of having right ventricular dysfunction based on history and/or physical examination
- Reevaluation of patients with established right ventricular dysfunction in patients with a change in clinical status
- Evaluation of right ventricular function in patients with pulmonary hypertension
- Evaluation of right ventricular function in patients with diagnoses known to cause right ventricular dysfunction including but not limited to CAD, valvular heart disease, left ventricular dysfunction, congenital heart disease, morbid obesity, sleep apnea syndrome, advanced lung disease, pulmonary thromboembolic disease, and right ventricular dysplasia
- Evaluation of right ventricular function in patients with myocardial infarction where right ventricular involvement is suspected
- Evaluation of right ventricular function in patients who are being evaluated for or have undergone cardiac or lung transplantation

Coronary artery disease (applies to patients with established CAD)

Cardiac blood pool imaging is considered medically necessary in **ANY** of the following scenarios:

- Recent (less than 3 weeks) acute coronary syndrome (myocardial infarction or unstable angina) for initial assessment of left ventricular function
    - This study is usually done prior to discharge
    - Not required if left ventricular function has been assessed using another imaging modality
- Prior acute coronary syndrome (myocardial infarction or unstable angina) for reevaluation of ventricular function during recovery phase (up to 6 months following acute coronary syndrome)
- Prior acute coronary syndrome (myocardial infarction or unstable angina) for reevaluation of ventricular function after the recovery phase (more than 6 months) in patients who develop new signs or symptoms suggestive of heart failure
- Prior myocardial infarction for reevaluation of left ventricular function in patients being considered for ICD or cardiac resynchronization therapy (CRT)

Congenital heart disease

Cardiac blood pool imaging is considered medically necessary in **EITHER** of the following scenarios:

- Detection and localization of shunts (ventricular septal defect [VSD], atrial septal defect [ASD], patent ductus arteriosus [PDA], anomalous pulmonary venous drainage)
    - Echocardiography is generally considered to be a preferable imaging modality in this clinical situation
- Evaluation of right ventricular and/or left ventricular function in a patient with established complex congenital heart disease

Valvular heart disease

Cardiac blood pool imaging is considered medically necessary in **EITHER** of the following scenarios:

- Established valvular heart disease in patients with new or worsening signs or symptoms
    - In patients with suspected valvular heart disease, echocardiography is the appropriate initial imaging modality
- Patients with severe asymptomatic aortic regurgitation to assist in optimal timing of aortic valve replacement
    - Rest and stress studies are appropriate in this clinical situation

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ECHOCARDIOGRAPHY

Resting Transthoracic Echocardiography (TTE)

Codes

The following code list is not meant to be all-inclusive. Authorization requirements will vary by health plan. Please consult the applicable health plan for guidance on specific procedure codes.

Specific CPT codes for services should be used when available. Nonspecific or not otherwise classified codes may be subject to additional documentation requirements and review.

CPT/HCPCS

93303	Transthoracic echocardiography or congenital cardiac anomalies; complete
93304	Transthoracic echocardiography or 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
93307	Transthoracic echocardiography; complete, without spectral Doppler echocardiography, or color flow Doppler echocardiography
93308	Transthoracic echocardiography; complete, without spectral Doppler echocardiography, or color flow Doppler echocardiography follow-up or limited study
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)

General Information

Standard Anatomic Coverage

- Heart, proximal great vessels, pericardium

Imaging Considerations

Advantages of transthoracic echocardiography

- No risk to the patient
- Minimal patient discomfort
- Widely available
- Extremely portable
- No exposure to ionizing radiation

Disadvantages of transthoracic echocardiography

- Image quality suboptimal in some patients
- Less sensitive than transesophageal echocardiography in some clinical situations

Ordering issues

- Transthoracic echocardiography should only be acquired on equipment which has the capability to perform Doppler echocardiography (pulsed-wave and continuous wave with spectral display) and color flow velocity mapping.
- For interpretation of the guidelines, the term “clinically stable” means that the patient has no new or worsening cardiac symptoms, and there are no changes on cardiovascular examination.

Clinical Indications

Suspected valvular heart disease

Resting transthoracic echocardiography is considered medically necessary in **ANY** of the following scenarios:

- Evaluation of cardiac murmurs when the diagnosis of valvular heart disease has not been established
    - After the diagnosis of valvular heart disease has been established, follow the guidelines for the specific valvular lesion (e.g., established aortic stenosis)
- Initial evaluation for mitral valve prolapse when signs or symptoms of mitral valve prolapse are present
- Initial evaluation for bicuspid aortic valve when there is a family history (established diagnosis in a first-degree relative)

Rationale

Professional society guidelines state that transthoracic echocardiography is the standard initial diagnostic test in evaluating patients with suspected or known valvular heart disease. In addition, repeat transthoracic echocardiography is appropriate to evaluate changing signs or symptoms in a patient with known valvular heart disease. The frequency of routine surveillance depends on the severity of valvular disease. Carelon Guidelines are in concordance with professional society guidance from the American College of Cardiology and the American Heart Association.[34]

Established native valvular stenosis (does not apply to congenital valvular stenosis)

Resting transthoracic echocardiography is considered medically necessary in **ANY** of the following scenarios:

- Changing signs or symptoms
- Annual evaluation of clinically stable patients with moderate or severe stenosis
- Evaluation every 3 years of clinically stable patients with mild stenosis
- Assessment of changes in hemodynamic severity and left ventricular function in patients with known aortic stenosis during pregnancy

Rationale

Professional society guidelines state that transthoracic echocardiography is the standard initial diagnostic test in evaluating patients with suspected or known valvular heart disease. In addition, repeat transthoracic echocardiography is appropriate to evaluate changing signs or symptoms in a patient with known valvular heart disease. The frequency of routine surveillance depends on the severity of valvular disease. Carelon Guidelines are in concordance with professional society guidance from the American College of Cardiology and the American Heart Association.[34]

Established native valvular regurgitation

Resting transthoracic echocardiography is considered medically necessary in **ANY** of the following scenarios:

- Changing signs or symptoms
- Annual evaluation of clinically stable patients with moderate or severe regurgitation
- Evaluation every 3 years of clinically stable patients with mild regurgitation

Rationale

Professional society guidelines state that transthoracic echocardiography is the standard initial diagnostic test in evaluating patients with suspected or known valvular heart disease. In addition, repeat transthoracic echocardiography is appropriate to evaluate changing signs or symptoms in a patient with known valvular heart disease. The frequency of routine surveillance depends on the severity of valvular disease. Carelon Guidelines are in concordance with professional society guidance from the American College of Cardiology and the American Heart Association.[34]

Established bicuspid aortic valve

Resting transthoracic echocardiography is considered medically necessary in **ANY** of the following scenarios:

- Changing signs or symptoms suggesting the development of aortic valve dysfunction
- Annual evaluation of bicuspid aortic valve and dilated aortic root on prior echo
- Evaluation every 3 years of bicuspid aortic valve and normal aortic root on prior echo

Rationale

Professional society guidelines state that transthoracic echocardiography is the standard initial diagnostic test in evaluating patients with suspected or known valvular heart disease. In addition, repeat transthoracic echocardiography is appropriate to evaluate changing signs or symptoms in a patient with known valvular heart disease. The frequency of routine surveillance depends on the severity of valvular disease. Carelon Guidelines are in concordance with professional society guidance from the American College of Cardiology and the American Heart Association.[34]

Established mitral valve prolapse

Resting transthoracic echocardiography is considered medically necessary in the following scenario:

- Changing signs or symptoms

Rationale

Professional society guidelines state that transthoracic echocardiography is the standard initial diagnostic test in evaluating patients with suspected or known valvular heart disease. In addition, repeat transthoracic echocardiography is appropriate to evaluate changing signs or symptoms in a patient with known valvular heart disease. The frequency of routine surveillance depends on the severity of valvular disease. Carelon Guidelines are in concordance with professional society guidance from the American College of Cardiology and the American Heart Association.[34]

Established valvular heart disease – patients who have undergone valve intervention (replacement or repair)

This guideline does not apply to valve replacement or repair for correction of congenital heart disease in childhood – see guideline ***Evaluation of patients with congenital heart disease****.*

Resting transthoracic echocardiography is considered medically necessary in **ANY** of the following scenarios:

- Initial post-intervention evaluation of valve function (baseline study usually performed within 3 months)
- Signs and/or symptoms suggesting dysfunction of a repaired or replaced valve

- Annual evaluation of a patient with a prosthetic or repaired heart valve noted on prior imaging study to have moderate or severe dysfunction (stenosis or regurgitation)
- Evaluation every 3 years of a patient with a prosthetic or repaired heart valve noted on prior imaging study to have mild dysfunction (stenosis or regurgitation)
- Evaluation of stable patients who have undergone surgical implantation of bioprosthetic valve at 5 and 10 years after implantation and annually thereafter *(This guideline does not apply to patients with a mechanical valve prosthesis)*
- Annual evaluation of stable patients who have undergone transcatheter placement of bioprosthetic valve
- Evaluation of stable patients who have undergone surgical mitral valve repair at one (1) year and every 2 years thereafter
- Annual evaluation of stable patients who have undergone transcatheter mitral valve repair

Rationale

Professional society guidelines state that transthoracic echocardiography is the primary modality for postoperative evaluation after valve repair or replacement. Approximately 30% of patients with a bioprosthetic aortic valve develop valvular dysfunction in the 10 years after implantation, and the incidence increases significantly after 10 years. Thus, annual surveillance is reasonable 10 years after bioprosthetic valve implantation. Carelon Guidelines are in concordance with professional society guidance from the American College of Cardiology and the American Heart Association.[34]

Evaluation of patients with congenital heart disease

Resting transthoracic echocardiography is considered medically necessary in **ANY** of the following scenarios:

- Evaluation of patients in whom congenital heart disease is suspected based on signs and symptoms (including murmur, cyanosis, unexplained arterial desaturation, abnormal arterial pulses), abnormal EKG, abnormal chest x-ray
- Patients with chromosomal abnormalities or major extra cardiac abnormality associated with a high incidence of coexisting cardiac abnormality
- Patients with established congenital heart disease (repaired or unrepaired) in whom there is a change in clinical status
- Adult patients with a childhood history of congenital heart disease (with or without prior surgical repair) in whom the original diagnosis is uncertain or when the precise nature of the structural abnormalities or hemodynamics is unclear
- Annual echocardiography is appropriate in clinically stable patients age 6 years or older with established complex congenital heart disease (with or without prior surgical repair) in whom surveillance for ventricular function, valvular function, or pulmonary artery pressure is important in clinical decision-making.
    - This does not include patients with successfully repaired patent ductus arteriosus, small atrial or ventricular septal defects, bicuspid aortic valve or mitral valve prolapse
- Clinically stable patients age 5 years or younger with established congenital heart disease (with or without prior surgical repair) in whom surveillance for ventricular function, AV valvular regurgitation or pulmonary artery pressure is important in clinical decision-making
- Initial outpatient post-operative evaluation of patients who have undergone surgical or catheter-based procedures to correct congenital heart disease (within 60 days of the procedure)
- Evaluation every 3 years in the follow-up of patients who have undergone catheter-based closure of atrial or ventricular septal defects
- Non-adult patients (less than or equal to 18 years old) who are undergoing staged surgical correction of congenital heart disease

- Patients in whom a decision to perform surgical or catheter-based repair of congenital heart disease has been made and in whom echocardiography will be used to assist with procedural planning

Evaluation of ventricular function

Note: It is assumed that left ventricular function will be evaluated using a single imaging modality. Thus, if left ventricular function has been evaluated recently by blood pool imaging, reevaluation using echocardiography is not necessary.

Resting transthoracic echocardiography is considered medically necessary in **ANY** of the following scenarios:

Abnormalities on other testing

- Evaluation of patients with resting EKG abnormalities (LBBB, RBBB with left anterior or posterior hemiblock, LVH, RVH, Q waves suggestive of prior infarction)
- When left ventricular dysfunction is suggested by other testing (chest imaging, elevated B-type natriuretic peptide [BNP]) and left ventricular function has not been evaluated by another modality since that testing was performed
- Where a significant discrepancy (more than would be expected for the range of error of the methods) exists in the evaluation of left ventricular dysfunction by two other imaging modalities, echocardiography can be used as an arbiter

Hypertension

- Initial evaluation of patients with an established diagnosis of hypertension
- Annual evaluation of non-adult patients (less than or equal to 18 years old) with an established diagnosis of hypertension

Heart Failure / Cardiomyopathy / Left Ventricular Dysfunction

- Initial evaluation of known or suspected heart failure
- Reevaluation of patients with known heart failure (systolic or diastolic) in a patient with a deterioration in clinical status
- Reevaluation of patients with known left ventricular dysfunction (systolic or diastolic) in a patient with a deterioration in clinical status
- Evaluation of clinically stable non-adult (age 18 years or younger) patients with left ventricular (LV) systolic dysfunction (LV ejection fraction < 60%) at 6-month intervals
- Screening study every 2 years in clinically stable first-degree relatives of patients with inherited cardiomyopathy (see specific indications for hypertrophic obstructive cardiomyopathy [HOCM] below)
- Evaluation of suspected restrictive, infiltrative or genetic cardiomyopathy
- Initial evaluation of suspected hypertrophic obstructive cardiomyopathy (HOCM)
- Reevaluation of known hypertrophic obstructive cardiomyopathy (HOCM) in a patient with a change in clinical status to guide or evaluate therapy
- Annual evaluation non-adult (age 18 years or younger) first-degree relatives of patients with established hypertrophic obstructive cardiomyopathy (HOCM)
- Evaluation every 5 years of adult (age 19 years or older) first-degree relatives of patients with established hypertrophic obstructive cardiomyopathy (HOCM)
- Annual evaluation of asymptomatic adult (age 19 years or older) patients with known hypertrophic obstructive cardiomyopathy (HOCM)
- Evaluation of asymptomatic non-adult (age 18 years or younger) patients with known hypertrophic obstructive cardiomyopathy (HOCM) at 6-month intervals
- Evaluation of patients on mavacamten for treatment of HOCM as follows:

- Prior to initiation
- At week 4, week 8, and week 12 following initiation
- Every 12 weeks after the first 12 weeks if dose is stable
- At week 4 and week 12, and every 12 weeks thereafter following up-titration of dose
- At week 4 and week 8 following treatment interruption for LVEF < 50%
- At week 4 and week 12, and every 12 weeks thereafter following reintroduction after treatment interruption

Implantable devices

- Evaluation of left ventricular function in a patient with known cardiomyopathy being considered for cardiac resynchronization therapy (CRT), implantable defibrillator (ICD) or ventricular assist device (VAD)
- Initial evaluation for cardiac resynchronization therapy (CRT) device optimization following implantation
- Evaluation of a patient being treated with cardiac resynchronization therapy (CRT) with new or persistent signs or symptoms of heart failure for device optimization
- For optimization of device settings in patients with ventricular assist device (VAD)
- Evaluation of signs and/or symptoms suggestive of device related complications in patients with ventricular assist device (VAD)

Other

- Precardiac transplant evaluation
- Post-cardiac transplant evaluation when **EITHER** of the following applies:
  - Evaluation of new or worsening cardiac signs, symptoms, or new EKG abnormalities
  - Surveillance of a stable patient (no new or worsening cardiac signs or symptoms) at **ANY** of the following times:
    - Within the first 6 months post-transplant
    - 3-month intervals between 6 and 24 months post-transplant
    - 6-month intervals more than 24 months post-transplant
- Screening for cardiac disease on one occasion in patients being evaluated for solid organ or hematopoietic cell transplant
  - Requests for subsequent echocardiograms should be informed by abnormalities on the screening echocardiogram
- Evaluation of known or suspected myocarditis
- Evaluation of right ventricular function in patients with disease likely to affect right ventricular function, including but not limited to chronic lung diseases and sleep apnea syndrome
- Evaluation of ventricular function prompted by treatment with cardiotoxic agents (including but not limited to some chemotherapeutic agents for cancer, Novantrone [mitoxantrone] for multiple sclerosis, etc.) at **ANY** of the following times:
  - Baseline evaluation prior to starting treatment
  - Serial evaluation during treatment or within 6 months of completion of treatment
  - Surveillance annually thereafter

Rationale

The assessment or reassessment of ventricular function is appropriate when the results of that assessment will directly impact management. Examples include decisions related to the use of potentially cardiotoxic medications and decisions related to the placement and optimization of implantable devices. Multiple professional societies have collaborated on guidelines related to the use of echocardiography[12], and Carelon Guidelines are in concordance with those guidelines.

Evaluation of patients with cardiac arrhythmias

Resting transthoracic echocardiography is considered medically necessary in **ANY** of the following scenarios:

- Patients who have sustained (lasting more than 30 seconds) or nonsustained (more than 3 beats but terminating within 30 seconds) ventricular tachycardia and have not undergone echocardiography since the arrhythmia was recognized
- Patients who have sustained (lasting more than 30 seconds) or nonsustained (more than 3 beats but terminating within 30 seconds) supraventricular tachycardia (including but not limited to atrial fibrillation, atrial flutter, atrial tachycardia, AV node reentrant tachycardia, etc.) and have not undergone echocardiography since the arrhythmia was recognized
- Patients who have frequent premature ventricular contractions (PVC) defined as more than 30 PVCs per hour on ambulatory EKG (Holter) monitoring and have not undergone echocardiography since the arrhythmia was recognized
    - Echocardiography is not clinically indicated for evaluation of infrequent premature atrial or ventricular depolarizations
- Patients who have persistent frequent premature ventricular contractions (PVC) defined as more than 30 PVCs per hour on ambulatory EKG (Holter) monitoring, transthoracic echocardiography is appropriate to exclude arrhythmia-induced LV dysfunction
- Patients who have persistent uncontrolled atrial fibrillation or flutter on ambulatory EKG (Holter) monitoring, transthoracic echocardiography is appropriate to exclude arrhythmia-induced LV dysfunction

Rationale

Carelon Guidelines for the use of echocardiography in evaluation of cardiac arrhythmias are in concordance with guidelines from multiple professional societies.[12]

Evaluation of infective endocarditis (native or prosthetic valves)

Resting transthoracic echocardiography is considered medically necessary in **ANY** of the following scenarios:

- Patients with suspected endocarditis (positive blood cultures and/or a new murmur on physical examination)
- Reevaluation of patients with established endocarditis who have **ANY** of the following:
    - Virulent organism
    - Severe hemodynamic lesion
    - Aortic involvement
    - Persistent bacteremia
    - Clinical deterioration

Evaluation of patients with suspected CAD

Resting echocardiography is considered medically necessary in **EITHER** of the following scenarios:

- Chest pain

    - Resting echocardiography may suggest a cause for the chest pain other than myocardial ischemia (mitral valve prolapse) and is therefore a reasonable imaging procedure in patients with chest pain
    - If CAD is a likely diagnosis and if a resting echocardiogram cannot be performed while the patient is experiencing the pain, a provocative test (exercise or pharmacological stress test with or without imaging as appropriate) is preferable
    - Resting echocardiography has no role in screening for CAD in asymptomatic patients
- Evaluation of patients with suspected aberrant or anomalous coronary origins or coronary artery fistula

Evaluation of patients with known CAD

Resting transthoracic echocardiography is considered medically necessary in **ANY** of the following scenarios:

- Recent (< 3 weeks) acute coronary syndrome (myocardial infarction or unstable angina) and hemodynamic instability or signs or symptoms suggesting a complication of myocardial infarction including but not limited to acute mitral regurgitation, hypoxemia, abnormal chest x-ray, acute ventricular septal rupture, free wall rupture / tamponade, shock, right ventricular involvement, heart failure, or thrombus
    - This study is usually requested on an inpatient
- Recent (< 3 weeks) acute coronary syndrome (myocardial infarction or unstable angina) for initial assessment of left ventricular function
    - This study is usually done prior to discharge
    - Not required if left ventricular function has been assessed using a different imaging modality
- Prior acute coronary syndrome (myocardial infarction or unstable angina) for reevaluation of ventricular function during recovery phase (up to 6 months following acute coronary syndrome)
- Prior acute coronary syndrome (myocardial infarction or unstable angina) for reevaluation of ventricular function after the recovery phase (more than 6 months) in patients who develop new symptoms or signs suggestive of heart failure
- Prior myocardial infarction for reevaluation of left ventricular function in patients being considered for ICD or cardiac resynchronization therapy (CRT)
- Annual echocardiography is appropriate in non-adult patients (less than or equal to 18 years old) with an established diagnosis of aberrant or anomalous coronary origins or coronary artery fistula if the findings on echocardiography will impact clinical decision making

Evaluation of suspected or established Kawasaki disease

Resting transthoracic echocardiography is considered medically necessary in **ANY** of the following scenarios:

- Evaluation of patients with suspected Kawasaki disease
- Patients with an established diagnosis of Kawasaki disease at 2 to 4 weeks and again at 6 to 8 weeks following diagnosis whether or not there was coronary artery involvement
- Periodic surveillance up to one year following diagnosis of Kawasaki disease in patients with persistent fever
- Periodic surveillance up to one year following diagnosis of Kawasaki disease when previous echocardiograms reveal **ANY** of the following:
    - Coronary abnormalities
    - Left ventricular dysfunction
    - Pericardial effusion
    - Valvular regurgitation (other than trace or trivial regurgitation)

    - Aortic dilation
- Annual evaluation in patients with an established diagnosis of Kawasaki disease who have small or medium-sized coronary artery aneurysms
- Semiannual evaluation (every 6 months) in patients with an established diagnosis of Kawasaki disease who have large or giant coronary artery aneurysms, or coronary artery obstruction

Rationale

In the setting of Kawasaki disease, criteria for transthoracic echocardiography are in concordance with a statement from the American Heart Association.[29]

Evaluation of signs, symptoms, or abnormal testing

Resting transthoracic echocardiography is considered medically necessary in **ANY** of the following scenarios:

- Evaluation of the following newly recognized symptoms (dyspnea, syncope, reduced functional capacity, orthopnea, paroxysmal nocturnal dyspnea, transient ischemic attack [TIA] or stroke)
- Evaluation of newly recognized lightheadedness (dizziness, presyncope, near-syncope, etc.) when accompanied by other symptoms, signs or EKG abnormalities (LBBB, RBBB with left anterior hemiblock, LVH, RVH, or Q waves suggestive of prior infarction) which suggest structural heart disease
- Evaluation of newly recognized palpitation when accompanied by other symptoms, signs or EKG abnormalities (LBBB, RBBB with left anterior hemiblock, LVH, RVH, or Q waves suggestive of prior infarction) which suggest structural heart disease
- Evaluation of chest pain not thought to be due to myocardial ischemia or infarction. If myocardial ischemia or infarction is thought to be the cause, resting outpatient echocardiography is not appropriate
- Evaluation of the following newly recognized signs suggesting structural heart disease (murmur, cyanosis, ankle edema, ascites, elevation of jugular venous pressure, unexplained weight gain, tachycardia, tachypnea, audible third heart sound, lung crackles suggestive of pulmonary edema)
- Evaluation of patients who are hemodynamically unstable or hypotensive for unknown reasons
- Evaluation of abnormal results from other testing which suggests underlying cardiac disease (abnormal chest imaging suggesting cardiac chamber enlargement, valvular or congenital heart disease or congestive heart failure [CHF], abnormal EKG suggesting chamber hypertrophy, valvular or congenital heart disease [LBBB, RBBB with anterior or posterior hemiblock, LVH, RVH, or Q waves suggestive of prior infarction] or abnormal laboratory results suggesting CHF, such as elevated B-type natriuretic peptide [BNP])
    - When other cardiac testing raises concerns of underlying CAD, provocative testing is recommended over resting echocardiography
- Evaluation of respiratory failure of unknown cause
- Annual evaluation of patients with syndromes which place them at increased risk for the development of acquired myocardial or aortic diseases (e.g., Marfan syndrome, Ehlers-Danlos syndrome, Turner syndrome, etc.)
- Evaluation of suspected acute rheumatic fever

Evaluation of patients with pulmonary embolus

Resting transthoracic echocardiography is considered medically necessary in **ANY** of the following scenarios:

- Patients with known acute pulmonary embolus, echocardiography may be appropriate as it is useful in guiding initial decision making (thrombectomy, thrombolysis)
    - Echocardiography is not indicated in the initial evaluation of a patient with suspected pulmonary embolism in order to establish the diagnosis

- Patients who have had a pulmonary embolus, echocardiography may be appropriate to evaluate right ventricular function and pulmonary artery pressure. If right ventricular function and pulmonary artery pressure are normal, repeated studies are not necessary

Evaluation of patients with pulmonary hypertension

Resting transthoracic echocardiography is considered medically necessary in **ANY** of the following scenarios:

- Evaluation of suspected pulmonary hypertension
- Follow-up of pulmonary arterial pressures in patients with pulmonary hypertension to evaluate response to treatment
- Annual evaluation in clinically stable patients with an established diagnosis of pulmonary hypertension
- Evaluation of signs or symptoms which may be attributable to worsened pulmonary hypertension

Rationale

Carelon Guidelines for the use of echocardiography in evaluation of suspected and known pulmonary hypertension are in concordance with guidelines from multiple professional societies.[12]

Evaluation of aortic disease

Resting transthoracic echocardiography is considered medically necessary in **ANY** of the following scenarios:

- One-time evaluation when ascending aortic aneurysm/dilation or dissection is suspected based on symptoms of chest pain or shortness of breath or abnormal physical findings suggesting these diagnoses
    - Although some providers will use transthoracic echocardiography in evaluation of diseases of the thoracic aorta, transesophageal echocardiography is often preferable in this situation
- Annual evaluation when pathology of the ascending aorta (aneurysm/dilation or dissection) is suspected because the patient has an established diagnosis of a connective tissue disease or genetic condition which predisposes to ascending aortic pathology including but not limited to Marfan syndrome, Ehlers-Danlos syndrome and familial aortic dilation. *(This guideline does not apply to surveillance of patients with bicuspid aortic valve – see above guideline **Established bicuspid aortic valve**).*
- Evaluation of the ascending aorta in patients with a suspected connective tissue disease or genetic condition which predisposes to ascending aortic pathology including but not limited to Marfan syndrome, Ehlers-Danlos syndrome and familial aortic dilation
- Annual evaluation in patients with an established diagnosis of ascending aortic aneurysm or dissection
    - Annual echocardiographic evaluation is usually sufficient in clinically stable patients but more frequent testing may be appropriate in some situations (e.g., in longitudinal follow-up of large or enlarging thoracic aneurysms, in follow-up of recently diagnosed thoracic aneurysms until stability is established)
- Patients with an established diagnosis of ascending aortic aneurysm or dissection who develop new symptoms or signs of aortic aneurysm or dissection.

Rationale

According to guidelines from the American College of Cardiology and the American Heart Association, transthoracic echocardiography is the most common initial imaging modality for nonemergent evaluation of the thoracic aorta, and is very useful in evaluating the aortic root, ascending aorta, and the aortic valve. Carelon Guidelines are aligned with the principles set forth in that guideline.[24]

Evaluation of pericardial diseases

Resting transthoracic echocardiography is considered medically necessary in **EITHER** of the following scenarios:

- Evaluation of suspected pericardial conditions, including but not limited to pericardial effusion, pericardial mass, constrictive pericarditis, effusive-constrictive conditions, patients post-cardiac surgery or suspected pericardial tamponade
- Evaluation of established pericardial conditions, including but not limited to moderate and large pericardial effusion, pericardial mass, constrictive pericarditis, effusive-constrictive conditions, patients post-cardiac surgery or suspected pericardial tamponade
    - Routine surveillance of known small pericardial effusions with no change in clinical status is not appropriate

Evaluation of cardiac masses or cardiac source of embolus

Resting transthoracic echocardiography is considered medically necessary in **EITHER** of the following scenarios:

- Diagnosis or exclusion of a cardiac source of embolus in a patient who has had or appears to have had a systemic embolic event (although transesophageal echocardiography [TEE] is often preferable in this situation)
- Pre- and post-treatment evaluation of cardiac masses (tumor or thrombus)
    - Annual echocardiographic evaluation is usually sufficient in clinically stable patients with cardiac masses (tumors or thrombus), but more frequent testing may be appropriate in some situations (e.g., in longitudinal follow-up of enlarging masses or in follow-up of recently diagnosed masses until stability is established)

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Transesophageal Echocardiography (TEE)

Codes

The following code list is not meant to be all-inclusive. Authorization requirements will vary by health plan. Please consult the applicable health plan for guidance on specific procedure codes.

Specific CPT codes for services should be used when available. Nonspecific or not otherwise classified codes may be subject to additional documentation requirements and review.

CPT/HCPCS

93312	Echocardiography, transesophageal, real-time with image documentation (2-D) (with or without M-mode recording)
93313	Echocardiography, transesophageal, probe placement only
93314	Echocardiography, transesophageal, image acquisition, interpretation and report only
93315	Echocardiography, transesophageal for congenital cardiac anomalies
93316	Echocardiography, transesophageal, probe placement only (congenital cardiac anomalies)
93317	Echocardiography, transesophageal, image acquisition, interpretation and report only (congenital cardiac anomalies)
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)

General Information

Standard Anatomic Coverage

- Heart, proximal great vessels, pericardium

Imaging Considerations

- In general, it is assumed that transesophageal echocardiography is appropriately used as an adjunct or subsequent test to transthoracic echocardiography when suboptimal transthoracic echocardiography images preclude obtaining a diagnostic study.
- There are some clinical situations for which transesophageal echocardiography is a more appropriate initial imaging test than transthoracic echocardiography. These situations are outlined below under Clinical Indications for transesophageal echocardiography.
- Since transesophageal echocardiography requires conscious sedation, it should only be performed at locations where cardiac monitoring and appropriate equipment for cardiopulmonary resuscitation are readily available.
- Patients with oropharyngeal or esophageal pathology which contraindicates intubation of the esophagus are not suitable candidates for transesophageal echocardiography.

Clinical Indications

Patients who have had, or are likely to have, suboptimal transthoracic imaging

Transesophageal echocardiography is considered medically necessary in **EITHER** of the following scenarios:

- When image quality is suboptimal such that the clinical question(s) prompting the transesophageal echocardiography has/have not been adequately answered
- When it is likely that transthoracic imaging will be suboptimal in the following situations:
    - Previous transthoracic echocardiograms were of suboptimal quality
    - Patients with severe abnormalities of thoracic contour (pectus deformities, severe kyphoscoliosis)
    - Patients who have recently had thoracic surgery where post-operative tenderness or the location of dressings or incisions would preclude imaging from the usual transthoracic locations
    - Following severe chest trauma
    - Following extensive burns to the thorax
    - Patients with a cardiac diagnosis made by transesophageal echocardiography who require reevaluation, the results of which would lead to a change in therapy (e.g., resolution of an intracardiac thrombus following anticoagulation)

Patients whose clinical situation suggests that transesophageal echocardiography may be preferable to transthoracic echocardiography

Transesophageal echocardiography is considered medically necessary in **ANY** of the following scenarios:

- Evaluation of suspected acute aortic pathology
- Evaluation of valvular structure and function to assess suitability for and assist in planning of surgical or catheter based valvular intervention
- Diagnosis or management of endocarditis with an intermediate or high pretest probability (e.g., bacteremia, especially staph bacteremia or fungemia)
- Diagnosis or management of endocarditis involving prosthetic heart valves
- Evaluation of persistent fever in a patient with an intracardiac device to exclude endocarditis
- Evaluation of a patient with atrial fibrillation/flutter to facilitate clinical decision-making with regards to anticoagulation and/or cardioversion and/or ablation
    - Transesophageal echocardiography is not required when the decision has been made to anticoagulate the patient and not perform cardioversion
- Evaluation of a patient who has undergone surgical correction of complex congenital heart disease for the exclusion of intracardiac thrombus
- Evaluation for cardiovascular source of embolic event when no non-cardiac source has been identified

Rationale

Transesophageal echocardiography (TEE) is generally used to provide additional detail in patients for whom transthoracic echocardiography has been, or is expected to be, of suboptimal quality. Specialty society guidelines consider TEE to be appropriate in the evaluation of atrial fibrillation or flutter “to facilitate decision making with regards to anticoagulation, cardioversion, and/or radiofrequency ablation.”[4] Carelon Guidelines for the use of TEE are in concordance with professional society guidelines.[4]

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Stress Echocardiography

Codes

The following code list is not meant to be all-inclusive. Authorization requirements will vary by health plan. Please consult the applicable health plan for guidance on specific procedure codes.

Specific CPT codes for services should be used when available. Nonspecific or not otherwise classified codes may be subject to additional documentation requirements and review.

CPT/HCPCS

93350	Echocardiography, transthoracic during rest and cardiovascular stress test using treadmill, bicycle exercise and/or pharmacologically induced stress, with interpretation and report
93351	Echocardiography, transthoracic 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
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)

General Information

Scope

- This guideline addresses the appropriate use of stress echocardiography (SE) in elective, non-emergent settings.
- It is anticipated that, consistent with current guidelines, the evaluation of patients with acute coronary syndromes (myocardial infarction and unstable angina) will occur in the emergency room or in an inpatient setting. SE performed in these practice settings is not included in this preauthorization program and is therefore not addressed in these guidelines.

Pretest Probability and CAD Risk Assessment

Reliability of noninvasive testing in accurately diagnosing or excluding CAD is dependent upon the likelihood of disease, which takes into account both **pretest probability** and **atherosclerotic disease risk.**

In those with low likelihood of disease, there is an unacceptably high rate of false-positive results, thus rendering these tests unreliable and potentially harmful.

Pretest probability may be estimated based on the quality of symptoms, age, and gender.

- Cardiac chest pain is centrally located, provoked by stress (exercise or emotional), and relieved by rest
- Possible cardiac chest pain has two of the three characteristics associated with cardiac chest pain
- Non-cardiac chest pain has one (or none) of the three characteristics associated with cardiac chest pain

Table 1 below shows the pretest probability of obstructive CAD for patients presenting with chest pain and dyspnea stratified by age, gender, and the nature of the symptoms.

Table 1. Pretest Probability (%) of CAD by Age, Gender, and Symptoms

	Cardiac	Cardiac	Possible cardiac	Possible cardiac	Noncardiac	Noncardiac	Dyspnea[#]	Dyspnea[#]
Age (years)	Male	Female	Male	Female	Male	Female	Male	Female
30-39	3	5	4	3	1	1	0	3
40-49	22	10	10	6	3	2	12	3
50-59	32	13	17	6	11	3	20	9
60-69	44	16	26	11	22	6	27	14
70+	52	27	34	19	24	10	32	12

#Applies to patients who have dyspnea without chest pain

Adapted from Knuuti J, Wijns W, Saraste A, et al. 2019 ESC guidelines for the diagnosis and management of chronic coronary syndromes. Eur Heart J. 2020;41: 407–477.

Atherosclerotic disease risk

The ASCVD Pooled Cohort Equations risk calculation tool is used to estimate risk of atherosclerotic cardiovascular disease. This tool, which is endorsed by several professional societies, incorporates age, gender, race, several clinical conditions known to affect ASCVD risk (including diabetes, dyslipidemia, hypertension), and tobacco use.

Uses of Stress Echocardiography

- SE is one of several noninvasive approaches to the evaluation of the patient with suspected or established CAD. In addition to the clinical scenario leading to the need for noninvasive CAD evaluation, clinicians should consider regional variation in availability, technical expertise and interpretive proficiency in selecting the optimal approach to testing.
- The primary use of SE is in the diagnosis or exclusion of obstructive CAD.
- SE is also used for management of established CAD.
- SE may be used for assessment of myocardial viability in patients who have had myocardial infarction.
- SE is also useful in the evaluation of valvular heart disease, and for the detection and management of occult pulmonary hypertension.

Imaging Considerations

- A resting EKG is strongly recommended, preferably within 30 days of the request for SE, as the findings may determine the optimal diagnostic approach. For example, resting ischemic changes or evidence of recent myocardial infarction may significantly alter the testing strategy.
- Selection of the optimal noninvasive testing should be made so that the resulting information facilitates patient management decisions and does not simply add a new layer of testing. Exercise should be used rather than pharmacological agents in those capable performing an exercise test, unless there are EKG findings (such as left bundle branch block) that would make pharmacological testing preferable
- Morbid obesity (BMI > 40) and advanced lung disease may impact image quality, and other testing modalities should be considered in those patients.
- The decision to use echocardiographic contrast agents is dependent on image quality and the specific clinical scenario. Contrast agent use does not require separate preauthorization.

Clinical Indications

Indications are organized as follows:

Suspected CAD in symptomatic patients
Established flow-limiting CAD in asymptomatic patients
Surveillance following revascularization
Follow-up to acute coronary syndrome
Evaluation of myocardial viability
Established flow-limiting CAD in symptomatic patients
Established or suspected CAD
Patients who have undergone cardiac transplantation
New onset arrhythmia
CHF or LV systolic dysfunction
Request prompted by abnormal or inconclusive test:
Abnormal resting EKG
Abnormal exercise EKG test
Abnormal stress imaging test
Preoperative cardiac evaluation for non-cardiac surgery (includes surveillance prior to solid organ transplant)
Valvular heart disease
Pulmonary hypertension
Hypertrophic cardiomyopathy
Miscellaneous indications
Inability to perform exercise EKG test
Kawasaki disease
Prior to initiation of Interleukin-2

Suspected CAD in symptomatic patients who have not had evaluation for CAD within the preceding 60 days

SE is considered medically necessary in **ANY** of the following scenarios:

- Chest pain with or without other symptoms of myocardial ischemia
    - With pretest probability of CAD > 15% (Table 1)
- Patients without chest pain whose predominant symptom is dyspnea
    - With pretest probability of CAD > 15% (Table 1)
- Patients with any cardiac symptom who have diseases/conditions with which CAD commonly coexists, such as **ANY** of the following:
    - Abdominal aortic aneurysm
    - Established and symptomatic peripheral vascular disease
    - Prior history of stroke, transient ischemic attack (TIA), carotid endarterectomy (CEA), or high-grade carotid stenosis (> 70%)
    - Chronic kidney disease

Established flow-limiting CAD in asymptomatic patients

SE is considered medically necessary in **ANY** of the following scenarios:

- Surveillance following coronary revascularization as follows:
    - Evaluation of stable patients who have undergone CABG more than 5 years previously and have not had an evaluation for CAD within the past 2 years
        - Stable patients whose revascularization has been incomplete may undergo SE 3 years following the procedure and every 2 years thereafter
- Patients who have had acute coronary syndrome within the preceding 90 days, did not undergo coronary angiography at the time of the acute event, and have not had evaluation for CAD since
- To establish myocardial viability in patients who are candidates for revascularization and have left ventricular systolic dysfunction (LV ejection fraction < 55%)

Established flow-limiting CAD in patients who have new or worsening symptoms

SE is considered medically necessary in **EITHER** of the following scenarios:

- Patients whose symptoms persist despite maximal anti-ischemic medical therapy or contraindication thereto
    - Patients with established CAD and typical angina pectoris despite maximal anti-ischemic therapy may be better served with invasive coronary angiography
- To establish myocardial viability in patients who are candidates for revascularization and have left ventricular systolic dysfunction (LV ejection fraction < 55%)

Established or suspected CAD

SE is considered medically necessary in **ANY** of the following scenarios:

Patients who have undergone cardiac transplantation

- With new or worsening cardiac symptoms
- With new or worsening physical examination abnormalities
- Clinically stable patients who have not had evaluation for CAD in the preceding year

Patients (symptomatic or asymptomatic) with ANY of the following new onset arrhythmias who have not had evaluation for CAD since the arrhythmia was recognized

- Sustained (lasting more than 30 seconds) or nonsustained (more than 3 beats but terminating within 30 seconds) ventricular tachycardia
- Atrial fibrillation or flutter and high or intermediate risk of CAD (using ASCVD Pooled Cohort Equations)
- Atrial fibrillation or flutter and established CAD
- Frequent premature ventricular contractions (PVC) defined as more than 30 PVCs per hour on ambulatory EKG (Holter) monitoring
    - SE is not clinically indicated for evaluation of infrequent premature atrial or ventricular depolarizations

Patients (symptomatic or asymptomatic) with new onset CHF or recently recognized LV systolic dysfunction who have not had evaluation for CAD since the onset of LV dysfunction/CHF

- For patients in this category with established CAD, or those with suspected CAD whose CAD risk (using ASCVD Pooled Cohort Equations) is high, coronary angiography may be more appropriate than noninvasive evaluation

Abnormal resting EKG

- Patients with **ANY** of the following newly recognized and not previously evaluated resting EKG changes:
    - Left bundle branch block
    - ST depression ≥ 1 mm
    - Left ventricular hypertrophy with repolarization abnormality
- Patients who would otherwise undergo exercise EKG testing (without imaging) but have **ANY** of the following resting EKG findings that would render the interpretation of an exercise EKG test difficult or impossible:
    - Left bundle branch block
    - Ventricular paced rhythm
    - Left ventricular hypertrophy with repolarization abnormality
    - Digoxin effect
    - ST depression ≥ 1 mm on a recent EKG (within the past 30 days)
    - Pre-excitation syndromes (e.g., Wolff-Parkinson-White syndrome)

Patients with abnormal exercise treadmill test (performed without imaging) who have not undergone evaluation for CAD since the treadmill test

- Abnormal findings on an exercise treadmill test include chest pain, ST segment change, abnormal blood pressure response, or complex ventricular arrhythmias

Patients who have undergone recent (within the past 60 days) stress testing with adjunctive imaging (MPI, perfusion PET, stress MRI)

- When the stress imaging test is technically suboptimal, technically limited, inconclusive, indeterminate, or equivocal, such that myocardial ischemia cannot be adequately excluded
    - SE is not appropriate for patients who have had a recent normal or abnormal stress imaging test
    - A stress imaging test is deemed to be abnormal when there are abnormalities on the imaging portion of the test. Electrocardiographic abnormalities without imaging evidence of ischemia do not render a stress imaging test abnormal.

Preoperative cardiac evaluation of patients undergoing non-emergency non-cardiac surgery (includes surveillance for CAD in patients awaiting solid organ transplant)

Note: It is assumed that those who require emergency surgery will undergo inpatient preoperative evaluation.

Prior to considering elective surgery, patients with active cardiac conditions such as unstable coronary syndromes (unstable angina), decompensated heart failure (NYHA class IV, worsening or new onset heart failure), significant arrhythmias (third degree AV block Mobitz II AV block, uncontrolled supraventricular arrhythmia, symptomatic ventricular arrhythmias, ventricular tachycardia), symptomatic bradycardia or severe stenotic valvular lesions should be evaluated and managed per ACC/AHA guidelines. That evaluation may include SE.

- **Low-risk surgery** (endoscopic procedures, superficial procedures, cataract surgery, breast surgery, ambulatory surgery)
    - Provided that there are no active cardiac conditions (as outlined above), SE prior to low-risk surgery is considered **not medically necessary**
- **Intermediate-risk surgery** (including but not limited to intraperitoneal and intrathoracic surgery, carotid endarterectomy, head and neck surgery, orthopedic surgery, prostate surgery, gastric bypass surgery) or **high-risk surgery** (including but not limited to aortic and other major vascular surgery, peripheral vascular surgery) when **BOTH** of the following apply:
    - Patient has not had a negative evaluation for CAD or a coronary revascularization procedure within the previous one (1) year

    - At least **ONE** of the following applies:
        - Patient has established CAD (prior MI, prior PCI or CABG) or presumed CAD (Q waves on EKG, abnormal MPI, SE, or cardiac PET)
        - Patient has compensated heart failure or prior history of CHF
        - Patient has diabetes mellitus
        - Patient has chronic kidney disease
        - Patient has a history of cerebrovascular disease (TIA, stroke, or documented carotid stenosis requiring carotid endarterectomy)
        - Patient is unable to walk on a treadmill for reasons other than obesity
- **Patients awaiting solid organ transplant**
    - Asymptomatic patients who have not undergone evaluation for CAD within the preceding one (1) year
    - Patients with symptoms consistent with myocardial ischemia

Valvular heart disease

SE is considered medically necessary in **EITHER** of the following scenarios:

- Evaluation of asymptomatic patients with **ANY** of the following valvular lesions:
    - Severe aortic stenosis
    - Severe aortic regurgitation with normal left ventricular size and function
    - Severe mitral stenosis
    - Severe mitral regurgitation with normal left ventricular size and function
- Evaluation of symptomatic patients with **ANY** of the following valvular lesions
    - Aortic stenosis of uncertain degree (due to the presence of coexistent severe left ventricular systolic dysfunction). Pharmacologic SE with a drug such as dobutamine that increases myocardial contractility is the preferred protocol.
    - Moderate mitral stenosis
    - Moderate mitral regurgitation

Pulmonary hypertension

SE is considered medically necessary in **EITHER** of the following scenarios:

- Evaluation of patients with suspected pulmonary hypertension whose resting echocardiogram fails to confirm that diagnosis, such that exercise induced pulmonary hypertension needs to be excluded
- Evaluation of right and/or left ventricular function during exercise in patients with established exercise-induced pulmonary hypertension

Hypertrophic obstructive cardiomyopathy

SE is considered medically necessary for the following:

- Evaluation of dynamic changes during exercise in patients with an established diagnosis of hypertrophic obstructive cardiomyopathy who do not have a resting outflow tract gradient of 50 mm Hg or more

Miscellaneous indications

SE is considered medically necessary in the following scenarios:

Inability to perform exercise EKG test

- Patients who would otherwise undergo exercise EKG testing (without imaging) but are unable (for reasons other than obesity) to perform exercise to a degree that would yield a diagnostic test. This provision includes patients with musculoskeletal, neurological or pulmonary limitation.

Established Kawasaki disease with coronary artery involvement

- Evaluation every 2 years for confirmed small to medium-sized coronary artery aneurysm
- Annual evaluation for confirmed large (giant) coronary artery aneurysm, multiple or complex aneurysms, or coronary artery obstruction confirmed by angiography

Prior to initiation of Interleukin-2

- When a decision has been made to treat the patient with Interleukin-2

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History

Status	Review Date	Effective Date	Action
Revised	01/23/2024	10/20/2024 – Not for LA Medicaid	Independent Multispecialty Physician Panel (IMPP) review. For resting TTE, expanded frequency of echocardiographic evaluation in patients on mavacamten treated for HOCM; expanded criteria for echocardiographic evaluation to allow single screening for cardiac disease in patients undergoing evaluation for solid organ or hematopoietic cell transplant.
Revised	07/18/2023	04/14/2024 for all except LA Medicaid; 10/20/2024 for LA Medicaid	IMPP review. Cardiac CT for cardiomyopathy: Added specificity to establish the basis for suspicion of ARVD to align with cardiac MRI guidelines. New indications for resting TTE for evaluation of ventricular function in patients on mavacamten for treatment of HOCM.
Updated	01/23/2024	Unchanged	IMPP review. Added required language to General Clinical Guideline per new Medicare regulations. Expanded guideline rationales. Added references.
Updated	n/a	01/01/2024	Annual CPT code update. Removed 0501T-0504T and added 75580. Added long descriptions for 75565, 78496, 93319-21, 93325, 93352.
Revised	05/09/2022	04/09/2023 for commercial, Medicare, and Medicaid except LA; 06/18/2023 for LA Medicaid	IMPP review. Stress tests with imaging (MPI, SE, stress MRI, PET perfusion, and CCTA): removed suspected and established CAD in asymptomatic patients; revised suspected CAD in symptomatic patients; removed established CAD in symptomatic patients. Expanded use of CCTA and stress MRI for evaluation of CAD. Revised/added indications for resting MRI (Fabry disease) and FFR-CT. Revised surveillance TTE to begin at 5 years in stable patients who have bioprosthetic valves; revised frequency of surveillance TTE in patients with prosthetic valves and those who had TAVR. Added references.
Revised	05/09/2022	11/06/2022 for commercial, Medicare, non-Anthem Medicaid; 04/09/2023 for Anthem Medicaid except LA; 06/18/2023 for LA Medicaid	IMPP review. New cardiac CT criteria for left atrial appendage closure devices.

Status	Review Date	Effective Date	Action
Revised	05/26/2021	03/13/2022	IMPP review. Revised CCTA criteria for preoperative evaluation of patients undergoing TAVI/TAVR to exclude those at intermediate risk for patients undergoing TAVI/TAVR. Added CPT code 93319.
Updated	-	01/01/2022	2022 Annual CPT code update: modified descriptor for 75573.
Revised	05/26/2021	11/07/2021	IMPP review. Revised CCTA criteria for preoperative evaluation of patients undergoing TAVI/TAVR or other cardiac valve surgery to include those at low risk for CAD. Revised surveillance TTE and blood pool imaging to every 6 months for stable patients more than two years post-cardiac transplant. Added reference.
Revised	12/03/2020	09/12/2021	IMPP review. Replaced use of SCORE risk calculator with the AHA/ACC risk calculator (ACSVD Pooled Cohort Equations). Added reference.
Revised	02/03/2020	03/14/2021	IMPP review. Expanded criteria for patients found to have structural heart disease on initial transthoracic echocardiography (TTE); added restrictions for patients whom the initial TTE shows no evidence of structural heart disease. Added restrictions for TTE in evaluation of palpitation and lightheadedness. Added references. Added CPT codes 78414, 78428, S8085, and S8092.
Revised	-	01/01/2020	2020 CPT code set added 78429, 78430, 78431, 78432, 78433, and modified descriptors for 78459, 78491, 78492.
Revised	03/29/2019	11/10/2019	IMPP review. Revised criteria for blood pool imaging to address appropriate evaluation and surveillance of left ventricular function in patients treated with cardiotoxic agents and following cardiac transplantation. New criteria include expansive language for cardiac CT with quantitative evaluation of calcification. Added references.
Revised	05/01/2018	06/29/2019	IMPP review. Revised criteria for resting TTE to address evaluation and surveillance of left ventricular function for cardio-oncology and frequency of surveillance following transcatheter mitral valve repair. Added clarifications to address exercise-induced syncope, dizziness, lightheadedness, or near syncope in symptomatic patients with suspected coronary artery disease (CAD) for MPI, stress echo, CCTA, and PET. Clarified established CAD as flow limiting when diagnosed by CCTA for MPI, stress echo, and PET. Added references.
Revised	07/11/2018	03/09/2019	IMPP review. Added the General Clinical Guideline.
Revised	05/01/2018	01/27/2019	IMPP review. For MPI, stress echo, and PET, revised criteria to allow annual surveillance of CAD in patients with established CAD post-cardiac transplant and revised definition of established CAD when diagnosed by CCTA. Added new criteria for resting TTE to address evaluation of ventricular function in patients who have undergone cardiac transplantation. Criteria changes for cardiac MRI allow for an annual study to quantify cardiac iron load in chronically ill patients with cardiomyopathy who require frequent blood transfusions and remove allowance for annual left ventricular function evaluation when echocardiography is suboptimal. Added references.
Revised	11/14/2017	01/01/2018	IMPP review. Revised criteria for CCTA and added new codes (0501T-0504T) and criteria for FFR-CT. Added references.
Revised	09/07/2017	11/20/2017	IMPP review. Revised criteria for PET. Added references.
Created	-	03/30/2005	Date of origin.