



CLINICAL GUIDELINES

Cardiac Imaging Policy

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eviCore healthcare Clinical Decision Support Tool Diagnostic Strategies: This tool addresses common symptoms and symptom complexes. Imaging requests for individuals with atypical symptoms or clinical presentations that are not specifically addressed will require physician review. Consultation with the referring physician, specialist and/or individual's Primary Care Physician (PCP) may provide additional insight.

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Cardiac Imaging Guidelines

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Abbreviations for Cardiac Imaging Guidelines

ACC	American College of Cardiology
ACS	acute coronary syndrome
AHA	American Heart Association
ASCOT	Anglo-Scandinavian Cardiac Outcomes Trial
ASD	atrial septal defect
BMI	body mass index
CABG	coronary artery bypass grafting
CAD	coronary artery disease
CHF	congestive heart failure
COPD	chronic obstructive pulmonary disease
CT	computed tomography
CCTA	coronary computed tomography angiography
CTA	computed tomography angiography
EBCT	electron beam computed tomography
ECP	external counterpulsation (also known as EECP)
ECG	electrocardiogram
ECP	external counterpulsation
ETT	exercise treadmill stress test
FDG	Fluorodeoxyglucose, a radiopharmaceutical used to measure myocardial metabolism
HCM	hypertrophic cardiomyopathy
IV	intravenous
LAD	left anterior descending coronary artery
LDL-C	low density lipoprotein cholesterol
LHC	left heart catheterization
LV	left ventricle
LVEF	left ventricular ejection fraction
MI	myocardial infarction
MPI	myocardial perfusion imaging (SPECT study, nuclear cardiac study)
MRA	magnetic resonance angiography
MRI	magnetic resonance imaging
mSv	millisievert (a unit of radiation exposure) equal to an effective dose of a joule of energy per kilogram of recipient mass
MUGA	multi gated acquisition scan of the cardiac blood pool
PCI	percutaneous coronary intervention (includes percutaneous coronary angioplasty (PTCA) and coronary artery stenting)
PET	positron emission tomography
PTCA	percutaneous coronary angioplasty
RHC	right heart catheterization
SPECT	single photon emission computed tomography
TEE	transesophageal echocardiogram
TIA	Transient Ischemic Attack
VSD	ventricular septal defect

Glossary

Agatston Score: a nationally recognized calcium score for the coronary arteries based on Hounsfield units and size (area) of the coronary calcium

Angina: principally chest discomfort, exertional (or with emotional stress) and relieved by rest or nitroglycerine

Anginal variants or equivalents: a manifestation of myocardial ischemia which is perceived by patients to be (otherwise unexplained) dyspnea, unusual fatigue, more often seen in women and may be unassociated with chest pain

ARVD/ARVC – Arrhythmogenic Right Ventricular Dysplasia/Cardiomyopathy: a potentially lethal inherited disease with syncope and rhythm disturbances, including sudden death, as presenting manifestations

BNP: B-type natriuretic peptide, blood test used to diagnose and track heart failure (n-T-pro-BNP is a variant of this test)

Brugada Syndrome: an electrocardiographic pattern that is unique and might be a marker for significant life-threatening dysrhythmias

Double Product (Rate Pressure Product): an index of cardiac oxygen consumption, is the systolic blood pressure times heart rate, generally calculated at peak exercise; over 25000 means an adequate stress load was performed

Fabry's Disease: an infiltrative cardiomyopathy, can cause heart failure and arrhythmias

Hibernating myocardium: viable but poorly functioning or non-functioning myocardium which likely could benefit from intervention to improve myocardial blood supply

Optimized Medical Therapy should include (where tolerated): antiplatelet agents, calcium channel antagonists, partial fatty acid oxidase inhibitors (e.g. ranolazine), statins, short-acting nitrates as needed, long-acting nitrates up to 6 months after an acute coronary syndrome episode, beta blocker drugs (optional), angiotensin-converting enzyme (ACE) inhibitors/angiotensin receptor blocking (ARB) agents (optional)

Platypnea: shortness of breath when upright or seated (the opposite of orthopnea) and can indicate cardiac malformations, shunt or tumor

Silent ischemia: cardiac ischemia discovered by testing only and not presenting as a syndrome or symptoms

Syncope: loss of consciousness; near-syncope is not syncope

Takotsubo cardiomyopathy: apical dyskinesia oftentimes associated with extreme stress and usually thought to be reversible

Troponin: a marker for ischemic injury, primarily cardiac

CD-1: General Guidelines

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Practice Estimate of Effective Radiation Dose chart for Selected Imaging Studies

Imaging Study	Estimate of Effective Radiation Dose
Sestamibi myocardial perfusion study (MPI)	9-12 mSv
PET myocardial perfusion study: Rubidium-82	3 mSV
NH3	2 mSV
Thallium myocardial perfusion study (MPI)	22-31 mSv
Diagnostic conventional coronary angiogram (cath)	5-10 mSv
Computed tomography coronary angiography (CTCA) (with prospective gating)	5-15 mSv Less than 5 mSv
CT of Abdomen and pelvis	8-14 mSv
Chest x-ray	<0.1 mSv

CD-1.1: General Issues – Cardiac

- Cardiac imaging is not indicated if the results will not affect patient management decisions. If a decision to perform cardiac catheterization or other angiography has already been made, there is often no need for imaging stress testing.
- A current clinical evaluation (within 60 days) is required prior to considering advanced imaging, which includes:
 - ◆ Relevant history and physical examination and appropriate laboratory studies and non-advanced imaging modalities, such as recent ECG (within 60 days), chest x-ray or ECHO/ultrasound, after symptoms started or worsened.
 - Effort should be made to obtain copies of reported “abnormal” ECG studies in order to determine whether the ECG is uninterpretable for ischemia on ETT
 - Most recent previous stress testing and its findings should be obtained
 - Other meaningful contact (telephone call, electronic mail or messaging) by an established patient can substitute for a face-to-face clinical evaluation.
 - ◆ Vital signs, height, and weight or BMI or description of general habitus is needed.
 - ◆ Advanced imaging should answer a clinical question which will affect management of the patient’s clinical condition.
 - ◆ Assessment of coronary artery disease can be determined by the following:
 - Typical angina (definite):
 - Substernal chest discomfort (generally described as pressure, heaviness, burning, or tightness)
 - Generally brought on by exertion or emotional stress and relieved by rest
 - May radiate to the left arm or jaw
 - When clinical information is received indicating that a patient is experiencing chest pain that is "exertional" or "due to emotional stress", this meets the typical angina definition under the Pre-Test Probability Grid. No further description of the chest pain is required (location within the chest is not required).
 - The Pre-Test Probability Grid (**Table 1**) is based on age, gender, and symptoms. All factors must be considered in order to approve for stress testing with imaging using the Pre-Test Probability Grid.

- **Atypical angina (probable):** Chest pain or discomfort (arm or jaw pain) that lacks one of the characteristics of definite or typical angina.
- **Non-anginal chest pain:** Chest pain or discomfort that meets one or none of the typical angina characteristics.
- **Anginal variants or equivalents:** a manifestation of myocardial ischemia which is perceived by patients to be (otherwise unexplained) dyspnea, nausea, diaphoresis, more often seen in women and may be unassociated with chest pain.

Table-1

Pre-Test Probability of CAD by Age, Gender, and Symptoms					
Age (years)	Gender	Typical / Definite Angina Pectoris	Atypical / Probable Angina Pectoris	Non-anginal Chest Pain	Asymptomatic
39 and younger	Men	Intermediate	Intermediate	Low	Very low
	Women	Intermediate	Very low	Very low	Very low
40 - 49	Men	High	Intermediate	Intermediate	Low
	Women	Intermediate	Low	Very low	Very low
50 - 59	Men	High	Intermediate	Intermediate	Low
	Women	Intermediate	Intermediate	Low	Very low
60 and over	Men	High	Intermediate	Intermediate	Low
	Women	High	Intermediate	Intermediate	Low
High	Greater than 90% pre-test probability				
Intermediate	Between 10% and 90% pre-test probability				
Low	Between 5% and 10% pre-test probability				
Very Low	Less than 5% pre-test probability				

CD-1.2: Stress Testing without Imaging – Procedures

The Exercise Treadmill Test (ETT) is without imaging.

- Necessary components of an ETT include:
 - ◆ ECG that can be interpreted for ischemia.
 - ◆ Patient capable of exercise on a treadmill or similar device (generally at 4 METs or greater; see functional capacity below).
- An abnormal ETT (exercise treadmill test) includes any one of the following:
 - ◆ ST segment depression (usually described as horizontal or downsloping, greater or equal to 1.0 mm below baseline)
 - ◆ Development of chest pain
 - ◆ Significant arrhythmia (especially ventricular arrhythmia)
 - ◆ Hypotension during exercise
- Functional capacity greater than or equal to 4 METs equates to the following:
 - ◆ Can walk four blocks without stopping
 - ◆ Can walk up a hill
 - ◆ Can climb one flight of stairs without stopping
 - ◆ Can perform heavy work around the house

Practice Note

An observational study found that, compared with the Duke Activity Status Index, subjective assessment by clinicians generally underestimated exercise capacity see reference 25.

CD-1.3: Stress Testing with Imaging-Procedures

- Imaging Stress Tests include any one of the following:
 - ◆ Stress Echocardiography see **CD-2.6: Stress Echocardiography (Stress Echo) – Coding**
 - ◆ MPI see **CD-3.1: Myocardial Perfusion Imaging (MPI) – Coding**
 - ◆ Stress perfusion MRI see **CD-5.3: Cardiac MRI – Indications for Stress MRI**
- Stress testing with imaging can be performed with maximal exercise or chemical stress (adenosine, dipyridamole, dobutamine, or regadenoson) and does not alter the CPT® codes used to report these studies.

CD-1.4: Stress Testing with Imaging – Indications

- Stress echo, MPI or stress MRI, can be considered if there are new, recurrent, or worsening cardiac symptoms and **any** of the following:
 - ◆ High pretest probability (greater than 90% probability of CAD) per Table 1
 - ◆ A history of CAD based on:
 - A prior anatomic evaluation of the coronaries OR
 - A history of CABG or PCI
 - ◆ Evidence or high suspicion of ventricular tachycardia
 - ◆ Age 40 years or greater and known diabetes mellitus
 - ◆ Coronary calcium score ≥ 100

- ◆ Poorly controlled hypertension defined as systolic BP greater than or equal to 180mmhg, if provider feels strongly that CAD needs evaluation prior to BP being controlled.
- ◆ ECG is uninterpretable for ischemia due to any one of the following:
 - Complete Left Bundle Branch Block (bifascicular block involving right bundle branch and left anterior hemiblock does not render ECG uninterpretable for ischemia)
 - Ventricular paced rhythm
 - Pre-excitation pattern such as Wolff-Parkinson-White
 - Greater or equal to 1.0 mm ST segment depression (NOT nonspecific ST/T wave changes)
 - LVH with repolarization abnormalities, also called LVH with strain (NOT without repolarization abnormalities or by voltage criteria)
 - T wave inversion in the inferior and/or lateral leads. This includes leads II, AVF, V5 or V6. (T wave inversion isolated in lead III or T wave inversion in lead V1 and V2 are not included).
 - Patient on digitalis preparation
- ◆ Continuing symptoms in a patient who had a normal or submaximal exercise treadmill test and there is suspicion of a false negative result.
- ◆ Patients with recent equivocal, borderline, or abnormal stress testing where ischemia remains a concern, regardless of symptoms.
- ◆ Heart rate less than 50 bpm in patients, including those on beta blocker, calcium channel blocker, or amiodarone, where it is felt that the patient may not achieve an adequate workload for a diagnostic exercise study.
- ◆ Inadequate ETT:
 - Physical inability to achieve target heart rate (85% MPPHR or 220-age. Target heart rate is calculated as 85% of the maximum age predicted heart rate (MPPHR). MPPHR is estimated as 220 minus the patient's age.
 - History of false positive exercise treadmill test: a false positive ETT is one that is abnormal however the abnormality does not appear to be due to macrovascular CAD.
- Stress echo, MPI or stress MRI, can be considered regardless of symptoms for **any** of the following:
 - ◆ Within 3 months of an acute coronary syndrome (e.g. ST segment elevation MI [STEMI], unstable angina, non-ST segment elevation MI [NSTEMI]), one MPI can be performed to evaluate for inducible ischemia if all of the following related to the most recent acute coronary event apply:
 - Individual is hemodynamically stable
 - No recurrent chest pain symptoms and no signs of heart failure
 - No prior coronary angiography or imaging stress test since the current episode of symptoms
 - ◆ Assessing myocardial viability in patients with significant ischemic ventricular dysfunction (suspected hibernating myocardium) and persistent symptoms or heart failure such that revascularization would be considered.
 - Note: MRI, cardiac PET, MPI, or Dobutamine stress echo can be used to assess myocardial viability depending on physician preference.

- PET and MPI perfusion studies are usually accompanied by PET metabolic examinations (CPT® 78459). TI-201 MPI perfusion studies may assess viability without accompanying PET metabolism information.
 - ◆ Unheralded syncope (not near syncope)
 - ◆ Asymptomatic patient with an uninterpretable ECG that:
 - Has never been evaluated or
 - Is a new uninterpretable change.
 - ◆ Patient with an elevated cardiac troponin.
 - ◆ One routine study 2 years or more after a stent
 - Except with a left main stent where it can be done at 1 year.
 - ◆ One routine study at 5 years or more after CABG, without cardiac symptoms.
 - ◆ Every 2 years if there was documentation of previous “silent ischemia” on the imaging portion of a stress test but not on the ECG portion.
 - ◆ To assess for CAD prior to starting a Class IC antiarrhythmic agent (flecainide or propafenone) and annually while taking the medication.
 - ◆ Prior anatomic imaging study (coronary angiogram or CCTA) demonstrating coronary stenosis in a major coronary branch, which is of uncertain functional significance, can have one stress test with imaging.
- Evaluating new, recurrent, or worsening left ventricular dysfunction/CHF see **CD-9.1: CHF– Imaging** for additional indications.

CD-1.5: Stress Testing with Imaging - Preoperative

- There are **2** steps that determine the need for imaging stress testing in (stable) pre-operative patients:
- ◆ Would the patient qualify for imaging stress testing independent of planned surgery?
 - If yes, proceed to stress testing guidelines;
 - If no, go to step 2
 - ◆ Is the surgery considered high, moderate or low risk? (see **Table 2**) If high or moderate-risk, proceed below. If low-risk, there is no evidence to determine a need for preoperative cardiac testing.
 - **High Risk Surgery**: All patients in this category should receive an imaging stress test if there has not been an imaging stress test within 1 year* unless the patient has developed new cardiac symptoms or a new change in the EKG since the last stress test.
 - **Intermediate Surgery**: One or more risk factors and unable to perform an ETT per guidelines if there has not been an imaging stress test within 1 year* unless the patient has developed new cardiac symptoms or a new change in the EKG since the last stress test.
 - **Low Risk**: Preoperative imaging stress testing is not supported.
 - ◆ Clinical Risk Factors (for cardiac death & non-fatal MI at time of non-cardiac surgery)
 - Planned high-risk surgery (open surgery on the aorta or open peripheral vascular surgery)
 - History of ischemic heart disease (previous MI, previous positive stress test, use of nitroglycerin, typical angina, ECG Q waves, previous PCI or CABG)

- History of compensated previous congestive heart failure (history of heart failure, previous pulmonary edema, third heart sound, bilateral rales, chest x-ray showing heart failure)
- History of previous TIA or stroke
- Diabetes Mellitus
- Creatinine level > 2 mg/dL

*Time interval is based on consensus of eviCore executive cardiology panel.

Table 2

Cardiac Risk Stratification List		
High Risk (> 5%)	Intermediate Risk (1-5%)	Low Risk (<1%)
<ul style="list-style-type: none"> ➤ Open aortic and other major open vascular surgery ➤ Open peripheral vascular surgery 	<ul style="list-style-type: none"> ➤ Open intraperitoneal and/or intrathoracic surgery ➤ Open carotid endarterectomy ➤ Head and neck surgery ➤ Open orthopedic surgery ➤ Open prostate surgery 	<ul style="list-style-type: none"> ➤ Endoscopic procedures ➤ Superficial procedures ➤ Cataract surgery ➤ Breast surgery ➤ Ambulatory surgery ➤ Laparoscopic and endovascular procedures that are unlikely to require further extensive surgical intervention

CD-1.6: Transplant Patients

- Stress Testing in patients for Non-Cardiac Transplant
 - ◆ Individuals who are candidates for any type of organ, bone marrow, or stem cell transplant can undergo imaging stress testing every year (usually stress echo or MPI) prior to transplant.
 - ◆ Individuals who have undergone organ transplant are at increased risk for ischemic heart disease secondary to their medication. Risk of vasculopathy is 7% at one year, 32% at five years and 53% at ten years. An imaging stress test can be repeated annually after transplant for at least two years or within one year of a prior cardiac imaging study if there is evidence of progressive vasculopathy.
 - ◆ After two consecutive normal imaging stress tests, repeated testing is not supported more often than every other year without evidence for progressive vasculopathy or new symptoms.
 - ◆ Stress testing after five years may proceed according to normal patterns of consideration.
- Post-Cardiac transplant assessment of transplant CAD:
 - ◆ One of the following imaging studies may be performed annually:
 - MPI
 - Stress ECHO
 - Stress MRI
 - Cardiac PET perfusion **with** coronary flow quantitation (CPT® 78491 or CPT® 78492)

CD-1.7: Non-imaging Heart Function and Cardiac Shunt Imaging

- Procedures reported with CPT® 78414 and CPT® 78428 are essentially obsolete and should not be performed in lieu of other preferred modalities.
- Echocardiogram is the preferred method for cardiac shunt detection, rather than the cardiac shunt imaging study described by CPT® 78428.
- Ejection fraction can be obtained by echocardiogram, MPI, MUGA study, cardiac MRI, cardiac CT, or cardiac PET depending on the clinical situation, rather than by the non-imaging heart function study described by CPT® 78414.

CD-1.8: Genetic lab testing in the evaluation of CAD

- Corus® CAD genetic expression score – refer to lab management program guidelines

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CD-2: Echocardiography (ECHO)

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CD-2.1: Transthoracic Echocardiography (TTE) - Coding

TTE CODES		
Transthoracic Echocardiography		CPT®
TTE for congenital cardiac anomalies, complete		93303
TTE for congenital cardiac anomalies, follow-up or limited		93304
TTE with 2-D, M-mode, Doppler and color flow, complete		93306
TTE with 2-D, M-mode, without Doppler or color flow		93307
TTE with 2-D, M-mode, follow-up or limited		93308
Doppler Echocardiography		CPT®
Doppler echo, pulsed wave and/or spectral display		+93320*
Doppler echo, pulsed wave and/or spectral display, follow-up or limited study		+93321*
Doppler echo, color flow velocity mapping		+93325
*CPT® 93320 and CPT® 93321 should not be requested or billed together		
Transthoracic Echocardiography		CPT®
C8921	TTE for congenital cardiac anomalies, complete	93303
C8922	TTE for congenital cardiac anomalies, follow-up or limited	93304
C8929	TTE with 2-D, M-mode, Doppler and color flow, complete	93306
C8923	TTE with 2-D, M-mode, without Doppler or color flow	93307
C8924	TTE with 2-D, M-mode, follow-up or limited	93308

C codes are unique temporary codes established by CMS. C codes were established for contrast echocardiography. Each echocardiography C code corresponds to a standard echo code (Class I CPT code) The C code and the matching CPT code should not both be approved.

Investigational Codes		
0399T	Myocardial strain imaging (quantitative assessment of myocardial mechanics using image-based analysis of local myocardial dynamics) (List separately in addition to code for primary procedure)	Investigational
0439T	Myocardial contrast perfusion echocardiography, at rest or with stress, for assessment of myocardial ischemia or viability	Investigational

- The most commonly performed study is a complete transthoracic echocardiogram with spectral and color flow Doppler (CPT® 93306).
 - ◆ CPT® 93306 includes the Doppler exams, so CPT® codes 93320-93325 should **not** be assigned together with CPT® 93306.
 - ◆ Doppler codes (CPT® 93320, CPT® 93321, and CPT® 93325) are 'add-on codes' (as denoted by the + sign) and are assigned in addition to code for the primary procedure.
- For a 2D transthoracic echocardiogram without Doppler, report CPT® 93307.

- Limited transthoracic echocardiogram should be billed if the report does not “evaluate or document the attempt to evaluate” all of the required structures.
 - ◆ A limited transthoracic echocardiogram is reported with CPT® 93308.
 - ◆ CPT® 93321 (not CPT® 93320) should be reported with CPT® 93308 if Doppler is included in the study. CPT® 93325 can be reported with CPT® 93308 if color flow Doppler is included in the study.
 - ◆ A limited congenital transthoracic echocardiogram is reported with CPT® 93304.
- Doppler echo may be used for evaluation of the following:
 - ◆ Shortness of breath
 - ◆ Known or suspected valvular disease
 - ◆ Known or suspected hypertrophic obstructive cardiomyopathy
 - ◆ Shunt detection

Practice Note

Providers performing echo on a pediatric patient, may not know what procedure codes they will be reporting until the initial study is completed.

- If a congenital issue is found on the initial echo, a complete echo is reported with codes CPT® 93303, CPT® 93320, and CPT® 93325 because CPT® 93303 does NOT include Doppler and color flow mapping.
- If no congenital issue is discovered, then CPT® 93306 is reported alone and includes 2-D, Doppler, and color flow mapping.
- Since providers may not know the appropriate code/s that will be reported at the time of the pre-authorization request, they may request all 4 codes (CPT® 93303, CPT® 93320, CPT® 93325, and CPT® 93306).
- Depending upon individual health plan payer contracts, post-service audits may be completed to ensure proper claims submission.

Practice Note

- CPT® 76376 and CPT® 76377 are not unique to 3D Echo. These codes also apply to 3D rendering of MRI and CT studies. see **CD-2.8: 3D Echocardiography – Coding**
- CPT® 93325 may also be used with fetal echocardiography.

CD-2.2: Transthoracic Echocardiography (TTE) – Indications

- TTE can be performed for the following:
 - ◆ New or worsening cardiac signs or symptoms, including, but not limited to:
 - Dyspnea
 - Chest pain
 - Palpitations
 - Syncope
 - Heart failure
 - Murmur
 - ◆ Hypertension – can be done once with initial evaluation
 - ◆ New signs or symptoms of cerebral ischemia or peripheral embolic event
 - ◆ Valve function and structure:

- History and/or physical examination suggesting significant valvular disorder
- Valve Surgery
 - If valve surgery is being considered can have TTE twice a year
 - Post surgery at 6 weeks to establish baseline, then one routine study (surveillance) 3 years or more after valve surgery (repair or prosthetic valve implantation).
 - TAVR follow-up may be approved at, 1 month, and at one year post-procedure and annually thereafter.
 - A baseline post-op TTE is usually performed within one week after surgery. This baseline study may also be approved as an outpatient if not performed in the hospital prior to discharge
 - See: **CD 4.8: Transcatheter Aortic Valve Replacement (TAVR)**
 - Mitral valve clip follow-up may be approved at 1 month, at 6 months, and at one year post-procedure
- ◆ Ventricular function assessment including, but not limited to the following:
 - Chemotherapy induced cardiomyopathy see: **CD-12.1 Oncologic Indications for Cancer Therapeutics-Related Cardiac Dysfunction (CTRCD)**
 - Post myocardial infarction can be done once in follow-up. This should not be done less than 6 weeks post MI
 - Evaluation prior to ICD/CRT placement, if baseline has not been established
- ◆ Cardiac structure: an echocardiogram can be done to assess cardiac structure when there are new or worsening cardiac signs or symptoms, suggesting disorders such as, but not limited to:
 - Infiltrative diseases (e.g. sarcoid, amyloid)
 - Ventricular septal defect (VSD)
 - Papillary muscle rupture/dysfunction
 - Hypertrophy including:
 - asymmetric septal hypertrophy
 - spade heart
 - hypertensive concentric hypertrophy
 - infiltrative hypertrophy
 - pacemaker insertion complication
 - pericardial effusion
 - cardiac injury due to blunt chest trauma
- ◆ Cardiac Defects or Masses
 - Embolic source in patients with recent Transient Ischemic Attack (TIA), stroke, or peripheral vascular emboli as an initial study before TEE.
 - ASD repair or VSD repair:
 - Within the first year of surgery
 - Incomplete septal defect repair may be followed yearly
 - Tumor evaluation including myxomas
 - Clot detection
 - Evaluation of adult congenital heart disease see also: **PEDCD-2 Congenital Heart Disease**

- Routine yearly surveillance of adult congenital heart disease is allowed following incomplete or palliative repair, with residual abnormality and without a change in clinical status.
- Screening for the presence of bicuspid aortic valve is recommended for first-degree relatives of patients with bicuspid aortic valve.
- Screening of the ascending aorta in known or suspected connective tissue disease that predisposes to an aortic aneurysm or dissection (e.g., Marfan syndrome, hereditary forms of ascending aortopathy)
- Also see **CH-29: Thoracic Aorta**
- ◆ Inflammatory
 - Pericardial effusion/pericardial disease including pericardial cysts
 - Congenital heart disease
 - Endocarditis including:
 - Fever
 - Positive blood cultures indicating bacteremia or
 - A new murmur
- ◆ Pacemaker insertion complication
- ◆ Screening for first-degree relatives of patients with hypertrophic cardiomyopathy (HCM)
 - First-degree relatives who are 12 to 18 years old should be screened yearly for HCM by 2D- echocardiography, and ECG.
 - First-degree relatives who are older than age 18 should have 2D-echo and ECG every five years to screen for delayed adult-onset LVH.
 - Systematic screening is usually not indicated for first-degree relatives who are younger than age 12 unless there is a high-risk family history or the child is involved in particularly intense competitive sports.
 - Affected individuals identified through family screening or otherwise should be evaluated every 12 to 18 months with 2D-echo, Holter monitor, and blood pressure response during maximal upright exercise.
- ◆ New abnormality on an EKG that has not been evaluated
- ◆ Thoracic aortic aneurysm/dissection see **CH-29: Thoracic Aorta**
- ◆ Patients with BAVs and no demonstrable aortopathy may be followed every 3 years with TTE for the development of aortic enlargement

CD-2.3: Frequency of Echocardiography Testing

- Repeat routine echocardiograms are not supported (annually or otherwise) for evaluation of clinically stable syndromes
- Every three years, when there is a history of:
 - ◆ Bicuspid aortic valve
 - ◆ Mild aortic or mitral stenosis
 - ◆ Prosthetic heart valve
- Once a year (when no change in clinical status), when there a history of:
 - ◆ Significant valve dysfunction, including moderate or severe regurgitation or stenosis

- ◆ Significant valve deformity, such as thickened myxomatous valve or bileaflet prolapse, regardless of extent of regurgitation or stenosis
 - ◆ Hypertrophic cardiomyopathy see **CD-2.2: Transthoracic Echocardiography (TTE) – Indications, CD-2.7: Stress Echocardiography – Indications, other than ruling out CAD**
 - ◆ Chronic pericardial effusions
 - ◆ Left ventricular contractility/diastolic function prior to planned medical therapy for heart failure or to evaluate the effectiveness of on-going therapy
 - ◆ Pre-operative aortic root dilatation (see CH 29.2 for postoperative frequency)
 - ◆ Pulmonary hypertension (can be done more frequently with change in therapy)
 - ◆ Systemic Scleroderma
 - ◆ Prior TAVR
- Anytime, without regard for the number or timing of previous ECHO studies, if there is a change in clinical status or new signs or symptoms such as:
- ◆ Cardiac murmurs
 - ◆ Myocardial infarction or acute coronary syndrome
 - ◆ Congestive heart failure (new or worsening)
 - New symptoms of dyspnea
 - Orthopnea
 - Paroxysmal nocturnal dyspnea
 - Edema
 - Elevated BNP
 - ◆ Pericardial disease
 - ◆ Stroke/transient ischemic attack
 - ◆ Decompression illness
 - ◆ Prosthetic valve dysfunction or thrombosis
 - ◆ A history of prior cardiac transplant, per transplant center protocol

Practice note:

- Decisions regarding routine echocardiographic follow-up should not be based on the degree of regurgitation alone, but should take into account associated structural valvular and cardiac abnormalities. For example: a structurally normal mitral valve with moderate mitral regurgitation by color flow Doppler and normal left atrial size, does not generally require routine echocardiographic follow-up. However, a thickened, myxomatous appearing mitral valve with bi-leaflet prolapse and only trivial or mild mitral regurgitation, should be followed echocardiographically at routine intervals.

CD-2.4: Transesophageal Echocardiography (TEE) – Coding

Transesophageal Echocardiography		CPT®
TEE with 2-D, M-mode, probe placement, image acquisition, interpretation and report		93312
TEE probe placement only		93313
TEE image acquisition, interpretation, and report only		93314
TEE for congenital anomalies with 2-D, M-mode, probe placement, image acquisition, interpretation and report		93315
TEE for congenital anomalies, probe placement only		93316
TEE for congenital anomalies, image acquisition, interpretation and report only		93317
TEE for monitoring purposes, ongoing assessment of cardiac pumping function on an immediate time basis		93318
Doppler Echocardiography*:		CPT®
Doppler echo, pulsed wave and/or spectral display		+93320
Doppler echo, pulsed wave and/or spectral display, follow-up or limited study		+93321
Doppler echo, color flow velocity mapping		+93325
*Doppler echo, if performed, may be reported separately in addition to the primary TEE codes: CPT® 93312, CPT® 93314, CPT® 93315, and CPT® 93317.		
CPT®	Transesophageal Echocardiography	
93312	TEE with 2-D, M-mode, probe placement, image acquisition, interpretation and report	C8925
93315	TEE for congenital anomalies with 2-D, M-mode, probe placement, image acquisition, interpretation and report	C8926
93318	TEE for monitoring purposes, ongoing assessment of cardiac pumping function on an immediate time basis	C8927

- **The complete transesophageal echocardiogram** service, including both (1) probe (transducer) placement and (2) image acquisition/interpretation, is reported with CPT® 93312.
 - ◆ Probe placement only is reported with CPT® 93313.
 - ◆ The image acquisition/interpretation only is reported with CPT® 93314.
- Physicians assign codes CPT® 93312, CPT® 93313, and/or CPT® 93314 to report professional services if the test is performed in a hospital or other facility where the physician cannot bill globally.
 - ◆ Modifier -26 (professional component) is appended to the appropriate code
 - ◆ CPT® 93313 and CPT® 93314 should never be used together. If both services are provided, CPT® 93312 is reported.
- Hospitals should report TEE procedures using CPT® 93312 (the complete service). CPT® 93313 and CPT® 93314 are not used for hospital billing.
- Monitoring of patients undergoing cardiac surgery is CPT® 93318.

CD-2.5: Transesophageal Echocardiography (TEE) – Indications

- Limited transthoracic echo window
- Assessing valvular dysfunction, especially mitral regurgitation, when TTE is inadequate
- Pre-operative planning for cardiac surgery
- Embolic source or intracardiac shunting when TTE is inconclusive
 - ◆ **Examples:** atrial septal defect, ventricular septal defect, patent foramen ovale, aortic cholesterol plaques, thrombus in cardiac chambers, valve vegetations, tumor
- Embolic events when there is an abnormal TTE or a history of atrial fibrillation
 - ◆ Clarify atria/atrial appendage, aorta, mitral/aortic valve beyond the information that other imaging studies have provided
 - ◆ Cardiac valve dysfunction
 - Differentiation of tricuspid from bicuspid aortic valve
 - Congenital abnormalities
- Assessing for left atrial thrombus prior to cardioversion of atrial fibrillation.
- Prior to planned atrial fibrillation ablation/pulmonary vein isolation procedure.
- Repeat TEE studies are based upon findings in the original study and documentation of the way in which repeat studies will affect patient management

CD-2.6: Stress Echocardiography (Stress Echo) - Coding

Stress ECHO Procedure Codes	
Stress Echocardiography	CPT®
Echo, transthoracic, with (2D), includes M-mode, during rest and exercise stress test and/or pharmacologically induced stress, with report;*	93350
Echo, transthoracic, with (2D), includes M-mode, during rest and exercise stress test and/or pharmacologically induced stress, with report: <i>including performance of continuous electrocardiographic monitoring, with physician supervision*</i>	93351
Doppler Echocardiography:	CPT®
Doppler echo, pulsed wave and/or spectral display**	+93320
Doppler echo, pulsed wave and/or spectral display, follow-up/limited study	+93321
Doppler echo, color flow velocity mapping**	+93325
*CPT® 93350 and CPT® 93351 do not include Doppler studies	
*Doppler echo (CPT® +93320 and CPT® +93325), if performed, may be reported separately in addition to the primary SE codes: CPT® 93350 or CPT® 93351.	

CPT®	Stress Echocardiography	
93350	Echo, transthoracic, with (2D), includes M-mode, during rest and exercise stress test and/or pharmacologically induced stress, with report;*	C8928
93351	Echo, transthoracic, with (2D), includes M-mode, during rest and exercise stress test and/or pharmacologically induced stress, with report: <i>including performance of continuous electrocardiographic monitoring, with physician supervision*</i>	C8930

CD-2.7: Stress Echocardiography—Indications, other than ruling out CAD

See: **CD-1.4: Stress Testing with Imaging – Indications**

- In addition to the evaluation of CAD, stress echo can be used to evaluate the following conditions:
 - ◆ Dyspnea on exertion (specifically to evaluate pulmonary hypertension)
 - ◆ Right heart dysfunction
 - ◆ Valvular heart disease, especially when the outcome would affect a therapeutic or interventional decision
 - ◆ Pulmonary hypertension, when the outcome will measure response to therapy and/or prognostic information
 - ◆ Hypertrophic cardiomyopathy
 - In a patient with a history of hypertrophic cardiomyopathy who has been previously evaluated with a stress echo, another stress echo may be appropriate if there are worsening symptoms or if there has been a therapeutic change (for example: change in medication, surgical procedure performed).
- In general spectral Doppler (CPT® 93320 or 93321) and color-flow Doppler (CPT® 93325) are necessary in the evaluation of the above conditions and can be added to the stress echo code.

CD-2.8: 3D Echocardiography – Coding

- The procedure codes used to report 3D rendering for echocardiography are not unique to echocardiography and are the same codes used to report the 3D post-processing work for CT, MRI, ultrasound, and other tomographic modalities.
 - ◆ **CPT® 76376**, not requiring image post-processing on an independent workstation, is the most common code used for 3D rendering done with echocardiography
 - ◆ **CPT® 76377** requires the use of an independent workstation

CD-2.9: 3D Echocardiography – Indications

- 3D Echo Indications
 - ◆ Echocardiography with 3-dimensional (3D) rendering is becoming universally available, yet its utility remains limited based on the current literature. Current indications include:
 - Left ventricular volume and ejection fraction assessment
 - Mitral valve anatomy specifically related to mitral valve stenosis
 - Guidance of transcatheter procedures

CD-2.10: Myocardial strain imaging (CPT® 0399T)

- Investigational see **CD-2.1: Transthoracic Echocardiography (TTE) – Coding**

CD-2.11: Myocardial contrast perfusion echocardiography (CPT® 0439T)

- Investigational see **CD-2.1: Transthoracic Echocardiography (TTE) – Coding**

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CD-3: Nuclear Cardiac Imaging

CD-3.1: Myocardial Perfusion Imaging (MPI) – Coding	28
CD-3.2: MPI – Indications	28
CD-3.3: MUGA - Coding	29
CD-3.4: MUGA Study – Cardiac Indications	30
CD-3.5: MUGA Study - Oncologic Indications for Cancer Therapeutics-Related Cardiac Dysfunction (CTRCD)	30
CD-3.6: Myocardial Sympathetic Innervation Imaging in Heart Failure	31
CD-3.7: Myocardial Tc-99m Pyrophosphate Imaging	31
CD-3.8: Cardiac Amyloidosis	32

CD-3.1: Myocardial Perfusion Imaging (MPI) – Coding

Nuclear Cardiac Imaging Procedure Codes	
Myocardial Perfusion Imaging (MPI)	CPT®
MPI, 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)	78451
MPI, 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	78452

- The most commonly performed myocardial perfusion imaging are single (at rest or stress, CPT® 78451) and multiple (at rest and stress, CPT® 78452) SPECT studies.
 - ◆ Evaluation of the individual's left ventricular wall motion and ejection fraction are routinely performed during MPI and are included in the code's definition.
 - ◆ First pass studies, (CPT® 78481 and CPT® 78483), MUGA, (CPT® 78472 and CPT® 78473) and SPECT MUGA (CPT® 78494) should not be reported in conjunction with MPI codes.
 - ◆ Attenuation correction, when performed, is included in the MPI service by code definition. No additional code should be assigned for the billing of attenuation correction.
- **Multi-day Studies:** In the absence of written payer guidelines to the contrary, it is not appropriate to bill separately for the rest and stress segments of MPI even if performed on separate calendar dates. A single code is assigned to define the entire procedure on the date all portions of the study are completed.
- 3D rendering, (CPT® 76376/CPT® 76377), should not be billed in conjunction with MPI.
- Separate codes for such related services as treadmill testing (CPT® 93015 - CPT® 93018) and radiopharmaceuticals should be assigned in addition to MPI. These services are reimbursed according to each individual payer policy.

CD-3.2: MPI – Indications

- See: **CD-1.4: Stress Testing with Imaging-Indications**

CD-3.3: MUGA - Coding

Nuclear Cardiac Imaging Procedure Codes	
MUGA (Multi Gated Acquisition) – Blood Pool Imaging	CPT®
Cardiac blood pool imaging, gated equilibrium; planar, single study at rest or stress, wall motion study plus ejection fraction, with or without quantitative processing	78472
Cardiac blood pool imaging, gated equilibrium; planar, multiple studies, wall motion study plus ejection fraction, at rest <i>and</i> stress, with or without additional quantification	78473
Cardiac blood pool imaging, gated equilibrium, SPECT, at rest, wall motion study plus ejection fraction, with or without quantitative processing	78494
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) [Use in conjunction with CPT® 78472]	+78496

- The technique employed for a MUGA service guides the code assignment. CPT® 78472 is used for a planar MUGA scan at rest or stress, and CPT® 78473 for planar MUGA scans, multiple studies at rest and stress.
- The two most commonly performed MUGA scans are the studies defined by CPT® 78472 and SPECT MUGA, CPT® 78494.
- Planar MUGA studies (CPT® 78472 and CPT® 78473) should not be reported in conjunction with:
 - ◆ MPI (CPT® 78451 - CPT® 78454)
 - ◆ First pass studies (CPT® 78481- CPT® 78483), and/or
 - ◆ SPECT MUGA (CPT® 78494).
- CPT® +78496 is assigned only in conjunction with CPT® 78472.
 - ◆ See: **CD-3.4: MUGA Study – Cardiac Indications**
 - ◆ This add-on code should not be performed as a routine protocol.

CD-3.4: MUGA Study – Cardiac Indications

MUGA (Multi Gated Acquisition) – Blood Pool Imaging Indications

- Echocardiography is the preferred method of following left ventricular systolic function. Indications below refer to scenarios in which MUGA may be performed rather than ECHO:
 - ◆ Prior ECHO demonstrates impaired systolic function (EF < 50%).
 - ◆ Pre-existing left ventricular wall motion abnormalities from ischemic heart disease or ischemic or non-ischemic cardiomyopathies.
 - ◆ ECHO is technically limited and prevents accurate assessment of LV function.
 - ◆ AICD placement:
 - MUGA to assess LV ejection fraction when there are conflicting results between other forms of testing and the issue is clinically relevant, eg. MPI LVEF is 80% and an echo EF is 30%, the MUGA would be appropriate.
 - However, if the MPI LVEF is 80% and the echo EF is 50%, this would **not** be appropriate even though the difference is significant since the echo EF is still normal.
 - ◆ Congestive heart failure:
 - MUGA to measure response to cardiac medications for CHF if echocardiogram was performed and was technically difficult
 - ◆ Previous low LV ejection fraction determination was < 50% and receiving potentially cardiotoxic chemotherapy
 - ◆ Documentation of other need for information given by MUGA that cannot be obtained by ECHO

MUGA is NOT indicated for the following:

- A prior MUGA is not a reason to approve another MUGA (it is not necessary to compare LVEF by the same modality)
- To resolve differences in ejection fraction measurements between ECHO and MPI **unless** there is clear documentation as to how quantitative measurement of LVEF will affect patient management (e.g. implantation of an AICD).

Note:

- LV ejection fraction measurement is variable and can vary by +/-5-10% without any accompanying change in clinical status. Normal physiologic changes in intravascular volume, catecholamine levels, fever, and medications are among the many factors which cause variation in LVEF in the absence of myocardial pathology.
- Right ventricular first pass study, (CPT® +78496), may be indicated if there is clear documentation of a concern regarding right ventricular dysfunction or overload.

CD-3.5: MUGA Study - Oncologic Indications for Cancer Therapeutics-Related Cardiac Dysfunction (CTRCD)

- See **CD 12.1: Oncologic Indications for Cancer Therapeutics-Related Cardiac Dysfunction (CTRCD)**

CD-3.6: Myocardial Sympathetic Innervation Imaging in Heart Failure

- In heart failure, the sympathetic nervous system is activated in order to compensate for the decreased myocardial function. Initially, this is beneficial, however, long-term this compensatory mechanism is detrimental and causes further damage.
- Markers have been developed, using radioactive iodine, in an attempt to image this increased myocardial sympathetic activity. Currently, AdreView™ (Iodine-123 meta-iodobenzylguanidine), is the only FDA-approved imaging agent available for this purpose. eviCore currently considers AdreView to be experimental and investigational.
- The AMA has established the following set of Category III codes to report these studies:
 - ◆ **0331T** - Myocardial sympathetic innervation imaging, planar qualitative and quantitative assessment
 - ◆ **0332T** - Myocardial sympathetic innervation imaging, planar qualitative and quantitative assessment; with tomographic SPECT.

CD-3.7: Myocardial Tc-99m Pyrophosphate Imaging

Myocardial Tc-99m Pyrophosphate Imaging	
MUGA (Multi Gated Acquisition) – Blood Pool Imaging	CPT®
Myocardial Imaging, infarct avid, planar, qualitative or quantitative	78466
Myocardial Imaging, infarct avid, planar, qualitative or quantitative with ejection fraction by first pass technique	78468
Myocardial Imaging, infarct avid, planar, qualitative or quantitative tomographic SPECT with or without quantification	78469
A single planar imaging session alone (without a SPECT study), Radiopharmaceutical localization of tumor or distribution of radiopharmaceutical agent(s); limited area	78800
Planar with SPECT, Radiopharmaceutical localization of tumor or distribution of radiopharmaceutical agent(s) tomographic (SPECT). Note: <i>When reporting CPT® 78803, planar imaging of a limited area or multiple areas should be included with the SPECT</i>	78803

- Historically this method of imaging the myocardium was used to identify recent infarction, hence, the term "infarct-avid scan." Although still available, the sensitivity and specificity for identifying infarcted myocardial tissue are variable and the current use for this indication is limited. See **CD-5: Cardiac MRI**

CD-3.8: Cardiac Amyloidosis

- Tc-99m pyrophosphate imaging may be used to identify cardiac amyloidosis (CPT[®] 78803). Chest SPECT and planar imaging may be used, as well as whole-body imaging for identification of systemic ATTR (transthyretin) amyloidosis.
- For a single planar imaging session alone (without a SPECT study), report CPT[®] 78800 Radiopharmaceutical localization of tumor or distribution of radiopharmaceutical agent(s); limited area
- Indications may include:
 - ◆ Individuals with heart failure and unexplained increase in left ventricular wall thickness.
 - ◆ African-Americans over the age of 60 years with heart failure, unexplained or with increased left ventricular wall thickness (> 12 mm).
 - ◆ Individuals over the age of 60 years with unexplained heart failure and preserved ejection fraction.
 - ◆ Individuals, especially elderly males, with unexplained neuropathy, bilateral carpal tunnel syndrome or atrial arrhythmias in the absence of usual risk factors, and signs/symptoms of heart failure.
 - ◆ Evaluation of cardiac involvement in individuals with known or suspected familial amyloidosis.
 - ◆ Diagnosis of cardiac ATTR in individuals with CMR or echocardiography consistent with cardiac amyloidosis.
 - ◆ Patients with suspected cardiac ATTR amyloidosis and contraindications to CMR such as renal insufficiency or an implantable cardiac device.¹⁴

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CD-4: Cardiac CT, Coronary CTA, and CT for Coronary Calcium(CAC)

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CD-4.1: Cardiac CT and CTA – General Information and Coding

- The high negative predictive value (98%-99%) of CCTA in ruling out significant coronary artery disease has been confirmed in multiple studies.

Cardiac Imaging Procedure Codes	
Cardiac CT	CPT®
CT, heart, without contrast, with quantitative evaluation of coronary calcium	75571
The code set for Cardiac CT and CCTA (CPT® 75572-CPT® 75574), include quantitative and functional assessment (for example, calcium scoring) if performed	
CPT® 75571 describes a non-contrast CT of the heart with calcium scoring and should be reported only when calcium scoring is performed as a stand-alone procedure.	
<ul style="list-style-type: none"> ➤ Can be used to report a preliminary non-contrast scan which indicates an excessive amount of calcium such that the original scheduled study must be discontinued. ➤ CPT® 75571 should not be reported in conjunction with any of the contrast CT/CTA codes (CPT® 75572- CPT® 75574). 	
Cardiac CT and CCTA	CPT®
CT, heart, with contrast, for evaluation of cardiac structure and morphology (including 3D image post-processing, assessment of cardiac function, and evaluation of venous structures, if performed).	75572
CT, heart, with contrast, for evaluation of cardiac structure and morphology <i>in the setting of congenital heart disease</i> (including 3D image post-processing, assessment of cardiac function, and evaluation of venous structures, if performed).	75573
CTA, heart, coronary arteries and bypass grafts (when present), with contrast, including 3D image post-processing (including 3D image post-processing, assessment of cardiac function, and evaluation of venous structures, if performed).	75574
Noninvasive estimated coronary fractional flow reserve (FFR) derived from coronary computed tomography angiography data using computation fluid dynamics physiologic simulation software analysis of functional data to assess the severity of coronary artery disease; data preparation and transmission, analysis of fluid dynamics and simulated maximal coronary hyperemia, generation of estimated FFR model, with anatomical data review in comparison with estimated FFR model to reconcile discordant data, interpretation and report	0501T
Noninvasive estimated coronary fractional flow reserve (FFR) derived from coronary computed tomography angiography data using computation fluid dynamics physiologic simulation software analysis of functional data to assess the severity of coronary artery disease; data preparation and transmission	0502T
Noninvasive estimated coronary fractional flow reserve (FFR) derived from coronary computed tomography angiography data using computation fluid dynamics physiologic simulation software analysis of functional data to assess the severity of coronary artery disease; analysis of fluid dynamics and simulated maximal coronary hyperemia, and generation of estimated FFR model	0503T
Noninvasive estimated coronary fractional flow reserve (FFR) derived from coronary computed tomography angiography data using computation fluid dynamics physiologic simulation software analysis of functional data to assess the severity of coronary artery disease; anatomical data review in comparison with estimated FFR model to reconcile discordant data, interpretation and report	0504T

- 3D rendering, (CPT® 76376/CPT® 76377), should not be billed in conjunction with Cardiac CT and CCTA.
- Only one code from the set: CPT® 75572 - CPT® 75574 can be reported per encounter.
- CPT® 75574 includes evaluation of cardiac structure and morphology when performed; therefore, additional code/s should not be assigned.

CD-4.2: CT for Coronary Calcium Scoring (CPT® 75571)

CD-4.2.1: CT Calcium Scoring for CAD Screening

- Coronary calcium scoring as a standalone test is considered investigational in asymptomatic patients with any degree of CAD risk.
- Medicare policies consider that there is insufficient evidence based data to support the performance of Coronary Calcium Scoring.
- Texas Heart Attack Preventive Screening Law (HR 1290) mandates that insurers in Texas cover either a calcium scoring study (CPT® 75571 or HCPCS S8092) **or** a carotid intima-media thickness study (ultrasound—Category III code 0126T) every five years for certain populations. To qualify, the following must apply:
 - ◆ Must be a Texas resident.
 - ◆ Must be a member of a fully-insured Texas health plan.
 - ◆ Must be a man age 45 to 75 or a woman age 55 to 75.
 - ◆ Must have either diabetes or a Framingham cardiac risk score of intermediate or higher.
 - ◆ Must not have had a calcium scoring study or a carotid intima-media thickness study within the past 5 years.

CD-4.2.2: CT Calcium Scoring Indications

- Symptomatic individuals with a ‘very low’, or ‘low’ pretest probability of CAD*, see **Table 1** in **CD-1.1: General Issues – Cardiac**

CD-4.3: CCTA – Indications for CCTA

- Symptomatic individuals who have a ‘low’ or ‘intermediate’ pretest probability of CAD*, see **Table 1** in CD-1.1: General Issues – Cardiac:
- ‘Low’ or ‘intermediate’ pre-test probability of coronary disease with persistent symptoms after a stress test.
- Replace performance of invasive coronary angiogram in individuals with low risk of CAD (i.e. Pre-op non-coronary surgery).

For symptomatic individuals, evaluate post-CABG graft patency when **only** graft patency is a concern **and** imaging of the native coronary artery anatomy is not needed, such as in early graft failure.

CD-4.4: CCTA – Additional Indications

- Re-do CABG
 - ◆ To identify whether bypass grafts are located directly beneath the sternum, so that alternative ways to enter the chest can be planned.
- Evaluate coronary artery anomalies and other complex congenital heart disease of cardiac chambers or great vessels.
 - ◆ Report CPT® 75574 for evaluating coronary artery anomalies.
 - ◆ Report CPT® 75573 for congenital heart disease.
 - To evaluate the great vessels, Chest CTA (CPT® 71275) can be performed instead of CCTA or in addition to CCTA. For anomalous pulmonary venous return, can add CT abdomen and pelvis with contrast (CPT® 74177).
- Anomalous coronary artery(ies) suspected for diagnosis or to plan treatment and less than age 40 with a history that includes one or more of the following :
 - ◆ Persistent exertional chest pain and normal stress test,
 - ◆ Full sibling(s) with history of sudden death syndrome before age 30 or with documented anomalous coronary artery
 - ◆ Resuscitated sudden death and contraindications for conventional coronary angiography
 - ◆ Prior nondiagnostic coronary angiography in determining the course of the anomalous coronary artery in relation to the great vessels, origin of a coronary artery or bypass graft location.
- Unexplained new onset of heart failure
- Evaluation of newly diagnosed congestive heart failure or cardiomyopathy.
 - ◆ No prior history of coronary artery disease, the ejection fraction is less than 50 percent, and low or intermediate risk on the pre-test probability assessment, **and**
 - ◆ No exclusions to cardiac CT angiography.
 - ◆ No cardiac catheterization, SPECT, cardiac PET, or stress echocardiogram has been performed since the diagnosis of congestive heart failure or cardiomyopathy.
- Ventricular tachycardia (6 beat runs or greater) if CCTA will replace conventional invasive coronary angiography.
- Equivocal coronary artery anatomy on conventional cardiac catheterization.
- Newly diagnosed dilated cardiomyopathy.
- Preoperative assessment of the coronary arteries in patients who are going to undergo surgery for aortic dissection, aortic aneurysm, or valvular surgery if CCTA will replace conventional invasive coronary angiography.
- Vasculitis/Takayasu's/Kawasaki's disease
- **Cardiac Trauma:** Chest CTA (CPT® 71275) and CCTA (CPT® 75574) are useful in detecting aortic and coronary injury and can help in the evaluation of myocardial and pericardial injury see **CD-10.1: Cardiac Trauma – Imaging**

Practice Note – relative contraindications for Coronary CT

- Irregular heart rhythms (e.g., atrial fibrillation/flutter, frequent irregular premature ventricular contractions or premature atrial contractions, and high-grade heart block)
- Multifocal Atrial Tachycardia (MAT)
- Inability to lie flat
- Body mass index of 40 or more
- Inability to obtain a heart rate less than 65 beats per minute after beta-blockers
- Inability to hold breath for at least 8 seconds
- Renal Insufficiency
- Asymptomatic patients and routine use in the evaluation of the coronary arteries following heart transplantation
- CCTA should not be performed if there is extensive coronary calcification (calcium score >1000).
- Evaluation of coronary stent patency if the vessel is less than 3.0 mm in diameter (metal artifact limits accuracy)
- Evaluation of left ventricular function following myocardial infarction or in chronic heart failure
 - ◆ Patients with indeterminate echocardiogram should undergo MUGA (CPT® 78472 or CPT® 78494) or cardiac MRI.
- High pre-test probability for CAD – rather, these patients should undergo conventional coronary angiography, especially if an interventional procedure (e.g., PCI) is anticipated.
- Identification of plaque composition and morphology
- Myocardial perfusion and viability studies
- Preoperative assessment for non-cardiac, nonvascular surgery
- Routine follow-up of asymptomatic or stable symptoms of CAD with CCTA
- There is insufficient evidence to support routine use of Coronary Computed Tomography Angiography (CCTA) in the evaluation of the coronary arteries following heart transplantation.

CD-4.5: Fractional Flow Reserve by Computed Tomography

- Fractional flow reserve (FFR) is typically measured using invasive techniques. FFR can be obtained noninvasively from coronary computed tomography angiography data (FFR-CT).
- Indications for FFR-CT
 - ◆ To further assess CAD seen on a recent CCTA that is of uncertain physiologic significance

CD-4.6: CT Heart – Indications

- Cardiac vein identification for lead placement in patients needing left ventricular pacing.
- Pulmonary vein isolation procedure (ablation) for atrial fibrillation
 - ◆ Cardiac MRI (CPT® 75557 or CPT® 75561), chest MRV (CPT® 71555), chest CTV (CPT® 71275), or cardiac CT (CPT® 75572) can be performed to evaluate the anatomy of the pulmonary veins prior to an ablation procedure performed for atrial fibrillation.
 - ◆ Study may be repeated post-procedure between 3-6 months after ablation because of a 1%-2% incidence of asymptomatic pulmonary vein stenosis
 - ◆ See **CD-8: Pulmonary Artery and Vein Imaging**
- If echocardiogram is inconclusive for:
 - ◆ Cardiac or pericardial tumor or mass
 - ◆ Cardiac thrombus
 - ◆ Pericarditis/constrictive pericarditis
 - ◆ Complications of cardiac surgery
- Clinical suspicion of arrhythmogenic right ventricular dysplasia or arrhythmogenic cardiomyopathy (ARVD/ARVC), especially if patient has presyncope or syncope if the clinical suspicion is supported by established criteria for ARVD.
- Recurrent laryngeal nerve palsy due to cardiac chamber enlargement.
- Coronary imaging is not included in the code definition for CPT® 71275.
 - ◆ The AMA definition for CPT® 71275 reads: “CTA Chest (non-coronary), with contrast material(s), including non-contrast images, if performed, and image post-processing.”

CD-4.7: CT Heart for Congenital Heart Disease

- Coronary artery anomaly evaluation
 - ◆ A cardiac catheterization was performed, and not all coronary arteries were identified.
- Thoracic arteriovenous anomaly evaluation
 - ◆ A cardiac MRI or chest CT angiogram was performed and suggested congenital heart disease.
- Complex adult congenital heart disease evaluation
 - ◆ No cardiac CT or cardiac MRI has been performed, and there is a contraindication to cardiac MRI.
 - ◆ A cardiac CT or cardiac MRI was performed one year ago or more.

CD-4.8: Transcatheter Aortic Valve Replacement (TAVR)

- Once the decision has been made for aortic valve replacement, the following may be used to determine if a patient is a candidate for TAVR:
 - ◆ CTA of chest (CPT® 71275), abdomen and pelvis (combination code CPT® 74174) are considered appropriate, and
 - ◆ Cardiac CT (CPT® 75572) may be considered to measure the aortic annulus² or
 - ◆ Coronary CTA (CCTA CPT® 75574) may be considered to both measure the aortic annulus and assess the coronary arteries in lieu of heart catheterization.
- Post TAVR:
 - ◆ TAVR follow-up may be approved at 1 months, at one year post-procedure, and annually thereafter.

Practice Note

A baseline post-op TTE is usually performed within one week after surgery. This baseline study may also be approved as an outpatient if not performed in the hospital prior to discharge.

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CD-5: Cardiac MRI

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CD-5.5: Cardiac MRI – Evaluation of Pericardial Effusion or Diagnosis of Pericardial Tamponade	45

CD-5.1: Cardiac MRI – Coding

Cardiac Imaging Procedure Codes	
Cardiac MRI	CPT®
Cardiac magnetic resonance imaging for morphology and function without contrast	75557
Cardiac magnetic resonance imaging for morphology and function without contrast; with stress imaging	75559
Cardiac magnetic resonance imaging for morphology and function without and with contrast and further sequences	75561
Cardiac magnetic resonance imaging for morphology and function without and with contrast and further sequences; with stress imaging	75563
Cardiac magnetic resonance imaging for velocity flow mapping (List separately in addition to code for primary procedure)	+75565

- Only one procedure code from the set (CPT® 75557- CPT® 75563) should be reported per session.
- Only one flow velocity measurement (CPT® +75565) should be reported per session when indicated.
 - ◆ Requests for cardiac MRI that contain more than one cardiac/chest MRI CPT® Code must be forwarded for Medical Director review.

CD-5.2: Cardiac MRI – Indications (excluding Stress MRI)

- Assess myocardial viability (to differentiate hibernating myocardium from scar) when necessary to determine if revascularization should be performed (CPT® 75561)
- Assessment of global ventricular function and mass if a specific clinical question is left unanswered by a recent echocardiogram and results will affect patient management (CPT® 75557 or CPT® 75561). Particularly useful in evaluating:
 - ◆ Cardiomyopathy (ischemic, diabetic, hypertrophic, or muscular dystrophy)
 - ◆ Noncompaction
 - ◆ Amyloid heart disease
 - ◆ Post cardiac transplant
 - ◆ Hemochromatosis
 - ◆ Post transfusion hemosiderosis
 - ◆ Hypertrophic heart disease
 - ◆ Myocarditis, cardiac aneurysm, trauma, and contusions
 - ◆ Monitoring cancer chemotherapy effect on the heart (especially if an accurate assessment of right ventricular function is documented as necessary).
- Pre and postoperative congenital heart disease assessment (e.g. Tetralogy of Fallot, patent ductus arteriosus, platypnea, atrial septal defects, restrictive VSD, anomalous pulmonary arteries or veins or anomalous coronary arteries) (CPT® 75557 or CPT® 75561).
 - ◆ Chest MRA (CPT® 71555) may be added if the aorta or pulmonary artery need to be visualized beyond the root.

- ◆ Report CPT® +75565 in conjunction with CPT® 75557 or CPT® 75561, only if there is a need to clarify findings on a recent echocardiogram and cardiac Doppler study.
- Chest MRA alone (CPT® 71555) can be performed in certain situations (e.g. suspected dissection, coarctation, known or suspected aortic aneurysm).
- Coarctation of the aorta
 - ◆ Follow-up (surveillance) imaging after repair of coarctation:
 - Adults: chest MRA (CPT® 71555) every 2 to 3 years and before and after any intervention for re-coarctation
 - Infants and children: ECHO every month for several months, then ECHO every 6 months to one year thereafter
- Arrhythmogenic right ventricular dysplasia or arrhythmogenic cardiomyopathy (ARVD/ARVC) suspicion (including presyncope or syncope, established criteria for ARVD (CPT® 75557 or CPT® 75561).
- Differentiate constrictive pericarditis from restrictive cardiomyopathy (CPT® 75561).
- Evaluate cardiac tumor or mass when echocardiogram is inconclusive.
- Initial evaluation for cardiac sarcoidosis.
- Anomalous coronary arteries: Cardiac MRI (CPT® 75561) or CCTA (CPT® 75574) is much better at detecting this than conventional angiography.
- Assess coronary arteries in Kawasaki's disease.
- Fabry disease
 - ◆ Late enhancement MRI may predict the effect of enzyme replacement therapy on myocardial changes that occur with this disease (CPT® 75561).
- Evaluate valvular heart disease when echocardiogram is inconclusive. Appropriate procedures include:
 - ◆ CPT® 75557 or CPT® 75561 **and**
 - ◆ CPT® 75565
- Pulmonary vein anatomy for planned ablation procedures in patients with atrial fibrillation. Report cardiac MRI (CPT® 75557 or CPT® 75561) or chest MRV (CPT® 71555), but not both see **CD-8: Pulmonary Artery and Vein Imaging** for guidelines on follow-up imaging after ablation procedure.
- Suspected cardiac thrombus when echocardiogram is inconclusive (CPT® 75557).
- Right ventricular function evaluation (CPT® 75557 in conjunction with CPT® +75565) if a recent ECHO has been done, and there is documented need to perform cardiac MRI in order to resolve an unanswered question.
- Shunting through a VSD (CPT® 75557 in conjunction with CPT® +75565) if a recent ECHO has been done, including a bubble study, and there is documented need to perform cardiac MRI in order to resolve an unanswered question.
- Evaluate for iron overload due to conditions requiring frequent blood transfusions (i.e. sickle cell, thalassemia, hemochromatosis, etc.) (CPT® 75557).

CD-5.3: Cardiac MRI – Indications for Stress MRI

- For indications for Stress MRI see **CD-1.4: Stress Testing with Imaging - Indications**
- Also, if a nuclear perfusion (MPI) stress test was performed and was equivocal, a stress MRI is appropriate.

CD-5.4: Cardiac MRI - Aortic Root and Proximal Ascending Aorta

- See **CH-29: Thoracic Aorta** in the Chest Imaging Guidelines

CD-5.5: Cardiac MRI - Evaluation of Pericardial Effusion or Diagnosis of Pericardial Tamponade

- Contrast-enhanced cardiac MRI (CPT® 75561) is useful for evaluating pericarditis, neoplastic and other effusion, tamponade or myocardial infiltration if a specific clinical question is left unanswered by echocardiogram or another recent imaging study.

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CD-6: Cardiac PET

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CD-6.1: Cardiac PET – Coding

Cardiac Imaging Procedure Codes	
Cardiac PET	CPT®
Myocardial imaging, PET, <i>metabolic evaluation</i>	78459
Myocardial imaging, PET, <i>perfusion</i> ; single study at rest or stress	78491
Myocardial imaging, PET, <i>perfusion</i> ; multiple studies at rest and/or stress	78492
Absolute quantitation of myocardial blood flow, PET, rest and stress	+0482T

- 3D rendering, (CPT® 76376/CPT® 76377), should not be billed in conjunction with PET.
- Separate codes for such related services as treadmill testing (CPT® 93015-CPT® 93018) and radiopharmaceuticals should be assigned in addition to perfusion PET. These services are paid according to each individual payor.
- 0482T is an add-on code for CPT® 78491 or CPT® 78492 and is considered investigational

CD-6.2: Cardiac PET – Perfusion – Indications (CPT® 78491 and CPT® 78492)

- Meets all of the criteria for an imaging stress test and additionally any one of the following:
 - ◆ Individual is obese (for example BMI >40 kg/m²) or
 - ◆ Individual has large breasts or implants
- Equivocal nuclear perfusion (MPI) stress test
 - ◆ Routine use in post heart transplant assessment of transplant CAD
- CMS (Medicare) does not cover reporting for wall motion and ejection fraction performed in conjunction with cardiac perfusion PET. There is not a separate CPT® or HCPCS code associated with these specific services. eviCore and their partner health plans adhere to the CMS policy unless explicitly stated in the health plan's coverage policy.

CD-6.3: Cardiac PET – Absolute Quantitation of Myocardial Blood Flow (CPT® 0482T)

- Performance of quantitation of myocardial blood flow by Cardiac PET is currently non-standardized between different vendor products.
- Absolute quantitation of myocardial blood flow is considered experimental, investigational and/or unproven (EIU).

CD-6.4: Cardiac PET – Metabolic – Indications (CPT® 78459)

- To determine myocardial viability when a previous study has shown significant left ventricular dysfunction when under consideration for revascularization, or
- To identify and monitor response to therapy for established or strongly suspected cardiac sarcoid. This study may be performed in conjunction with a Cardiac PET perfusion examination, single study, CPT® 78491 or MPI SPECT CPT® 78451

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CD-7: Diagnostic Heart Catheterization

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CD-7.1: Diagnostic Heart Catheterization – Code Sets

Cardiac Catheterization Procedure Codes	
Cardiac Cath Procedures	CPT®
Congenital Heart Disease Code “Set”	93530-93533
Right Heart Catheterization (CHD)	93530
Right/Left Heart Catheterization (CHD)	93531
Right/Left Heart Catheterization (CHD-TS)	93532
Right/Left Heart Catheterization (CAD-ASD)	93533
Anomalous coronary arteries, patent foramen ovale, mitral valve prolapse, and bicuspid aortic valve	93451-93464, 93566-93568
RHC without LHC or coronaries	93451
LHC without RHC or coronaries	93452
RHC and retrograde LHC without coronaries	93453
Native coronary artery catheterization;	93454
with bypass grafts	93455
with RHC	93456
with RHC and bypass grafts	93457
with LHC	93458
with LHC and bypass grafts	93459
with RHC and LHC	93460
with RHC and LHC and bypass grafts	93461
LHC by transeptal or apical puncture	+93462
Angiography of noncoronary arteries and veins performed as a distinct service	Select appropriate codes from the Radiology and Vascular Injection Procedures sections.

CD-7.2: Diagnostic Heart Catheterization – Coding Notes

Cardiac catheterization (CPT® 93451-CPT® 93461) includes all “road mapping” angiography necessary to place the catheters, including any injections and imaging supervision, interpretation, and report.

Cardiac catheterization (CPT® 93452-CPT® 93461) (for all conditions other than congenital heart disease) includes contrast injections, imaging supervision, interpretation, and report for imaging typically performed.

Catheter placements in native coronaries or bypass grafts (CPT® 93454-CPT® 93461) include intraprocedural injections for bypass graft angiography, imaging supervision, and interpretation.

Injection codes CPT® 93563-CPT® 93565 should not be used in conjunction with CPT® 93452-CPT® 93461.

Codes CPT® 93451-CPT® 93461 do not include contrast injections and imaging supervision, interpretation, and report for imaging that is separately identified by the following specific procedure codes: CPT® 93566, CPT® 93567 and CPT® 93568.

Separate diagnostic cardiac catheterization codes should only be assigned in conjunction with interventional procedures in the following circumstances:

- ◆ No prior or recent diagnostic catheterization is available to guide therapy
- ◆ Individual’s condition has significantly changed since the last diagnostic cath
- ◆ The treatment plan may be affected
- ◆ Other vessels may be identified for treatment
- ◆ Further establishment of a diagnosis from a non-invasive study is necessary

CD-7.3: Diagnostic Left Heart Catheterization (LHC)

- These guidelines apply to individuals with stable conditions and who are not in the acute setting (acute coronary syndrome) or patients with unstable angina. Individuals in acute settings or with unstable angina should be handled as medical emergencies.
- Incidental angiography can be performed:
 - ◆ Iliac/femoral artery angiography when dissection or obstruction to the passage of the catheter/guidewire is encountered.
 - ◆ Renal arteriography if the criteria outlined in the Abdomen Imaging Guidelines are met see **PVD-6.5: Renovascular Hypertension**.
- Identifying disease for which invasive procedures have been shown to prolong survival:
 - ◆ Left main coronary artery disease plus right coronary artery disease plus left ventricular dysfunction.
 - ◆ Triple vessel coronary artery disease plus left ventricular dysfunction.
- Unstable angina (new, accelerating, or worsening symptoms that are suggestive of unstable angina), even in the absence of noninvasive cardiac testing.
- Symptomatic patients with a high pretest probability of CAD.

- Angina that is unresponsive to optimized medical therapy see **CD-1.1: General Issues – Cardiac** and for which invasive procedures are needed to provide pain relief.
- Left ventricular dysfunction (congestive heart failure) in patients suspected of having coronary artery disease.
- Ventricular fibrillation or ventricular tachycardia where the etiology is unclear.
- Unheralded syncope (not near syncope).
- Recent noninvasive cardiac testing was equivocal, unsuccessful in delineating the clinical problem, or led to a conclusion that intervention is indicated for the following conditions:
 - ◆ Suspicion of cardiomyopathy, endocarditis, or myocarditis
 - ◆ Significant/serious ventricular arrhythmia
 - ◆ Evaluating progression of known CAD when symptoms are persistent or worsening
 - ◆ An intermediate or large amount of myocardium (>5%) may be in jeopardy
 - ◆ Evaluation of coronary grafts
 - ◆ Evaluation of previously placed coronary artery stents
 - ◆ Evaluation of structural disease
- Ruling out coronary artery disease prior to planned non-coronary cardiac or great vessel surgery (i.e. cardiac valve surgery, aortic dissection, aortic aneurysm, congenital disease repair such as atrial septal defect, etc.).
- Assessment for accelerated coronary artery disease associated with cardiac transplantation.
- Pre-organ transplant (non-cardiac). Some institutions perform a heart cath as part of their initial evaluation protocol. Others use an imaging stress test for evaluation. Either is appropriate and can be approved but **NOT** both.
- Valvular heart disease when there is a discrepancy between the clinical findings (history, physical exam, and non-invasive test results) or valvular surgery is being considered.
- Suspected pericardial disease.
- A history of prior cardiac transplant, per transplant center protocol

CD-7.4: Right Heart Catheterization (RHC)

CD-7.4.1: General information RHC

- It is performed most commonly from the femoral vein, less often through the subclavian or internal jugular veins and inter-atrial septal puncture approach.
- It includes a full oximetry for detection and quantification of shunts.
- Pressure measurements are made and are done simultaneously with aortic and left ventricular pressures.
- Cardiac outputs are calculated by several techniques including thermodilution.

CD-7.4.2: Diagnostic Right Heart Catheterization – Indications

- Atrial septal defect (ASD) including shunt detection and quantification
- Ventricular septal defect (VSD) including shunt detection and quantification
- Patent foramen ovale (PFO)
- Anomalous pulmonary venous return
- Congenital defects including persistent left vena cava
- Pulmonary hypertension
- Pericardial diseases (constrictive or restrictive pericarditis)
- Valvular disease
- Right heart failure
- Left heart failure
- Preoperative evaluation for valve surgery
- Newly diagnosed or worsening cardiomyopathy
- During a left heart cath where the etiology of the symptoms remains unclear.
- Pre-lung transplant to assess pulmonary pressures
- Uncertain intravascular volume status with an unclear etiology
- Assessment post-cardiac transplant
 - ◆ For routine endomyocardial biopsy
 - ◆ Assess for rejection
 - ◆ Assess pulmonary artery pressure
 - ◆ Can be done per the institution protocol or anytime organ rejection is suspected and biopsy is needed for assessment
- Evaluation of right ventricular morphology.
- Suspected arrhythmogenic right ventricular dysplasia.

CD-7.5: Combined Right and Left Heart Catheterization Indications

- Preoperative evaluation for valve surgery
- Newly diagnosed or worsening cardiomyopathy
- If the major component of the patient symptoms is dyspnea, and the indications for **CD-7.3: Diagnostic Left Heart Catheterization** are also met
- If indications are met according to **CD-7.3: Diagnostic Left Heart Catheterization (LHC)** and **CD-7.4: Right Heart Catheterization**, then a combination heart catheterization may be appropriate.

CD-7.6: Planned (Staged) Coronary Interventions

- The CPT® codes for percutaneous coronary interventions (PCI) include the following imaging services necessary for the procedure(s):
 - ◆ Contrast injection, angiography, ‘roadmapping’, and fluoroscopic guidance
 - ◆ Vessel measurement
 - ◆ Angiography following coronary angioplasty, stent placement, and atherectomy
- Separate codes for these services should not be assigned in addition to the PCI code/s because the services are already included.
- A repeat diagnostic left heart catheterization is not medically necessary when the patient is undergoing a planned staged percutaneous coronary intervention.
- CPT® 93530 to 93533 are appropriate for invasive evaluation of congenital heart disease.

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CD-8: Pulmonary Artery and Vein Imaging

CD-8.1: Pulmonary Artery Hypertension (PAH) - Indications	57
CD-8.2: Pulmonary Vein Imaging – Indications	57

CD-8.1: Pulmonary Artery Hypertension (PAH) - Indications

- CT or CTA or MRA of the pulmonary arteries (CPT® 71260 or CPT® 71275 or CPT® 71555) is useful in the assessment of PAH, especially if there is suspicion for recurrent pulmonary emboli.
- In the absence of a clinical change, follow-up imaging for PAH is not indicated.
- Also see:
 - ◆ **PVD-5: Pulmonary Artery Hypertension** in the Peripheral Vascular Disease Imaging Guidelines.
 - ◆ **CH-25: Pulmonary Embolism (PE)** in the Chest Imaging Guidelines.

CD-8.2: Pulmonary Vein Imaging – Indications

- Cardiac MRI (CPT® 75557 or CPT® 75561), Chest MRV (CPT® 71555), Chest CTV (CPT® 71275), or Cardiac CT (CPT® 75572) can be performed to evaluate the anatomy of the pulmonary veins:
 - ◆ Prior to an ablation procedure performed for atrial fibrillation.
 - ◆ Post-procedure between 3-6 months after ablation because of a 1% to 2% incidence of asymptomatic pulmonary vein stenosis.
 - If no pulmonary vein stenosis is present, no further follow-up imaging is required.
 - If pulmonary vein stenosis is present on imaging following ablation and symptoms of pulmonary vein stenosis (usually shortness of breath) are present, can be imaged at 1, 3, 6, and 12 months.
 - ◆ The majority (81%) of pulmonary vein stenosis remain stable over 1 year. Progression occurs in 8.8% and regression occurs in a small percentage.

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CD-9: Congestive Heart Failure

CD-9.1: CHF – Imaging	60
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CD-9.3: Myocardial Sympathetic Innervation Imaging	60

CD-9.1: CHF – Imaging

- Congestive heart failure, including post-cardiac transplant failure:
 - ◆ An echocardiogram is generally the first study to be done after the clinical evaluation of the patient who is suspected of having heart failure.
 - ◆ If the ECHO is limited or does not completely answer the question, then further evaluation with MUGA, cardiac MRI or cardiac CT may be appropriate.
 - ◆ A stress test to assess for CAD may be appropriate. Follow stress testing guideline: **CD-1.4: Stress Testing with Imaging-Indications**
- Arteriovenous fistula with “high output” heart failure:
 - ◆ CT Chest with contrast (CPT® 71260) and/or CT Abdomen and/or CT Pelvis with contrast (CPT® 74160 or CPT® 72193 or CPT® 74177) **OR**
 - ◆ CTA Chest (CPT® 71275) and/or CTA Abdomen and/or CTA Pelvis (CPT® 74175 or CPT® 72191 or CPT® 74174) **OR**
 - ◆ MRI Chest and/or MRI Abdomen and/or MRI Pelvis without and with contrast (CPT® 71552 and/or CPT® 74183 and/or CPT® 72197) **OR**
 - ◆ MRA Chest and/or MRI Abdomen and/or MRI Pelvis (CPT® 71555 and/or CPT® 74185 and/or CPT® 72198)
- Right-sided congestive heart failure can be a manifestation of pulmonary hypertension or serious lung disease.
 - ◆ Chest CT (CPT® 71260) or chest CTA (CPT® 71275) to evaluate for recurrent pulmonary embolism

CD-9.2: Palliative Care in patients with heart failure

- There are currently no widely accepted published guidelines regarding end of life care for end-stage heart failure patients who are not candidates for advanced heart failure treatments such as left ventricular assist devices, heart pumps or heart transplantation. Consideration for palliative care services should be given to such patients.

CD-9.3: Myocardial Sympathetic Innervation Imaging

- In heart failure, the sympathetic nervous system is activated in order to compensate for the decreased myocardial function. Initially, this is beneficial, however, long-term this compensatory mechanism is detrimental and causes further damage.
- Markers have been developed, using radioactive iodine, in an attempt to image this increased myocardial sympathetic activity. Currently, AdreView™ (Iodine-123 meta-iodobenzylguanidine), is the only FDA-approved imaging agent available for this purpose. eviCore currently considers AdreView™ to be experimental and investigational.
- The AMA has established the following set of Category III codes to report these studies:
 - ◆ **0331T** - Myocardial sympathetic innervation imaging, planar qualitative and quantitative assessment
 - ◆ **0332T** - Myocardial sympathetic innervation imaging, planar qualitative and quantitative assessment; with tomographic SPECT.

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CD-10: Cardiac Trauma

CD-10.1: Cardiac Trauma - Imaging

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CD-10.1: Cardiac Trauma – Imaging

- Any of the following can be used to evaluate cardiac or aortic trauma:
 - ◆ Echocardiogram (TTE, TEE)
 - ◆ Cardiac MRI (CPT® 75557, CPT® 75561, and CPT® 75565)
 - ◆ Cardiac CT (CPT® 75572)
 - ◆ CCTA (CPT® 75574)
 - ◆ Chest CTA (CPT® 71275)

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CD-11: CAD

CD-11.1: CAD General

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CD-11.1: CAD General

- Risk factor modification
 - ◆ Statins remain the mainstay of medical treatment for cardiovascular risk reduction with an abundance of scientific evidence regarding their efficacy.
 - ◆ PCSK9 drugs are a new addition to the treatment of hyperlipidemia
 - Refer to specialty drug coverage criteria for these drugs.

CD-12: Cancer Therapeutics-Related Cardiac Dysfunction (CTRCD)

CD-12.1: Oncologic Indications for Cancer Therapeutics-Related Cardiac Dysfunction (CTRCD)

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CD-12.1: Oncologic Indications for Cancer Therapeutics-Related Cardiac Dysfunction (CTRCD)

- If an echocardiogram is not appropriate, MUGA evaluation of LV ejection fraction and wall motion analysis are appropriate for any of the following chemotherapy-related indications:
 - ◆ Determine LV function in patients in patients on cardiotoxic chemotherapeutic drugs.
 - The time frame should be determined by the provider, but no more often than baseline and at every 6 weeks.
 - May repeat every 4 weeks if cardiotoxic chemotherapeutic drug is withheld for significant left ventricular cardiac dysfunction
 - ◆ If the LVEF is < 50% on echocardiogram than follow up can be done with MUGA at appropriate intervals.
 - ◆ Echocardiography vs. MUGA for Determining Left Ventricular Ejection Fraction (LVEF) in Patients on Cardiotoxic Chemotherapy Drugs:
 - ◆ eviCore guidelines support using **echocardiography rather than MUGA** for the determination of LVEF and/or wall motion EXCEPT in one of the circumstances described previously in **CD-3.4: MUGA Study – Cardiac Indications**.

Practice Note

- Advantages of Echocardiography in comparison to MUGA in patients on cardiotoxic chemotherapy:
 - ◆ No ionizing radiation
 - ◆ No IV access required when echo contrast is not used
 - ◆ Allows view of the pericardium to look for effusion
 - ◆ Allows estimate of pulmonary pressure
 - ◆ May allow visualization of a clot or tumor in the Inferior Vena Cava (IVC) and/or the right heart

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