2025 Cardiac Catheterization

Cardiology

CARD-Cath-HH

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Heart Catheterization Contraindications

Left Heart Catheterization Contraindications

A left heart catheterization is contraindicated when the documentation demonstrates **ANY** of the following:

1. Left ventricular (LV) thrombus is suspected.
2. Mechanical prosthetic aortic valve(s) present
   Reference: [12]

Left Heart Catheterization Relative Contraindications

Relative contraindications for a left heart catheterization include **ANY** of the following:

1. Bleeding is active.
   References: [6] [12]
2. Coagulopathy is severe.
   References: [6] [12]
3. Cooperation is **NOT** achievable.
   References: [6] [12]
4. Infection is active.
   References: [6] [12] [10]
5. Peripheral vascular disease is severe.
   References: [6] [12]
6. Pregnancy
   References: [6] [12] [12]
7. Reaction to contrast media (anaphylaxis, nephrotoxicity)
   References: [6] [12] [10]
8. Thrombocytopenia is severe.
   References: [6] [12]

Right Heart Catheterization Contraindications

A right heart catheterization is contraindicated when the documentation demonstrates **ANY** of the following:

1. Endocarditis is right-sided.
   Reference: [12]

2. Intracardiac tumor is present.
   Reference: [12]
3. Mechanical prosthetic tricuspid or pulmonic valve is present.
   Reference: [12]
4. Thrombus is present.
   ***Reference*:** [12]

Right Heart Catheterization Relative Contraindications

Relative contraindications for a right heart catheterization include **ANY** of the following:

1. Bleeding is active.
   Reference: [12]
2. Coagulopathy is severe.
   Reference: [12]
3. Infection is active.
   Reference: [12]
4. Left bundle branch block is present.
   Reference: [12]
5. Thrombocytopenia is severe.
   Reference: [12]

Coronary Computed Tomography Angiography (CCTA) Contraindications

Computed tomography angiography (CTA) may be contraindicated when the individual's body mass index (BMI) is more than 40 (relative contraindication due to suboptimal image quality). [13]

CTA General Contraindications

Computed tomography angiography (CTA) is contraindicated for **ANY** of the following: [3] [5] [21]

- Contrast allergy
- Heart failure is decompensated.
- Hemodynamic instability (eg, abnormal laboratory values, blood pressure instability)
- Renal impairment (glomerular filtration rate is 30 mL/min/1.73m^2)
- Protocol can **NOT** be followed (eg, technical or related to individual).

Cardiac Catheterization

NCD 20.7
*__NOTE__: ***NO*** *clinical criteria*
See also, **NCD 20.7**: Percutaneous Transluminal Angioplasty (PTA) at https://www.cms.gov/medicare-coverage-database/search.aspx *if applicable to individual's healthplan membership*.

Preamble: Pediatric Cardiology Preamble

HealthHelp's clinical guidelines for the Cardiology program, are intended to apply to both adults and pediatrics (21 years of age or younger), unless otherwise specified within the criteria.

Cardiac Catheterization Guideline

NOTICE
Individuals at intermediate to high risk, with stable chest pain and **NO** known coronary artery disease (CAD) are recommended to use **coronary computed tomography angiography (CCTA)** in CAD diagnosis, risk stratification and treatment planning, per the 2021 AHA/ACC/ASE/CHEST/SAEM/SCCT/SCMR Guideline for the Evaluation and Diagnosis of Chest Pain grade 1A recommendation. [8]

Left Heart Catheterization

A left heart catheterization (coronary angiography) for diagnostic purposes is considered medically appropriate when the documentation demonstrates **ANY** of the following:

1. Acute coronary syndrome (ACS) is suspected and **ANY** of the following:
    a. ACS is suspected due to cardiogenic shock.
    b. Risk score (eg, global registry of acute coronary events [GRACE], thrombolysis in myocardial infarction [TIMI]) is low, intermediate or high and **ANY** of the following:
        i. ACS is suspected with new left ventricle wall motion abnormalities **OR** resting myocardial perfusion defect.
        ii. Angina is unstable with non-ST elevation MI (NSTE-ACS).

c. ST-segment elevation myocardial infarction (STEMI) is suspected or known.

References: [17] [20] [4] [14] [18]

2. Arrhythmia with unclear etiology and **EITHER** of the following:
   a. Cardiac arrest with return of spontaneous circulation
   b. Ventricular fibrillation (VF) or sustained ventricular tachycardia (VT) with or **WITHOUT** symptoms

   References: [17] [7] [2]
3. Cardiomyopathy is suspected or known and **EITHER** of the following:
   a. Known, for re-evaluation when symptoms (eg, dyspnea, fatigue, palpitations) are new or progressing.
   b. With or **WITHOUT** heart failure

   References: [17] [12]
4. Congenital heart disease to guide surgery or treatment
   References: [17] [19]
5. Coronary artery disease (CAD) is suspected and **ANY** of the following:
   a. Prior non-invasive testing demonstrates **ANY** of the following.
      i. Coronary computerized tomography angiography (CCTA) with **ANY** of the following:
         A. Asymptomatic, left main obstruction suspected **AND** lesion severity is unclear.
         B. Symptomatic (chest pain, dyspnea, nausea, vomiting) and **ANY** of the following:
            I. Lesion is 50% or more in the left main, non-left main or in 2 or more coronary territories.
            II. Lesion is non-left main, has unclear severity and is possibly obstructive.
      ii. Electrocardiogram (ECG) stress testing demonstrates high-risk findings (eg, Duke treadmill score is -11 or less).
      iii. Prior testing demonstrates exercise induced hypotension, ST-segment elevation, prolonged ST-segment depression or ventricular tachycardia (VT).
      iv. Stress test with imaging (single photon emission computed tomography myocardial perfusion imaging [SPECT MPI], stress echocardiography

[ECHO], stress positron emission tomography [PET], stress cardiac magnetic resonance [CMR]) and **EITHER** of the following:

A. Asymptomatic with **EITHER** of the following:

I. High-risk findings (eg, more than 10% ischemic myocardium on stress SPECT MPI or stress PET, stress-induced wall motion abnormality in 2 or more segments on stress ECHO or stress CMR, transient ischemic dilation [TID], significant stress-induced left ventricular (LV) dysfunction)

II. Left ventricle baseline resting is less than 40% **AND** prior testing demonstrates (eg, dobutamine ECHO, MRI, PET) myocardial viability in dysfunctional segment

B. Symptomatic with **ANY** of the following:

I. Discordant clinical findings (eg, low-risk prior imaging with ongoing symptoms consistent with ischemic equivalent, low-risk stress imaging with high-risk stress ECG response or stress-induced typical angina).

II. High-risk findings (eg, more than 10% ischemic myocardium on stress SPECT MPI or stress PET, stress-induced wall motion abnormality in 2 or more segments on stress ECHO or stress CMR, transient ischemic dilation [TID], significant stress-induced left ventricualr (LV) dysfunction)

III. Intermediate-risk findings (eg, 5% to 10% ischemic myocardium on stress SPECT MPI or stress PET, stress-induced wall motion abnormality in a single segment on stress ECHO or stress CMR)

IV. Left ventricle baseline resting is less than 40% **AND** prior testing demonstrates (eg, dobutamine ECHO, MRI, PET) myocardial viability in dysfunctional segment.

V. Prior testing is <u>non-diagnostic or indeterminate</u> (eg, perfusion defect vs. attenuation artifact, uninterpretable stress imaging).

v. Transthoracic echocardiography (TTE) with **ANY** of the following:

A. CAD significant ischemic complication is suspected (eg, ischemic mitral regurgitation or ventricular septal defect [VSD]).

B. Symptomatic individual for baseline resting of **ANY** the following:

I. Left ventricle ejection fraction (LVEF) is less than 40% on initial imaging and etiology is unknown.

II. LVEF is 41% to 49% on initial imaging and etiology is unknown.

III. Regional wall motion abnormality is new, etiology is unknown and LV systolic function is normal.

b. Symptomatic, **NO** prior invasive imaging (**NO** prior percutaneous coronary intervention [PCI], coronary artery bypass graft [CABG] or angiogram demonstrating 50% or more stenosis) and CAD pre-test probability is high.

Reference: [17]

6. CAD is known, obstructive based on history (eg, obstruction demonstrated on invasive angiography, prior revascularization procedure) and **ANY** of the following:

   a. Asymptomatic, unchanged clinical findings or symptoms are controlled **AND** non-invasive findings demonstrate high-risk.

   b. Symptoms and clinical findings are worsening and/or limit activities **AND** non-invasive findings demonstrate intermediate or high risk.

   References: [17] [13] [8]

7. Intracardiac shunt is suspected or known with indeterminate shunt anatomy or fraction.
   Reference: [17]

8. Pericardial tamponade is suspected **OR** for determination of constrictive or restrictive physiology.
   References: [17] [10]

9. Valvular disease and **ANY** of the following:

   a. Left ventricular dysfunction is **NOT** proportional to severity of valvular disease

   b. Pulmonary hypertension is **NOT** proportional to severity of valvular disease.

   c. Valvular disease (native or prosthetic) and **ALL** of the following:

      i. **ANY** of the following:

         A. Aortic regurgitation or stenosis (*__NOTE__: *Equivocal/low gradient aortic stenosis may include pharmacological [eg, dobutamine] challenge*)

         B. Mitral regurgitation or stenosis

      ii. Chronic

iii. Prior non-invasive imaging demonstrates severity conflicting with clinical impression

iv. Symptomatic (eg, chest pain, fatigue, shortness of breath)

d. Valvular surgery pre-operative assessment

References: [17] [11]

Right Heart Catheterization

A right heart catheterization is considered medically appropriate when the documentation demonstrates **ANY** of the following:

1. Cardiogenic shock
   References: [12] [17]
2. Cardiomyopathy is restrictive.
   References: [12] [17] [15]
3. Congenital heart disease
   References: [12] [17]
4. Heart failure (HF) is known and **ALL** of the following:
   a. Hemodynamics are non-diagnostic or indeterminate.
   b. Symptoms (eg, dyspnea, fatigue, orthopnea) are persistent or worsening.

   References: [12] [17] [9]
5. Intracardiac shunt is suspected or known with indeterminate shunt anatomy or fraction.
   References: [12] [17]
6. Left ventricular pre-load quantification
   References: [12] [17]
7. Myocardial infarction is known and **ANY** of the following:
   a. Mechanical complications are suspected **OR** for complication management
   b. Right ventricular ischemia is suspected.

   References: [12] [17]
8. Pericardial effusion is known, to determine hemodynamic significance.
   References: [12] [17]
9. Pericarditis is constrictive.
   References: [12] [17] [1]
10. Peri-procedural hemodynamic monitoring, when high-risk and peripheral vascular, aortic or cardiac surgery is planned.

References: [12] [17]

11. Pulmonary hypertension is suspected or known for **ANY** of the following:
    a. Heart, liver, lung transplant evaluation
    b. Intravascular volume status is indeterminate and unknown etiology after initial evaluation.
    c. Pulmonary artery hypertension is suspected with **EITHER** of the following:
        i. Elevated estimated right ventricular systolic pressure on resting echocardiogram (ECHO) study
        ii. Equivocal or borderline elevated estimated right ventricular systolic pressure on resting ECHO study
    d. Pulmonary hypertension at rest is demonstrated to determine response to pulmonary vasodilators given in cath lab or after initiation of drug therapy

    References: [12] [17]
12. Valvular heart disease is suspected.
    References: [12] [17] [16]

Combined Left and Right Heart Catheterization

A combined left and right heart catheterization is considered medically appropriate when the documentation demonstrates **BOTH** of the following:

1. Left heart catheterization indications are met.
2. Right heart catheterization indications are met.
   Reference: [12]

LCD 33557
See also, **LCD 33557**: Cardiac Catheterization and Coronary Angiography at https://www.cms.gov/medicare-coverage-database/search.aspx *if applicable to individual's healthplan membership*.

LCD 33959
See also, **LCD L33959**: Cardiac Catheterization and Coronary Angiography https://www.cms.gov/medicare-coverage-database/search.aspx *if applicable to individual's healthplan membership*.

LCD 34761
See also, **LCD 34761** : Percutaneous Coronary Interventions at https://www.cms.gov/medicare-coverage-database/search.aspx *if applicable to individual's healthplan membership*.

LCD 35035
See also, **LCD 35035**: Thoracic Aortography and Carotid, Vertebral, and Subclavian Angiography at https://www.cms.gov/medicare-coverage-database/search.aspx *if applicable to individual's healthplan membership*.

Cardiac Catheterization Procedure Codes

Table 1. Cardiac Catheterization Associated Procedure Codes

CODE	DESCRIPTION
C9602	Percutaneous transluminal coronary atherectomy, with drug eluting intracoronary stent, with coronary angioplasty when performed; single major coronary artery or branch
C9603	Percutaneous transluminal coronary atherectomy, with drug-eluting intracoronary stent, with coronary angioplasty when performed; each additional branch of a major coronary artery (list separately in addition to code for primary procedure)
93451	Right heart catheterization including measurement(s) of oxygen saturation and cardiac output, when performed
93452	Left heart catheterization including intraprocedural injection(s) for left ventriculography, imaging supervision and interpretation, when performed
93453	Combined right and left heart catheterization including intraprocedural injection(s) for left ventriculography, imaging supervision and interpretation, when performed
93454	Catheter placement in coronary artery(s) for coronary angiography, including intraprocedural injection(s) for coronary angiography, imaging supervision and interpretation;
93455	Catheter placement in coronary artery(s) for coronary angiography, including intraprocedural injection(s) for coronary angiography, imaging supervision and interpretation; with catheter placement(s) in bypass graft(s) (internal mammary, free arterial, venous grafts) including intraprocedural injection(s) for bypass graft angiography
93456	Catheter placement in coronary artery(s) for coronary angiography, including intraprocedural injection(s) for coronary angiography, imaging supervision and interpretation; with right heart catheterization
93457	Catheter placement in coronary artery(s) for coronary angiography, including intraprocedural injection(s) for coronary angiography, imaging supervision and interpretation; with catheter placement(s) in bypass graft(s) (internal mammary, free arterial, venous grafts) including intraprocedural injection(s) for bypass graft angiography and right heart catheterization
93458	Catheter placement in coronary artery(s) for coronary angiography, including intraprocedural injection(s) for coronary angiography, imaging supervision and interpretation; with left heart catheterization including intraprocedural injection(s) for left ventriculography, when performed

CODE	DESCRIPTION
93459	Catheter placement in coronary artery(s)for coronary angiography, including intraprocedural injection(s) for coronary angiography, imaging supervision and interpretation; with left heart catheterization including intraprocedural injection(s) for left ventriculography, when performed, catheter placement(s) in bypass graft(s) (internal mammary, free arterial, venous grafts) with bypass graft angiography
93460	Catheter placement in coronary artery(s) for coronary angiography, including intraprocedural injection(s) for coronary angiography, imaging supervision and interpretation; with right and left heart catheterization including intraprocedural injection(s) for left ventriculography, when performed
93461	Catheter placement in coronary artery(s) for coronary angiography, including intraprocedural injection(s) for coronary angiography, imaging supervision and interpretation; with right and left heart catheterization including intraprocedural injection(s) for left ventriculography, when performed, catheter placement(s) in bypass graft(s) (internal mammary, free arterial, venous grafts) with bypass graft angiography
93462	Left heart catheterization by transseptal puncture through intact septum or by transapical puncture (List separately in addition to code for primary procedure)
93503	Insertion and placement of flow directed catheter (eg, Swan-Ganz) for monitoring purposes
93593	Right heart catheterization for congenital heart defect(s) including imaging guidance by the proceduralist to advance the catheter to the target zone; normal native connections
93594	Right heart catheterization for congenital heart defect(s) including imaging guidance by the proceduralist to advance the catheter to the target zone; abnormal native connections
93595	Left heart catheterization for congenital heart defect(s) including imaging guidance by the proceduralist to advance the catheter to the target zone, normal or abnormal native connections
93596	Right and left heart catheterization for congenital heart defect(s) including imaging guidance by the proceduralist to advance the catheter to the target zone(s); normal native connections
93597	Right and left heart catheterization for congenital heart defect(s) including imaging guidance by the proceduralist to advance the catheter to the target zone(s); abnormal native connections
93598	Cardiac output measurement(s), thermodilution or other indicator dilution method, performed during cardiac catheterization for the evaluation of congenital heart defects (List separately in addition to code for primary procedure)

Table 2. Cardiac Catheterization Associated Secondary Codes (Authorization Requirements Depend on Primary Procedure)

Code	Description
93463	Pharmacologic agent administration (eg, inhaled nitric oxide, intravenous infusion of nitroprusside, dobutamine, milrinone, or other agent) including assessing hemodynamic measurements before, during, after and repeat pharmacologic agent administration, when performed (List separately in addition to code for primary procedure)
93464	Physiologic exercise study (eg, bicycle or arm ergometry) including assessing hemodynamic measurements before and after (List separately in addition to code for primary procedure)
93563	Injection procedure during cardiac catheterization including imaging supervision, interpretation, and report; for selective coronary angiography during congenital heart catheterization (List separately in addition to code for primary procedure)

Code	Description
93564	Injection procedure during cardiac catheterization including imaging supervision, interpretation, and report; for selective opacification of aortocoronary venous or arterial bypass graft(s) (eg, aortocoronary saphenous vein, free radial artery, or free mammary artery graft) to one or more coronary arteries and in situ arterial conduits (eg, internal mammary), whether native or used for bypass to one or more coronary arteries during congenital heart catheterization, when performed (List separately in addition to code for primary procedure)
93565	Injection procedure during cardiac catheterization including imaging supervision, interpretation, and report; for selective left ventricular or left atrial angiography (List separately in addition to code for primary procedure)
93566	Injection procedure during cardiac catheterization including imaging supervision, interpretation, and report; for selective right ventricular or right atrial angiography (List separately in addition to code for primary procedure)
93567	Injection procedure during cardiac catheterization including imaging supervision, interpretation, and report; for supravalvular aortography (List separately in addition to code for primary procedure)
93568	Injection procedure during cardiac catheterization including imaging supervision, interpretation, and report; for nonselective pulmonary arterial angiography (List separately in addition to code for primary procedure)
93571	Intravascular Doppler velocity and/or pressure derived coronary flow reserve measurement (coronary vessel or graft) during coronary angiography including pharmacologically induced stress; initial vessel (List separately in addition to code for primary procedure)
93572	Intravascular Doppler velocity and/or pressure derived coronary flow reserve measurement (coronary vessel or graft) during coronary angiography including pharmacologically induced stress; each additional vessel (List separately in addition to code for primary procedure)

Cardiac Catheterization Summary of Changes

Cardiac Catheterization guideline from 2024 to 2025 had the following changes:

- Added the following to keep in line with current evidence:
  - Pediatric preamble
  - Under Left Heart Catheterization:
    - "Acute coronary syndrome (ACS) is suspected and **ANY** of the following:"
    - "Pericardial tamponade"
- Removed the following as current evidence does not support the indication:
  - Under Right Heart Catheterization:
    - "Hemodynamic monitoring"
    - "Partial anomalous pulmonary venous connection"
    - "Pericardial constriction or tamponade"
    - STEMI and **ANY** of the following: (Removed as this indication is redundant with letter C - ST-segment elevation myocardial infarction (STEMI) is suspected or known.)

1. Cardiogenic shock or hemodynamic instability
2. Fibrinolytic therapy and **EITHER** of the following:
    a. Reperfusion **FAILED**
    b. Stable, asymptomatic and within 3 to 24 hours of fibrinolytic therapy
3. Myocardial ischemia is spontaneous or easily provoked.
4. Non-invasive ischemia testing (coronary computed tomography angiography [CCTA], cardiac magnetic resonance [CMR], positron emission tomography [PET], single-photon emission computed tomography [SPECT]) risk is intermediate to high.

Cardiac Catheterization Definitions

Acute coronary syndrome (ACS) is a sudden, severe event in which the obstruction of a coronary artery interferes with blood flow to the heart muscle. It encompasses acute ischemic heart disease (eg, angina, myocardial infarction). ACS is diagnosed on the basis of rapidly accelerating symptoms of myocardial ischemia, with objective evidence of acute ischemia from an electrocardiogram and/or elevated circulating markers of myocardial injury.
Angina pectoris is the medical term for chest pain or discomfort due to coronary heart disease. It occurs when the heart muscle does not get as much blood as it needs. This may happen because one or more of the heart's arteries is narrowed or blocked, also called ischemia.

- Atypical chest pain or discomfort that lacks the characteristics of typical angina and is described as burning, sharp or stabbing brought on by deep breathing, coughing or movement of arms or torso, and lasting for seconds. The term non-cardiac should be used if heart disease is not suspected.
- Microvascular angina is a type of angina or chest pain that may be a symptom of coronary microvascular disease (MVD). Coronary MVD is a heart disease that affects the heart’s smallest coronary artery blood vessels. Spasms within the walls of these very small arterial blood vessels cause reduced blood flow to the heart muscle leading to a type of chest pain referred to as microvascular angina. Angina that occurs in coronary MVD may differ from the typical angina that occurs in heart disease. The chest pain usually lasts longer than 10 minutes, and it can last longer than 30 minutes.
- Prinzmetal angina may also be referred to as variant angina, Prinzmetal's variant angina or angina inversa. Prinzmetal’s angina almost always occurs at rest, usually between midnight and early morning. These attacks can be very painful. The pain from variant angina is caused by a spasm in the coronary arteries (which supply blood to the heart muscle). The

coronary arteries can spasm as a result of any of the following: exposure to cold weather, stress, medicines that tighten or narrow blood vessels, smoking or cocaine use.

- Typical angina, also known as stable angina or angina pectoris, is defined as: 1) substernal/ retrosternal chest pain, pressure, tightness or squeezing, described as dull, heavy, or crushing, and/or radiating to the mid-sternal or anterior chest; with possible associated symptoms (eg, dyspnea, nausea, lightheadedness) 2) provoked by exertion or emotional stress and 3) relieved by rest and/or nitroglycerin.
- Unstable angina (USA) is defined as angina that is of new onset and occurs at rest or with minimal exertion. USA can also occur from previously known stable angina in terms of increased frequency or duration of chest pain, resistance to previously effective medications, or provocation with decreasing levels of exertion or stress.

Aortic regurgitation is leakage of blood from the aorta back into the left ventricle during diastole because of failure of an aortic valve to close properly.
Arrhythmia is an irregular or abnormal heart rhythm. Arrhythmia refers to any change from the normal sequence of electrical impulses of the heart, causing abnormal heart rhythms. The electrical impulses may happen too fast, too slowly or erratically – causing the heart to beat too fast, too slowly or erratically.
CAD pre-test probability by age, gender and symptoms

Table 1. Pretest probability of CAD by age, gender and symptoms [a.]

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

[a.] Patel, M.R., Bailey, S.R., et al (2012). ACCF/SCAI/AATS/AHA/ASE/ASNC/HFSA/HRS/SCCM/SCCT/ SCMR/STS 2012 Appropriate Use Criteria for Diagnostic Catheterization. Journal of Thoracic and Cardiovascular Surgery, 144 (1), 39-71.
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

Cardiac catheterization is a procedure in which a thin, flexible tube (catheter) is guided through a blood vessel to the heart. It is used to diagnose or treat certain heart conditions, such as clogged arteries or irregular heartbeats. Cardiac catheterization gathers important information about the heart muscle, heart valves and blood vessels in the heart to develop a treatment plan.

Cardiac Magnetic Resonance (CMR), also known as cardiac MRI, is a non-invasive medical imaging technology that uses magnetic resonance imaging (MRI) techniques to produce detailed images of the beating heart.

Cardiac tamponade is a medical emergency characterized by the accumulation of fluid, blood, pus, or gas in the pericardial space, leading to compression of the heart chambers, compromised diastolic filling, and reduced cardiac output.

Cardiogenic shock (CS) is a serious and life-threatening condition that occurs when the heart is unable to pump enough blood to the body's vital organs and is commonly triggered by heart attack or heart failure.

Cardiomyopathy is a disease of the heart muscle that makes it harder for the heart to pump blood to the rest of the body. Cardiomyopathy can lead to heart failure. The main types of cardiomyopathy include dilated, hypertrophic and restrictive cardiomyopathy.

Coronary computed tomography angiography (CCTA) uses an injection of iodine-containing contrast material and CT scanning to examine the arteries that supply blood to the heart and determine whether they have been narrowed. The images generated during a CT scan can be reformatted to create three-dimensional (3D) images that may be viewed on a monitor, printed on film or by a 3D printer, or transferred to electronic media.

Congenital heart disease (CHD) is a term for a variety of birth defects that affect heart anatomy and function. Congenital is defined as present since birth. CHD occurs when the heart, or blood vessels near the heart, do not develop normally. Common heart defects include: atrial septal defect, coarctation of the aorta, d-transposition of the great arteries, Ebstein's anomaly, patent ductus arteriosus, tetralogy of fallot, total anomalous pulmonary venous connection and ventricular septal defect.

Table 2. Adult Congenital Heart Disease Classifications

Classifi-cation	CHD Anatomy
Simple	• Native Anatomy ▪ Isolated, small ASD ▪ Isolated, small VSD ▪ Mild, isolated pulmonic stenosis • Repaired Conditions ▪ Previously ligated or occluded ductus arteriosus ▪ Repaired secundum ASD or sinus venosus defect without significantresidual shunt or chamber enlargement ▪ Repaired VSD without significant residual shunt or chamberenlargement

Classification	CHD Anatomy
Moderate Complexity	• Repaired or unrepaired conditions ▪ Aorto-left ventricular fistula ▪ Anomalous pulmonary venous connection, partial or total ▪ Anomalous coronary artery arising from the pulmonary artery ▪ Anomalous aortic origin of a coronary artery from the opposite sinus ▪ AVSD (partial or complete, including primum ASD) ▪ Congenital aortic valve disease ▪ Congenital mitral valve disease ▪ Coarctation of the aortan Ebstein anomaly (disease spectrum includes mild, moderate, and severevariations) ▪ Infundibular right ventricular outflow obstruction ▪ Ostium primum ASD ▪ Moderate and large unrepaired secundum ASD ▪ Moderate and large persistently patent ductus arteriosus ▪ Pulmonary valve regurgitation (moderate or greater) ▪ Pulmonary valve stenosis (moderate or greater) ▪ Peripheral pulmonary stenosis ▪ Sinus of Valsalva fistula/aneurysm ▪ Sinus venosus defect ▪ Subvalvar aortic stenosis (excluding HCM ▪ Supravalvar aortic stenosis ▪ Straddling atrioventricular valve ▪ Repaired tetralogy of Fallot ▪ VSD with associated abnormality and/or moderate or greater shunt

Classification	CHD Anatomy
Great Complexity (or complex)	• Cyanotic congenital heart defect (unrepaired or palliated, all forms) • Double-outlet ventricle • Fontan procedure • Interrupted aortic arch • Mitral atresia • Single ventricle (including double inlet left ventricle, tricuspid atresia,hypoplastic left heart, any other anatomic abnormality with a functionally single ventricle) • Pulmonary atresia (all forms) • TGA (classic or d-TGA; CCTGA or l-TGA) • Truncus arteriosus • Other abnormalities of atrioventricular and ventriculoarterial connection (i.e.,crisscross heart, isomerism, heterotaxy syndromes, ventricular inversion)

Coronary artery bypass graft (CABG) is a surgical procedure performed to shunt blood around a narrowing or blockage in the coronary artery of the heart. This procedure involves attaching one end of a segment of blood vessel (eg, a vein of the leg) that was removed from another part of the body into the aorta, and the other end of the segment into the coronary artery beyond the obstructed area, to increase blood flow.

Coronary artery disease (CAD) is caused by plaque buildup in the walls of the arteries that supply blood to the heart (called coronary arteries) and other parts of the body.

Coronary computed tomography angiography (CCTA) is a non-invasive test that uses a computed tomography (CT) scanner to obtain a 3-dimensional image of the heart, including blood vessels that supply blood to the heart muscle (coronary arteries). During the CCTA, contrast dye is injected into the vein so that the coronary arteries can be seen. CCTA provides images to identify a narrowing or blockage of the coronary arteries caused by plaque and allows for accurate visualization of the 3-dimensional heart structure (to include the valves of the heart).

The Duke treadmill score (DTS) is a weighted index combining treadmill exercise time using standard Bruce protocol, maximum net ST segment deviation (depression or elevation), and exercise-induced angina. It was developed to provide prognostic information for the evaluation of suspected coronary heart disease.

- Duke Treadmill scores (typically range from -25 to +15) and associate risk:
  - Low risk is a score of +5 or more.
  - Moderate risk is a score of -10 to +4
  - High risk is a score of -11 or less

Dyspnea is difficult, painful breathing or shortness of breath.

Echocardiogram (ECHO) is a test that uses high frequency sound waves (ultrasound) to make pictures of the heart. The test is also called echocardiography or diagnostic cardiac ultrasound. An echo uses sound waves to create pictures of the heart's chambers, valves, walls and the blood vessels (aorta, arteries, veins). A probe called a transducer is passed over the chest. The probe produces sound waves that bounce off the heart and "echo" back to the probe. These waves are changed into pictures viewed on a video monitor.

Ejection fraction (EF) is a measurement of how much blood the left ventricle pumps out with each contraction. It is measured in percentages with a normal measurement usually between 50 and 70%.

Electrocardiogram (ECG or EKG) is a test that measures and records the electrical activity of the heart. The ECG electrical activity is divided into the P wave, PR interval, QRS complex, QT interval, ST segment, T wave and U wave. An ECG is useful in establishing many cardiac diagnoses.

Endocarditis is inflammation of the inside lining of the heart chambers and heart valves (endocardium). It is caused by a bacterial or rarely, a fungal infection.

Examples of clinical decision pathways and protocols used to categorize patients into low, intermediate, and high-risk when presenting with acute chest pain and suspected acute coronary syndrome include:

ADAPT Protocol is an accelerated diagnostic protocol to assess chest pain using troponins using a 2-hour accelerated diagnostic protocol to assess chest pain for risk of cardiac event. The ADAPT protocol tool may be found at: https://www.mdcalc.com/adapt-protocol-cardiac-event-risk

Emergency Department Assessment of Chest Pain Score (EDACS) is a diagnostic tool used to identify chest pain with low risk for a major adverse cardiac event (MACE). The EDACS tool may be found at: https://www.mdcalc.com/emergency-department-assessment-chest-pain-score-edacs

European Society of Cardiology Rapid Rule-In and Rule-Out Algorithm for Myocardial Infarction Due to the use of high-sensitivity cardiac troponin (hs-cTn) assay test, the time intervals for troponin assessment intervals can be shortened. It is recommended to use the 0 hour/1 hour algorithm (best option, blood draw at 0 hour and 1 hour) or the 0 hour/2 hour algorithm (second best option, blood draw at 0 hour and 2 hours) with suspected acute coronary syndrome. Low risk threshold - inital hs-cTn is "very low" and symptom onset is greater than 3 hours or inital hs-cTn is "low" and 1 or 2 hour is "low". Intermediate risk - initial hs-cTn is between "low" and "high" and/or 1 or 2 hour hs-cTn is between low and high thresholds. High risk - initial hs-cTn is "high" or 1 or 2 hours hs-cTn is high.
[1,2]

[1]Gulati, M., Levy, P.D., et al. 2021 AHA/ACC/ASE/CHEST/SAEM/SCCT/SCMR Guideline for the Evaluation and Diagnosis of Chest Pain: Executive Summary. A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Journal of the American College of Cardiology, 78(22), 2021

Global Registry of Acute Coronary Events (GRACE) risk score is a tool used to estimate probability of mortality within 6 months of hospital discharge with acute coronary syndrome. The GRACE tool may be found at: https://www.mdcalc.com/grace-acs-risk-mortality-calculator

HEART Score is a tool used to define risk when presenting to the emergency department with chest pain. The score identifies low, intermediate and high risk for short-term adverse outcome resulting from acute coronary syndrome (ACS). HEART (History, Electrocardiogram, Age, Risk factors, Troponin) is a 0 to 10-point scoring system. Scores are categorized as low (0 to 3), intermediate (4 to 6), and high risk (7 to 10) to inform and assist in clinical decision making.

No Objective Testing Rule (NOTR) is a clinical decision tool used to identify low probability of acute coronary syndrome (ACS) and without the need for objective cardiac testing for coronary artery disease (CAD).

Thrombolysis in myocardial infarction (TIMI) risk score for unstable angina (UA) and non ST-elevation MI (NSTEMI) estimates mortality for unstable angina and non-ST elevation MI. TIMI score less than 2 is low risk, 2-4 intermediate, and 5-7 high risk. TIMI risk tool may be found at: https://www.ncbi.nlm.nih.gov/books/NBK556069/

Fibrinolytic therapy is used to break down blood clots and establish reperfusion in acute thrombotic disease processes such as acute ischemic stroke, acute pulmonary embolism, and STEMI (ST-segment elevation myocardial infarction). Fibrinolytic agents activate plasminogen to plasmin, which then degrades fibrin, leading to the dissolution of thrombi. Agents include streptokinase, urokinase, and tissue plasminogen activator (t-PA) variants like alteplase, reteplase, and tenecteplase.

Fractional flow reserve (FFR) is a ratio of the maximal myocardial blood flow in the presence of a stenosis to the theoretical normal maximal flow in the same distribution. FFR is calculated by using the distal coronary pressure of the stenosis divided by the aortic pressure during maximal hyperemia (increased amount of blood in vessel).

Guideline-directed medical therapy (GDMT) refers to the optimal course of treatment for each stage of a chronic cardiac condition (eg, angina, heart failure), including those at high risk of disease progression but without structural heart disease or symptoms. The goal is titration of medications to maximum tolerated doses.

Heart failure (HF) (also known as **congestive heart failure [CHF]**) is a condition that develops when the heart is unable to pump enough blood for the body's needs. HF occurs when the heart cannot fill with enough blood or is too weak to pump properly. Decompensated heart failure is sudden worsening (exacerbation) of heart failure symptoms (eg, difficulty breathing, lower extremity edema, fatigue) to where the heart can no longer continue to compensate for its full function.

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[2]Collet, JP, Thiele, H., et al. 2020 2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. European Society of Cardiology. European Heart Journal 42, 1289-367, 2021

Hemodynamic instability is a condition caused by abnormal or unstable blood pressure that results in improper circulation and organs of the body do not receive adequate blood flow. It is characterized by chest pain, confusion, abnormal heart rate, loss of consciousness, restlessness, shortness of breath, cold hands, arms, legs or feet, etc.

Intracardiac shunt is an abnormal passageway in the heart that allows blood to flow between chambers or vessels it normally wouldn't. This can cause blood to flow in an abnormal way, bypassing the lungs and mixing oxygenated and deoxygenated blood.

Intravascular volume status is the amount of blood in a patient's circulatory system. It's a key part of a patient's overall fluid balance, which also includes intracellular and extracellular fluid.

Invasive coronary angiography (ICA) is part of a heart (cardiac) catheterization and uses contrast material and X-rays for imaging of the arteries of the heart. It can define the presence and severity of a luminal obstruction of an epicardial coronary artery, including its location, length, diameter, and coronary blood flow. [2021 AHA/ACC/ASE/CHEST/SAEM/SCCT/SCMR Guideline for the Evaluation and Diagnosis of Chest Pain]

Ischemic Heart Disease is a term given to heart problems caused by narrowed heart arteries. When arteries are narrowed, less blood and oxygen reaches the heart muscle, increasing the risk of myocardial infarction. This is also called coronary artery disease and coronary heart disease.

Ischemic mitral regurgitation (IMR) is a type of mitral regurgitation (MR) that occurs when the left ventricle (LV) is damaged by coronary artery disease (CAD). It's a common complication of CAD and can develop acutely or chronically.

Left ventricular ejection fraction (LVEF), also known as ejection fraction (EF), measures the amount of blood the left ventricle of the heart pumps out to the body with each heartbeat.

Lesion is a damaged or abnormal area of tissue in the body. Lesions can be caused by injury, infection, or disease. They can appear in many parts of the body, including the skin, brain, blood vessels, and other organs.

Magnetic resonance imaging (MRI) is a non-invasive diagnostic technique that produces computerized images of internal body tissues and is based on nuclear magnetic resonance of atoms within the body induced by the application of radio waves.

Mitral valve regurgitation is a condition where blood leaks from the mitral valve back into the heart. The mitral valve separates the two chambers of the heart's left side. When the valve doesn't close completely, blood flows backward into the upper heart chamber from the lower chamber.

Myocardial infarction (MI), also called a heart attack, occurs when the blood flow that brings oxygen to the heart muscle is severely reduced or cut off completely. The coronary arteries that supply the heart muscle with blood flow can become narrowed from a buildup of fat, cholesterol and other substances that together are called plaque. This process is known as atherosclerosis. When plaque within a coronary artery breaks, a blood clot forms around the plaque and can block the flow of blood through the artery to the heart muscle. Ischemia results when there is an

inadequate blood supply to the heart muscle causing damage or death of part of the heart muscle, resulting in an MI.

Myocardial ischemia occurs when blood flow to the heart is reduced, preventing the heart muscle from receiving enough oxygen. The reduced blood flow is usually the result of a partial or complete blockage of the heart's arteries (coronary arteries).

Myocardial perfusion imaging (MPI) uses an intravenously administered radio-pharmaceutical to depict the distribution of blood flow in the myocardium. Perfusion imaging identifies areas of relatively reduced myocardial blood flow associated with ischemia or scar. The relative distribution of perfusion can be assessed at rest, during cardiovascular stress or both. This test is often called a nuclear stress test.

Palpitations are rapid or irregular heartbeats that a person can feel.

Partial anomalous pulmonary venous connection (PAPVC), also known as partial anomalous pulmonary venous return (PAPVR), is a congenital heart defect in which some of the pulmonary veins inappropriately drain into the pulmonary circulation and can cause right heart failure if left untreated.

Patent Ductus Arteriosus (PDA), is a birth defect in the heart that occurs when the normal channel between the pulmonary artery and the aorta in the fetus does not close at birth. The blood vessel connecting the pulmonary artery and the aorta (ductus arteriosus) fails to close as it usually does shortly after birth.

Percutaneous coronary intervention (PCI) is a non-surgical procedure that uses a catheter (a thin flexible tube) to place a small structure called a stent to open up blood vessels in the heart that have been narrowed by plaque buildup, a condition known as atherosclerosis.

Pericarditis is inflammation of the pericardium (membrane enclosing the heart), often with fluid accumulation. Pericarditis may be caused by many disorders (eg, infection, myocardial infarction, trauma, tumors or metabolic disorders) but is often idiopathic. Symptoms include chest pain or tightness, often worsened by deep breathing. Cardiac output may be greatly reduced if cardiac tamponade (closure or blockage) or constrictive pericarditis develops.

Positron emission tomography (PET) scan is a procedure in which a small amount of radioactive glucose (sugar) is injected into a vein, and a scanner is used to make detailed, computerized pictures of areas inside the body where the glucose is taken up. It is a medical imaging test that shows the metabolic or biochemical function of organs and tissues.

Pre-test probability is a validated measure of the probability that an individual with chest pain has coronary artery disease (CAD). The test results are useful for making decisions on the appropriate diagnostic testing and planning based on an individual's characteristics. Characteristics measured include: age, sex, type of chest pain, comorbidities, smoking history and Coronary Calcium Scale (if available). The Diamond and Forrester model and the Duke clinical score are two examples of pre-test probability scoring tools often recommended to estimate the pretest probability of CAD when presenting with stable chest pain. Pretest probability tools may be found at https://qxmd.com/calculate/calculator_287/pre-test-probability-of-cad-cad-consortium

Low is less than 10%
Intermediate is 10% to 90%
High is more than 90%

Pulmonary hypertension is increased pressure in the pulmonary circulation that results in thickening and narrowing of the pulmonary arteries. Pulmonary hypertension can be either primary, the cause being idiopathic (unknown origin) or it can be secondary which occurs as a result of an identified medical condition.

Pulmonary vasodilators are medications that open the small arteries in the lungs to treat pulmonary arterial hypertension (PAH). PAH is a condition that causes constriction of the pulmonary arteries.

Reperfusion is the medical term for restoring blood flow to an organ or tissue after it has been blocked. It can occur after a heart attack or stroke. Types of reperfusion

Revascularization is a medical procedure that restores blood flow to an organ or body part that has been ischemic, or without enough blood. It can be used to treat existing blood flow problems, such as heart attacks, or to prevent similar problems from occurring in the future.

Shunt fraction quantifies the proportion of blood that bypasses the lungs or normal circulatory pathways due to a defect or abnormal connection between chambers or vessels. It is expressed as a ratio of pulmonary blood flow (Qp) to systemic blood flow (Qs), often referred to as Qp/Qs. The Qp/Qs ratio is used to determine the significance of the shunt, with values <1 indicating a net right-to-left shunt, and values >1 indicating a left-to-right shunt. A Qp/Qs ratio of <1.5 suggests a small left-to-right shunt, 1.5-2.0 indicates a moderate shunt, and >2.0 indicates a large shunt

Single-photon emission computed tomography (SPECT) is a nuclear imaging test that uses a radioactive substance and a special camera to create 3D images of the body's organs, tissue and bones. The images show how blood flows to tissues and organs.

ST Elevation Myocardial Infarction (STEMI) is a heart attack with a completely blocked coronary artery. It is accompanied by a persistent elevation of the ST segment on an electrocardiogram (ECG).

Stenosis is a narrowing or constriction of the diameter of a bodily passage or orifice.

Thrombolysis in myocardial infarction (TIMI) risk score for unstable angina (UA) and non ST-elevation MI (NSTEMI) estimates mortality for unstable angina and non-ST elevation MI. TIMI score less than 2 is low risk, 2-4 intermediate, and 5-7 high risk. TIMI risk tool may be found at: https://www.ncbi.nlm.nih.gov/books/NBK556069/

Thrombus is a blood clot that forms on the wall of a blood vessel or in the heart when blood platelets, proteins and cells stick together. A thrombus may block the flow of blood.

Transient ischemic dilation (TID) is recognized as a marker of extensive coronary artery disease (CAD) and is predictive of adverse outcomes, particularly when observed in myocardial perfusion imaging (MPI) during stress tests. TID is identified when there is a significant increase in the size of the left ventricle during stress compared to rest, quantified as a stress/rest ratio.

Transthoracic echocardiogram (TTE) involves placing a device called a transducer on the chest. The device sends ultrasound waves through the chest wall to the heart. As the ultrasound waves bounce off the structures of the heart, a computer converts them into pictures on the computer screen. A TTE uses sound waves to create pictures of the heart chambers, valves, walls and the blood vessels attached to your heart. The test is also called echocardiography or diagnostic cardiac ultrasound.

Valvular heart disease is a condition when any valve in the heart has damage or is diseased. When heart valves are diseased, the heart cannot effectively pump blood throughout the body and has to work harder to pump, either while the blood is leaking back into the chamber or against a narrowed opening. This can lead to heart failure, sudden cardiac arrest and death.

Ventricular fibrillation (VF) also called V-fib, is a serious cardiac rhythm disorder in which disordered electrical activity causes the heart's lower chambers (ventricles) to quiver or fibrillate, instead of contracting (beating) normally. This prohibits the heart from pumping blood, causing collapse and cardiac arrest. This type of arrhythmia is a life-threatening medical emergency.

Ventricular septal defect (VSD) is a defect in the interventricular septum that results in a communication between the right and left ventricles. They are classified based on the location within the interventricular septum: perimembranous, muscular, inlet, and outlet (supracristal). The size and location of the VSD influence the hemodynamic impact, with larger defects potentially causing significant left-to-right shunting, leading to symptoms of heart failure. Some VSDs may close spontaneously, particularly smaller muscular VSDs.

Ventricular tachycardia (VT) is a rhythm disorder caused by abnormal electrical signals in the ventricles of the heart.

- **Monomorphic ventricular tachycardia** is ventricular tachycardia with stable QRS morphology.
- **Non-sustained ventricular tachycardia (NSVT)** is defined as 3 or more consecutive beats originating from the ventricle, lasting less than 30 seconds, at a rate more than 100 beats per minute (bpm).
- **Polymorphic ventricular tachycardia** is a ventricular rhythm, with a rate greater than 100 bpm with a varying QRS pattern that terminates spontaneously (causing syncope if lasting more than a few seconds) or will deteriorate into ventricular fibrillation, causing cardiac arrest.
- **Sustained ventricular tachycardia (SVT)** is defined as a ventricular rhythm more than 100 bpm (widened QRS complex with duration greater than 120 ms) lasting more than 30 seconds or requiring termination due to hemodynamic instability.

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Disclaimer section

Purpose

The purpose of the HealthHelp's clinical guidelines is to assist healthcare professionals in selecting the medical service that may be appropriate and supported by evidence to safely improve outcomes. Medical information is constantly evolving, and HealthHelp reserves the right to review and update these clinical guidelines periodically. HealthHelp reserves the right to include in these guidelines the clinical indications as appropriate for the organization's program objectives. Therefore the guidelines are not a list of all the clinical indications for a stated procedure, and associated Procedure Code Tables may not represent all codes available for that state procedure or that are managed by a specific client-organization.

Clinician Review

These clinical guidelines neither preempt clinical judgment of trained professionals nor advise anyone on how to practice medicine. Healthcare professionals using these clinical guidelines

are responsible for all clinical decisions based on their assessment. All Clinical Reviewers are instructed to apply clinical indications based on individual patient assessment and documentation, within the scope of their clinical license.

Payment

The use of these clinical guidelines does not provide authorization, certification, explanation of benefits, or guarantee of payment; nor do the guidelines substitute for, or constitute, medical advice. Federal and State law, as well as member benefit contract language (including definitions and specific contract provisions/exclusions) take precedence over clinical guidelines and must be considered first when determining eligibility for coverage. All final determinations on coverage and payment are the responsibility of the health plan. Nothing contained within this document can be interpreted to mean otherwise.

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National and Local Coverage Determination (NCD and LCD)

NOTICE
To ensure appropriate review occurs to the most current NCD and/or LCD, always defer to https://www.cms.gov/medicare-coverage-database/search.aspx.

Background

National Coverage Determinations (NCD) and Local Coverage Determinations (LCD) are payment policy documents outlined by the Centers for Medicare and Medicaid Services (CMS) and the government's delegated Medicare Audit Contractors (MACs) that operate regionally in jurisdictions.
CMS introduced variation between different jurisdictions/Medicare Audit Contractors (MACs) and their associated covered code lists with the transition to ICD 10. The variation resulted in jurisdictions independently defining how codes are applied for exclusions, limitations, groupings, ranges, etc. for the medical necessity indications outlined in the NCD and LCD. Due to this

variation, there is an inconsistent use/application of codes and coverage determinations across the United States between the different MACs.
In addition, **WITHOUT** notice, CMS can change the codes that indicate medical necessity and the format of the coverage determinations/associated documents (eg, Articles). This is an additional challenge for organizations to keep up with ongoing, unplanned changes in covered codes and medical necessity indications.

Medical Necessity Codes

Due to the variation in code application between jurisdictions/MACs and that updates can happen without notification, HealthHelp is not able to guarantee full accuracy of the codes listed for any Coverage Determination, and advises that prior to use, the associated Coverage Determination Articles are reviewed to ensure applicability to HealthHelp's programs and any associated NCDs and LCDs.

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11248 11249 11253 11282 11325 11328 11333 11349 11350 11351 11352 11354 11355 11356 11358 11359 11360 11361 11362 11365 11366 11367 11368 11369 11370 11374 11375 11394 11395 11396 11565