Pericardial Disorder

Clinical Guidelines for Medical Necessity Review

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Important Notices

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Other Notices:

Guideline Information:

Disease Area: Cardiology
Care Path Group: General Cardiology
Care Path Name: Pericardial Disorder
Type: [**X**] Adult (18+ yo) | [_] Pediatric (0-17yo)

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Care Path Overview

Care Path Clinical Discussion

The pericardium is a double-walled sac around the heart and contains the roots of the great vessels. The most acute pericardial diseases are pericarditis (acute, subacute or incessant, chronic, and recurrent), pericardial effusion, cardiac tamponade, and constrictive pericarditis.[1,2]

Pericarditis, or inflammation of the pericardial sac, is the most common pericardial disorder. Basic testing and advanced imaging can confirm the cause of many types of pericarditis (e.g., specific infectious organisms, malignancies, and collagen vascular diseases). If an underlying disease causes acute pericarditis, the pericarditis usually responds to treatment for the responsible condition.[1] Treatment of idiopathic pericarditis may include non-steroidal anti-inflammatory drugs, colchicine, or corticosteroids.[3] Pericarditis may also occur after an acute myocardial infarction or following open-heart surgery. Generally speaking, pericarditis is self-limiting; there are some potentially life-threatening complications (e.g., cardiac tamponade, purulent pericarditis) that underscore the importance of an accurate diagnosis and treatment plan.[1]

A pericardial effusion refers to an abnormal amount of fluid accumulation (greater than 50ccs) within the pericardial space. A variety of local and systemic disorders can cause effusions, or they may be idiopathic. Pericardiocentesis may be necessary to resolve fast-accumulating effusions, purulent effusions, or malignant effusions.[2]

Cardiac tamponade occurs when a pericardial accumulation of fluid, purulent matter, blood, clots, or gas causes compression of the heart. Tamponade can be life-threatening and can result from inflammation, trauma, rupture of the heart, or aortic dissection.[2] It is often diagnosed with echocardiography and, in unstable patients, it requires immediate treatment with pericardiocentesis.[2]

Constrictive pericarditis occurs when the pericardium becomes scarred, thickened, or calcified and impairs cardiac filling. Constrictive pericarditis is a potentially treatable cause of chronic heart failure. The treating physician or cardiologist should use non-invasive imaging to distinguish between constrictive pericarditis and restrictive cardiomyopathy.[1] Constrictive pericarditis may resolve with anti-inflammatory medications or corticosteroids. However, an open chest surgical resection of both the visceral and parietal pericardium may be necessary. Invasive imaging (i.e., cardiac

catheterization to simultaneously measure both RV and LV pressure) is often required to confirm a constrictive pericarditis diagnosis before surgical intervention.[1]

The information contained herein gives a general overview of the pathway of this specific diagnosis, beginning with the initial presentation, recommended assessments, and treatment options as supported by the medical literature and existing guidelines. It should be noted that the care of patients can be complex. The information below is meant to support clinical decision-making in adult patients. It is not necessarily applicable to every case, as the entire clinical picture (including comorbidities, history, etc.) should be considered.

Key Information

- ➢ The patient with pericardial disease may present to the emergency department or the office of a primary care physician or cardiologist with acute or chronic non-specific complaints. Pericardial disease (i.e., effusions or inflammation) may also occur after a procedure such as chest surgery or after interventional manipulation of the cardiac arteries, veins, or valves.
- ➢ In the US, pericarditis is the cause of 0.1% of all hospital admissions and 5% of emergency room visits for chest pain.[2]
- ➢ If pericardial disease is suspected, the patient should undergo close physical exam (e.g., cardiac rub), ECG, chest x-ray, echocardiography, and blood work, including cardiac biomarkers of necrosis (e.g., creatinine kinase (CK), creatinine kinase-MB (CK-MB), troponin)
- ➢ For patients with cardiac tamponade, urgent pericardiocentesis can be lifesaving.
- ➢ Constrictive pericarditis is a potentially treatable cause of chronic heart failure.
- ➢ Physicians should first use non-invasive testing (e.g., CT, MRI) to distinguish between restrictive cardiomyopathies and constrictive pericarditis. Invasive imaging (i.e., right and left cardiac catheterization) is frequently needed to confirm a constrictive pericarditis diagnosis before surgical intervention.[1]

Definitions

- **Pericarditis:** an inflammatory process of the layers of the pericardial sac. It commonly falls into four tiers[1]:
  - **Acute:** Initial disease lasts 4-6 weeks
  - **Incessant:** Initial disease lasts for more than 4-6 weeks and up to three months without remission
  - **Recurrent:** Initial illness remits, but new signs and symptoms of pericardial inflammation recur after 4-6 weeks symptom-free
  - **Chronic:** Illness lasts longer than three months
- **Idiopathic pericarditis:** An acute pericarditis with an unknown cause despite diagnostic testing and treatment. These idiopathic cases may result from an unknown trigger of an immune response leading to inflammation of the pericardial tissue.[1]
- **Pericardial fluid:** The fluid enclosed in the pericardial space that acts as a lubricant for the vigor of the beating heart. It is typically a small volume (less than 50ccs).
- **Pericardial effusion:** An abnormal amount of fluid accumulation (greater than 50ccs) within the pericardial space.
- **Cardiac tamponade:** A potentially life-threatening accumulation of fluid, pus, blood, clots, or gas in the pericardium that compresses the

heart. Causes of cardiac tamponade include inflammation, trauma, rupture of the heart, and aortic dissection–among others.[2]

- **Constrictive pericarditis:** Constrictive pericarditis occurs when the pericardium becomes scarred, thickened, or calcified and impairs cardiac filling. This leads to equalization of the end-diastolic or mean pressures in all four cardiac chambers.[1]
- **Pericardial space:** Enclosed, fluid-filled space between the surface of the heart (epicardium) and the inner lining of the pericardial sac. In non-pathological conditions, this space does not communicate with adjacent mediastinal structures.[2]

Pericardial Disorder

What is a "Cohere Care Path"?

These Care Paths organize the services typically considered most clinically optimal and likely to be automatically approved. These service recommendations also include the suggested sequencing and quantity or frequency determined clinically appropriate and medically necessary for the management of most patient care scenarios in this Care Path's diagnostic cohort.

		Non-Surgical Management	Surgical or Interventional Management
Workup and Symptom Monitoring	Electrocardiogram (ECG)*		
	Labs	AND	
	Chest X-Ray		
Non-Invasive Testing	Transthoracic Echocardiogram (TTE) PA*		
	Transesophageal Echocardiogram (TEE) PA	OR	
	Computed Tomography Angiography (CTA), Cardiac PA		
	Magnetic Resonance Imaging (MRI), Cardiac PA		
	Cardiac Positron Emission Tomography (PET) PA	OR	
Non-Surgical Management	Medication		
	Lifestyle Changes	AND	
Surgical or Interventional Management	Cardiac Catheterization PA		

Non-Surgical Management

Key

PA = Service may require prior authorization
★ = Denotes preferred service
AND = Services completed concurrently
OR = Services generally mutually exclusive

= Non-surgical management prior authorization group of services
= Surgical management prior authorization group of services
= Subsequent service
= Management path moves to a different management path

Care Path Diagnostic Criteria

Disease Classification

ICD-10 Codes Associated with Classification

ICD-10 Code	Code Description/Definition
I30	Acute pericarditis
I31	Other diseases of pericardium
I31.31	Malignant pericardial effusion in diseases classified elsewhere
I31.39	Other pericardial effusion (noninflammatory)
I31.9	Disease of pericardium, unspecified
I30.9	Acute pericarditis, unspecified
I31.1	Chronic constrictive pericarditis
I31.8	Other specified diseases of pericardium
I30.0	Acute nonspecific idiopathic pericarditis
I31.4	Cardiac tamponade
I24.1	Dressler's syndrome
I31.2	Hemopericardium, not elsewhere classified
I30.8	Other forms of acute pericarditis
S26.91XA	Contusion of heart, unspecified with or without hemopericardium, initial encounter
M32.12	Pericarditis in systemic lupus erythematosus
I31.0	Chronic adhesive pericarditis
I30.1	Infective pericarditis
I97.0	Postcardiotomy syndrome

Presentation and Etiology

Causes and Risk Factors

Pericarditis is the most common clinical manifestation of pericardial disease. Cases of acute pericarditis include viral infection, advanced renal insufficiency, inflammation following open-heart surgery, and inflammation associated with auto-immune conditions (e.g., rheumatoid arthritis, lupus, scleroderma). Pericarditis can also occur following an Acute Myocardial Infarction (a condition known as Dressler's Syndrome). Bacterial and tuberculosis infections can also cause pericarditis, although less frequently. Cardiac metastatic cancer is often asymptomatic and may cause a large pericardial effusion.[1]

Any cause of pericarditis can create a pericardial effusion that results in cardiac tamponade. This life-threatening situation is due to pressure against the cardiac chambers, restricting overall cardiac filling and performance as a pump. Patients with a significant effusion require close observation and careful treatment, which may be best accomplished in an inpatient hospital setting.

Pericardial constriction is usually the result of pericardial inflammation leading to pericardial scarring, thickening, fibrosis, and calcification. The most frequent causes are viral infection, mediastinal radiation, auto-immune conditions, connective tissue diseases, and tuberculous infection.[1,2]

Clinical Presentation

Typical History Findings

Patients with acute pericarditis often experience severe, sharp retrosternal chest pain. Pericarditis can also present as shortness of breath or an air-hunger sensation. In some cases, however, pericarditis may be asymptomatic, as is often the case with the pericarditis accompanying rheumatoid arthritis. Pericardial pain is usually worse with inspiration and in the supine position. Sitting forward typically provides some relief.[1]

The clinical presentation of a pericardial effusion varies widely. It includes symptoms such as orthopnea, nausea, difficulty swallowing, hoarseness, and hiccups.[2] Patients with constrictive pericarditis may present with symptoms similar to restrictive cardiomyopathy, including fatigue, peripheral edema, dyspnea, and abdominal swelling.[2]

Typical Physical Exam Findings

The classic finding in patients with acute pericarditis is a pericardial friction rub. Although highly specific, it may be only briefly present and is therefore infrequently found.[1] A low-grade fever is common, but a temperature over 38 °C is unusual and suggests infectious pericarditis.[1]

Patients with a pericardial effusion without hemodynamic compromise may have a normal physical exam. However, if cardiac tamponade develops, patients may become visibly anxious and develop the following symptoms[1]:

- Hypotension.
- Tachycardia.
- Neck vein distension with elevated jugular venous pressure.
- A "pulsus paradoxus" greater than or equal to 10mmHg" (palpable pulse volume decreasing with inspiration and restoring with exhalation).
- Diminished heart sounds on cardiac auscultation.

The physical exam for a patient with constrictive pericarditis may show marked jugular venous distension, hepatic congestion, peripheral edema, hepatomegaly, and pleural effusions.[1,2] Some patients may have Kussmaul's sign or a rise in venous pressure replacing the usual inspiratory drop in jugular venous distention.[1]

Typical Diagnostic Findings

If a history and physical exam suggest pericardial disease, the patient should have an electrocardiogram (ECG), a chest x-ray, echocardiography, a complete blood count, and blood tests including markers of inflammation (e.g., C-Reactive protein (CRP), erythrocyte sedimentation rate (ESR), and cardiac-specific troponin to evaluate for myopericarditis).[2] The presenting differential diagnosis includes viral or bacterial pericarditis, tuberculous pericarditis, and pericarditis associated with a systemic disease (e.g., renal failure, Lupus, cancer).[2]

Diffuse ST-segment elevation on an ECG is a typical sign of acute pericarditis.[2] PR segment depression on an ECG also supports the diagnosis of pericarditis. Chest x-rays generally appear normal in patients with acute pericarditis.[2] Patients with constrictive pericarditis may have pericardial calcification on lateral chest x-ray.[1]

Echocardiography is the primary imaging tool for pericardial diseases. It may be the only modality needed for diagnosing and managing pericarditis. It is also a valuable adjunct to guide pericardiocentesis. Small effusions may not be visible on echocardiograms; CT and MRI will provide additional information in these cases.[2]

Cardiac magnetic resonance imaging (MRI) is beneficial when echocardiography leaves the diagnosis uncertain. Since it provides both morphologic and hemodynamic information, cardiac MRI can 1) define the severity of inflammation 2) identify and characterize the involvement of myocardial tissue (e.g., pericarditis following an acute myocardial infarction (MI), co-existing pericarditis and myocarditis).[1,4]

Cardiac computed tomography (CT) can demonstrate the thickness of the pericardium and is very sensitive in detecting a pericardial effusion. CT can readily demonstrate tumors, loculated pericardial effusions, and pericardial calcifications.

Care Path Services & Medical Necessity Criteria

Non-Invasive Testing

Service: Transthoracic Echocardiogram (TTE)

General Guidelines

- **Units, Frequency, & Duration:** Single procedures should be performed as needed based on the below-defined criteria.
- **Criteria for Subsequent Requests:**
    - A repeat transthoracic echocardiogram (TTE) is appropriate for:
        - Evaluating significant changes in signs or symptoms since the patient's prior TTE
        - Providing objective evidence of left ventricular (LV) functional response to medical therapy.
    - Annual repeat TTEs are NOT appropriate for clinically stable or asymptomatic patients with mild valvular disease or mild pulmonary hypertension.
- **Recommended Clinical Approach:** Transthoracic echocardiography is the first-line imaging test in patients with suspected pericardial disease. It accurately detects pericardial effusion and cardiac tamponade, as well as ventricular dysfunction due to myocardial involvement.[2] Early recognition of abnormal hemodynamics related to cardiac tamponade may decrease complications.[2,5]
- **Exclusions:** None.

Medical Necessity Criteria

Indications

➔ **TTE** is considered appropriate if **ANY** of the following is **TRUE**:

- ◆ The patient is known or suspected to have **ANY** of the following[2,5-6]:
    - Pericardial disease.[7]
    - Pericardial effusion.[8]
    - Cardiac tamponade.[8]
    - Constrictive pericarditis.[1]
    - Pericardial mass, malignancy, thrombus, or diverticulum.[9]
- ◆ The patient had a recent cardiovascular surgery or intervention - a complication is suspected.

- The patient is receiving pericardiocentesis (i.e., fluid removal from the pericardium). TTE is needed for visualization during the procedure.[1,9]

Non-Indications

➔ **TTE** is not considered appropriate if **ANY** of the following is **TRUE**:

- Echocardiography has no contraindications. Echocardiography may have limited benefit in patients at the extremes of adult body weight because a thick chest wall (in markedly obese patients) or overcrowded ribs (in severely underweight patients) may limit the penetration of ultrasound waves.[10-11]

Site of Service Criteria

Inpatient, outpatient, or observation status.

Procedure Codes (HCPCS/CPT)

HCPCS Code	Code Description/Definition
93303	Complete transthoracic echocardiography for congenital cardiac anomalies
93304	Follow-up transthoracic echocardiography for congenital cardiac anomalies
93306	Real time transthoracic echocardiography with 2-dimensional (2D) image documentation, M-mode recording with spectral Doppler echocardiography, and color flow Doppler echocardiography
93307	Complete real time transthoracic echocardiography with 2-dimensional (2D) image documentation
93308	Follow-up real time transthoracic echocardiography with 2-dimensional (2D) image documentation
C8921	Tte w or w/o fol w/cont, com
C8922	Tte w or w/o fol w/cont, f/u
C8923	2d tte w or w/o fol w/con,co
C8924	2d tte w or w/o fol w/con,fu
C8929	Tte w or wo fol wcon,doppler

Service: Transesophageal Echocardiogram (TEE)

General Guidelines

- **Units, Frequency, & Duration:** None.
- **Criteria for Subsequent Requests:** None.
- **Recommended Clinical Approach:** Transesophageal echocardiography (TEE) can be useful for patients with pericardial disease when transthoracic echocardiography results are inconclusive or discordant with history and physical exam findings.
- **Exclusions:** None.

Medical Necessity Criteria

Indications

➔ **TEE** is considered appropriate if **ANY** of the following is **TRUE**:

- ◆ The patient is known or suspected to have one or more of the following:
  - Pericardial constriction.[1,7]
  - Pericardial disease due to mass, malignancy, thrombus, or cardiac embolus.[7]
  - Cardiac compression by a loculated pericardial hematoma or effusion
  - Pericardial thickening inadequately defined by a transthoracic echocardiogram (TTE).[2]
  - Recent cardiovascular surgery or intervention in whicha complication is suspected.
- ◆ The patient is receiving a pericardial window procedure (i.e., surgically removing a piece of the pericardium); a TEE is needed for visualization during the procedure.[1]
- ◆ The patient is undergoing a pericardiectomy
- ◆ The patient has a pericardial effusion and one or more of the following:
  - An inconclusive TTE or a TTE discordant with clinical findings.[2]
  - Dissection of the aorta involving the aortic root.
  - Endocarditis.[7]

Non-Indications

➔ **TEE** may not be appropriate if **ANY** of the following is **TRUE**:

- ◆ The patient has a history of undiagnosed dysphagia (relative).
- ◆ The patient has a history of esophageal stricture, malignancy, recent surgery of the esophagus, active GI bleeding, esophageal varices (relative), or prior surgery (relative).

Site of Service Criteria

Outpatient or Inpatient.

Procedure Codes (HCPCS/CPT)

HCPCS Code	Code Description/Definition
93312	Real time transesophageal echocardiography with 2-dimensional (2D) image documentation, M-mode recording, probe placement, image acquisition, interpretation, and report
93313	Real time transesophageal echocardiography with 2-dimensional (2D) image documentation and placement of transesophageal probe only
93314	Interpretation and report only of real time transesophageal echocardiography with 2-dimensional (2D) image documentation and image acquisition
93315	Transesophageal echocardiography (TEE) with probe placement, image acquisition, interpretation, and report
93316	Transesophageal echocardiography (TEE) for placement of transesophageal probe only
93317	Interpretation and report only of transesophageal echocardiography (TEE) with image acquisition
93318	Real time transesophageal echocardiography (TEE) with probe placement, 2-dimensional (2D) image acquisition and interpretation
93355	Transesophageal echocardiography (TEE) for guidance of transcatheter closure of left atrial appendage, with quantitative measurements, probe manipulation, interpretation and report
C8925	2d tee w or w/o fol w/con,in
C8926	Tee w or w/o fol w/cont,cong
C8927	Tee w or w/o fol w/cont, mon

Service: Computed Tomography Angiography (CTA)/Computed Tomography with Contrast, Cardiac

General Guidelines

- **Units, Frequency, & Duration:** None.
- **Criteria for Subsequent Requests:** None.
- **Recommended Clinical Approach:** Cardiac CTA is a non-invasive imaging modality that can evaluate the anatomy and pathology of the pericardium, cardiac chambers, central great vessels, and the function of the heart, including the cardiac valves.[7] CT is complementary to echocardiography, and CT is the most accurate technique to image calcified tissue.[2,5]
- **Exclusions:** None.

Medical Necessity Criteria

Indications

➔ **Cardiac CTA** is appropriate if **ANY** of the following is **TRUE** [2,12]:

- The patient has pericardial disease and is known or suspected to have **ANY** of the following positive findings[4,9]:
  - A loculated pericardial effusion.
  - A chest abnormality that limits echocardiogram imaging.
  - Recent chest trauma.
  - A pericardial mass, malignancy, or cyst.[7]
  - A congenital pericardial defect.
  - A concern that the patient has tuberculosis.
  - A hemopericardium (pericardial blood or clot).
- The patient has acute pericarditis and **ANY** of the following[4,12]:
  - Acute myocardial infarction.
  - A concern of malignancy.
  - Lung or chest infection.
  - Pancreatitis.
- The patient's pericardial disease did not respond to anti-inflammatory medication.[4]
- A prior echo was inconclusive or discordant with clinical findings, and there is a clinical need to characterize the disease further.[2]
- The patient has an upcoming cardiovascular surgery or intervention, and a CT is needed for pre-procedure planning.[2]

Non-Indications

➔ **Cardiac CTA** may not be appropriate if **ANY** of the following is **TRUE**:

- ◆ The patient has non-rate controlled atrial fibrillation or uncontrolled rate with any rhythm.
- ◆ The patient takes metformin (unless held).
- ◆ The patient has severe renal impairment.
- The patient has a history of anaphylactic reaction to iodinated contrast. Other allergic reactions may require premedication.[1]

Site of Service Criteria

Outpatient or Inpatient.

Procedure Codes (HCPCS/CPT)

HCPCS Code	Code Description/Definition
75572	Computed tomography (CT) of heart with contrast material for evaluation of cardiac structure and morphology, including 3-dimensional (3D) image postprocessing, assessment of cardiac function, and evaluation of venous structures
75573	Computed tomography (CT) of heart with contrast material for evaluation of cardiac structure and morphology in congenital heart disease

Service: Magnetic Resonance Imaging (MRI), Cardiac

General Guidelines

- **Units, Frequency, & Duration:** None.
- **Criteria for Subsequent Requests:** Considerations of additional phase, dynamic sequences, positioning of the patient, and use of markers at the discretion of the protocoling radiologist.[5]
- **Recommended Clinical Approach:** Cardiac magnetic resonance imaging (MRI) provides visualization and tissue characterization of the pericardium and heart and the consequences of pericardial abnormalities on cardiac function.[2,5,12-14]
- **Exclusions:** Exclusions include contraindications of MRI (e.g., retained metal, incompatible width to bore size, possibly claustrophobia), incompatibility with following directions (i.e., breath-hold), and renal insufficiency (eGFR less than 30 mL/min per 1.73 m^2) if gadolinium is requested.[5,14-15]

Medical Necessity Criteria

Indications

➔ **Cardiac MRI** is appropriate if **ANY** of the following is **TRUE**:

- The patient has pericardial disease and is known or suspected to have ANY of the following[2,12-13]:
  - A loculated pericardial effusion.
  - A chest abnormality that limits echocardiogram imaging.
  - Recent trauma.[4]
  - A pericardial mass, malignancy, or cyst.[14]
  - A congenital pericardial defect.
  - A concern that the patient has tuberculosis.[4]
  - A hemopericardium (pericardial blood or clot)[4]
  - Pericarditis and myocarditis co-existing (i.e., perimyocarditis or myopericarditis)[9]
- The patient has acute pericarditis and **ANY** of the following[4,13-14]:
  - Acute myocardial infarction.[2]
  - A concern of malignancy.
  - Lung or chest infection.
  - Pancreatitis.
- The patient's pericardial disease did not respond to anti-inflammatory therapy.[4,9]
- A prior echo was inconclusive or discordant with clinical findings, and MRI is needed to characterize the disease further.[4,9,14]

- An MRI is required to aid in distinguishing between constrictive pericardial disease and restrictive cardiomyopathy.[2]

Non-Indications

➔ **Cardiac MRI** may not be appropriate if **ANY** of the following is **TRUE**[7]:

- Simultaneous or recent cardiac CT scan for the same indication.
- Non-compatible implanted devices.[14]
- Metallic intraocular foreign bodies.
- Claustrophobia.
- There is a potential for adverse reactions to contrast media.
- If the patient has renal insufficiency (eGFR less than 30 mL/min per 1.73 m^2) and if gadolinium contrast is requested, an MRI/MRA may not be considered appropriate.[5]

Site of Service Criteria

Outpatient or Inpatient.

Procedure Codes (HCPCS/CPT)

HCPCS Code	Code Description/Definition
75557	Cardiac magnetic resonance imaging (MRI) without contrast material, for morphology and function
75559	Cardiac magnetic resonance imaging (MRI) with stress imaging, without contrast material, for morphology and function
75561	Cardiac magnetic resonance imaging (MRI) without contrast material, followed by contrast material and further sequences, for morphology and function
75563	Cardiac magnetic resonance imaging (MRI) with stress imaging, without contrast material, followed by contrast material and further sequences, for morphology and function
C9762	Cardiac magnetic resonance imaging for morphology and function, quantification of segmental dysfunction; with strain imaging
C9763	Cardiac magnetic resonance imaging for morphology and function, quantification of segmental dysfunction; with stress imaging

S8042	MRI Low Field

Service: Cardiac Positron Emission Tomography (PET)

General Guidelines

- **Units, Frequency, & Duration:** Single request.
- **Criteria for Subsequent Requests:** None.
- **Recommended Clinical Approach:** Positron emission tomography (PET) is a non-invasive diagnostic imaging procedure used to evaluate metabolism in normal tissues and diseased tissues in ischemic heart disease. PET helps identify the nature of inflammatory pericarditis and to detect pericardial involvement in patients with solid cancers and lymphoma, providing information on the diagnosis, staging, and assessment of the therapeutic response.[2,16]
- **Exclusions:** None.

Medical Necessity Criteria

Indications

➔ **Cardiac PET** is appropriate if **ANY** of the following is **TRUE**[2,4,12]:
- ◆ The patient has a pericardial malignancy.[16]
- ◆ The patient has an extrathoracic disease that may involve the pericardium (e.g., sarcoidosis, amyloidosis, cancer.)
- ◆ The patient has inflammatory pericarditis.

Non-Indications

➔ **Cardiac PET** may not be appropriate if **ANY** of the following is **TRUE**:
- ◆ The patient is experiencing an acute myocardial infarction or unstable angina.
- ◆ Acute pulmonary condition (e.g., pneumonia, pulmonary embolism).
- ◆ The patient is pregnant.
- ◆ The patient has allergic reactions or intolerance to radiotracers.

Site of Service Criteria

Outpatient or Inpatient.

Procedure Codes (HCPCS/CPT)

HCPCS Code	Code Description/Definition
78429	Single positron emission tomography (PET) myocardial imaging study for metabolic evaluation with concurrently

	acquired computed tomography (CT) transmission scan
78430	Single positron emission tomography (PET) myocardial perfusion imaging study with evaluation of ejection fraction, at rest or stress (exercise or pharmacologic), with concurrently acquired computed tomography (CT) transmission scan
78432	Positron emission tomography (PET) combined myocardial perfusion imaging study and metabolic evaluation study using dual radiotracer
78433	Positron emission tomography (PET) combined myocardial perfusion imaging and metabolic evaluation study using dual radiotracer, with concurrently acquired computed tomography (CT) transmission scan
78459	Single positron emission tomography (PET) myocardial imaging study for metabolic evaluation
78811	Positron emission tomography (PET) imaging of chest
78814	Positron emission tomography (PET) with concurrently acquired computed tomography (CT)
G0235	Pet not otherwise specified
G0252	Pet imaging initial dx

Surgical or Interventional Management

Service: Cardiac Catheterization

General Guidelines

- **Units, Frequency, & Duration:** none.
- **Criteria for Subsequent Requests:** none.
- **Recommended Clinical Approach:** Differentiating between constrictive pericarditis and restrictive cardiomyopathy is complex. Left and right heart catheterization is particularly useful in distinguishing between pericarditis and cardiomyopathy.[2,15]
- **Exclusions:** None.

Medical Necessity Criteria

Indications

➔ **Cardiac catheterization** is appropriate if **ANY** of the following is **TRUE**:
- The patient has pericardial disease, but previous non-invasive tests were inconclusive or discordant with clinical findings.[15]
- There is suspicion of myocarditis or coronary artery disease.[2]
- Surgical intervention is planned, and supplementary information is needed for risk mitigation and planning.

Non-Indications

➔ **Cardiac catheterization** may not be appropriate if **ANY** of the following is **TRUE**[17]:
- Acute or chronic kidney disease.
- Coagulopathy.
- Fever or a systemic infection.
- Uncontrolled arrhythmia.
- Uncontrolled hypertension.
- Decompensated heart failure.
- Severe contrast agent allergy.

Site of Service Criteria

Inpatient, outpatient, or observation status.

Procedure Codes (HCPCS/CPT)

HCPCS Code	Code Description/Definition
93451	Right heart catheterization

93452	Left heart catheterization with intraprocedural injection for left ventriculography
93453	Combined right and left heart catheterization with intraprocedural injection for left ventriculography
93454	Catheter placement in coronary artery for coronary angiography, with intraprocedural injection for coronary angiography, imaging supervision, and interpretation
93455	Catheter placement in coronary artery for coronary angiography, with intraprocedural injection for coronary angiography, imaging supervision, and interpretation, with catheter placement in bypass graft, with intraprocedural injections for bypass graft angiography
93456	Catheter placement in coronary artery for coronary angiography, with intraprocedural injection for coronary angiography, imaging supervision, and interpretation, with right heart catheterization
93457	Catheter placement in coronary artery for coronary angiography, with intraprocedural injection for coronary angiography, imaging supervision, and interpretation, with catheter placement in bypass graft, with intraprocedural injection for bypass graft angiography and right heart catheterization
93458	Catheter placement in coronary artery for coronary angiography, with intraprocedural injection for coronary angiography, imaging supervision, and interpretation, with left heart catheterization, with intraprocedural injection for left ventriculography
93459	Catheter placement in coronary artery for coronary angiography, with intraprocedural injection for coronary angiography, imaging supervision and interpretation, with left heart catheterization, catheter placement in bypass graft, with bypass graft angiography
93460	Catheter placement in coronary artery for coronary angiography, with intraprocedural injection for coronary angiography, imaging supervision, and interpretation, with right and left heart catheterization

93461	Catheter placement in coronary artery for coronary angiography, with intraprocedural injection for coronary angiography, imaging supervision, and interpretation, with right and left heart catheterization, catheter placement in bypass graft, with bypass graft angiography

Surgical Risk Factors

Patient Medical Risk Stratification

Patient Risk Score	Patient Characteristic	Min Range	Max Range	Guidance
1- Very Low Risk	No known medical problems			
2- Low Risk	Hypertension		180/110 mm Hg	
2- Low Risk	Asthma	peak flow >80% of predicted or personal best value		
2- Low Risk	Prior history of alcohol abuse			Screen for liver disease and malnutrition
2- Low Risk	Prior history of tobacco use			
3- Intermediate Risk	Asthma	peak flow <80% of predicted or personal best value		
3- Intermediate Risk	Active alcohol abuse			
3- Intermediate Risk	Age	65	75	
3- Intermediate Risk	History of treated, stable coronary artery disease (CAD)			
3- Intermediate Risk	Stable atrial fibrillation			
3- Intermediate Risk	Diabetes mellitus	HbA1C >7%		
3- Intermediate Risk	Morbid obesity	BMI 30	BMI 40	
3- Intermediate Risk	Anemia	hemoglobin <11 (females), <12 (males)		Workup to identify etiology
3- Intermediate Risk	HIV	CD4 <200 cells/mm3		Get clearance from HIV specialist
3- Intermediate Risk	Rheumatologic disease			Preoperative consultation with rheumatologist re: perioperative medication management
3- Intermediate Risk	Peripheral vascular disease or history of peripheral vascular bypass	ankle-brachial pressure index (ABPI) <0.9		Preoperative consultation with vascular surgeon
3- Intermediate Risk	History of venous thromboembolism (VTE)			

3- Intermediate Risk	Well-controlled obstructive sleep apnea			
3- Intermediate Risk	Malnutrition	transferrin <200 mg/dL albumin <3.5 g/dL prealbumin <22.5 mg/dL total lymphocyte count <1200-1500 cell/mm3 BMI <18		Preoperative consultation with nutritionist
3- Intermediate Risk	Active tobacco Use			Enroll patient in smoking cessation program
3- Intermediate Risk	Known allergy or hypersensitivity to medication needed for procedure			
4- High Risk	Advanced Renal Disease (Creatinine > 2)			
4- High Risk	Diabetes mellitus with complications	HbA1c >8%		
4- High Risk	Age	76	85	
4- High Risk	Oxygen dependent pulmonary disease			
4- High Risk	Sickle cell anemia			
4- High Risk	Obesity	BMI 40		
4- High Risk	Cirrhosis, history of hepatic decompensation or variceal bleeding			
4- High Risk	Impaired cognition; dementia			
4- High Risk	Compensated CHF			
4- High Risk	Cerebrovascular disease			
4- High Risk	Uncontrolled or suspected obstructive sleep apnea (OSA)			
4- High Risk	Renal insufficiency	serum creatinine >1.5 mg/dL or creatinine clearance <100 mL/min		
4- High Risk	Opioid dependence			
5- Very High Risk	Percutaneous Coronary Intervention (PCI) within 1 month			

5- Very High Risk	Cardiovascular: unstable angina, recent myocardial infarction (60 days), uncontrolled atrial fibrillation or other high-grade abnormal rhythm, severe valvular disease, decompensated heart failure			
5- Very High Risk	Primary pulmonary hypertension			Preoperative consultation with pulmonologist warranted
5- Very High Risk	Cirrhosis or severe liver disease, history of hepatic decompensation or variceal bleeding			
5- Very High Risk	Severe frailty, dependence for ADLs, or history of 3 or more falls in last 6 mos			
5- Very High Risk	Obesity		BMI >50	
5- Very High Risk	Age		>85	
5- Very High Risk	History of VTE with CI to anticoagulation, failure of anticoagulation, cessation of anticoagulation therapy secondary to bleeding			Preoperative consultation with hematologist or internist
5- Very High Risk	Renal failure requiring dialysis			
5- Very High Risk	Immunosuppression			
5- Very High Risk	Chronic Pain			

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