

2024 Magnetic Resonance Imaging (MRI) Heart

Cardiology/Diagnostic Imaging

 $$\operatorname{MRI-Heart-HH}$$ Copyright © 2024 WNS (Holdings) Ltd.

Last Review Date: 10/28/2024 Previous Review Date: 10/03/2024 Guideline Initiated: 06/30/2019



Table of Contents

Magnetic R	Resonance Imaging (MRI) Heart	3	
	General Contraindications		
Pream	nble: Pediatric Diagnostic Imaging	3	
MRI H	Heart Guideline	3	
	Heart Procedure Codes		
MRI H	Heart Summary of Changes	8	
MRI Heart	Definitions	8	
MRI Heart	References 1	.3	
Disclaimer	Disclaimer section		
Purpo	ose 1	7	
Clinici	ian Review 1	8	
Payme	ent 1	8	
Regist	tered Trademarks $(\mathbb{R}/^{ exttt{TM}})$ and Copyright (\mathbb{C})	8	
Nation	nal and Local Coverage Determination (NCD and LCD) 1	8	
В	Background 1	9	
M	Medical Necessity Codes 1	9	



Magnetic Resonance Imaging (MRI) Heart



NCD 220.2

See also, NCD 220.2: Magnetic Resonance Imaging at https://www.cms.gov/medicare-coverage-database/search.aspx if applicable to individual's healthplan membership.

MRI General Contraindications

MRI may be contraindicated for **ANY** of the following:

- Safety, related to clinical status (body mass index exceeds MRI capability, intravascular stents within recent 6 weeks)
- Safety, related to implanted devices (aneurysm clips, cochlear implant, insulin pump, spinal cord stimulator)¹

References: [30] [9] [18]

Preamble: Pediatric Diagnostic Imaging

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

MRI Heart Guideline

Magnetic resonance imaging (MRI) of the heart (or cardiac magnetic resonance [CMR]) is considered medically appropriate when the documentation demonstrates **ANY** of the following:

- 1. Aortic pathology is suspected or known and **ANY** of the following: (***NOTE**: Computed tomography (CT), MR or echocardiogram [ECHO] can be used for screening and follow-up, with CT and MR preferred for imaging beyond the proximal ascending aorta.)
 - a. Aortic root is enlarged, for biannual surveillance.
 - b. Aortic root growth rate is more than 0.4 cm per year, for biannual surveillance.
 - c. Bicuspid aortic valve AND <u>ascending aorta</u> are known, larger than 4 cm in diameter, for re-evaluation of aortic sinuses and ascending aorta, and ANY of the following:

¹Some implanted devices that were once absolute contraindications to a MRI may now be accepted, including if the specific MRI is able to accommodate the device or the device itself is deemed safe for MRI.



- i. Aortic diameter has a rapid rate of change.
- ii. Aortic diameter is larger than 4.5 cm.
- iii. Familial first-degree relative (child, parent, sibling) with a history of aortic dissection.
- d. Connective tissue disease (eg, Ehler's Danlos, Loeys-Dietz, Marfan syndrome) is suspected or known, imaging at time of diagnosis, 6 months thereafter, followed by annually. (*NOTE: More frequent imaging may be required if aorta is greater than 4.5 cm or growth rate is greater than 0.5cm/year; up to twice/year.)
- e. Familial first-degree relative (child, parent, sibling) for screening when there is a history of bicuspid aortic valve, thoracic aortic aneurysm or thoracic aortic dissection.
- f. Thoracic aortic aneurysm is known and **ANY** of the following: [23]
 - AFTER initial diagnosis for assessment of growth rate, for follow-up every 6 months
 - ii. Aneurysm is larger than 4.4 cm, for follow-up annually.
- g. Turner's syndrome is known **AND** known abnormality exists, for follow-up annually **OR** if initial study is normal, follow-up every 5 to 10 years.

References: [2] [36] [22] [15] [47] [46] [37] [29] [10] [12] [4] [16] [43]

- 2. Cardiomyopathy **OR** heart failure is suspected or known and **ANY** of the following:
 - a. Arrhythmogenic right ventricular cardiomyopathy is suspected (eg, electrocardiogram [EKG] abnormalities, non-sustained ventricular tachycardia [VT], unexplained syncope).
 - b. Cardiomyopathy is suspected or known and **ANY** of the following:
 - i. Acquired or inherited cardiomyopathy is suspected.
 - ii. Newly diagnosed, to assess diastolic and systolic function.
 - iii. Non-compaction cardiomyopathy is suspected and <u>transesophageal</u> echocardiogram (TTE) is non-diagnostic or indeterminate.
 - c. Heart failure is new and **EITHER** of the following:
 - i. Ejection fraction (EF) differentiation between reduced and preserved EF
 - EF is reduced, with unknown etiology (eg, ischemic versus non-ischemic).
 - d. Hypertrophic cardiomyopathy (HCM) is suspected or known and ANY of the following:



- HCM, obstructive, is known, <u>ECHO detection autonomic mechanism of obstruction is non-diagnostic or indeterminate</u> **AND** CMR is needed for septal reduction therapy.
- ii. Sudden cardiac death (SCD) event with known HCM to follow-up to evaluate changes in development: follow-up every 3 to 5 years for ANY of the following:
 - A. Apical aneurysm
 - B. Ejection fraction (EF)
 - C. Late gadolinium enhancement (LGE)
 - D. Left ventricular (LV) wall thickness
- iii. Implantable cardioverter-defibrillator (ICD) placement is uncertain based on ECHO, positive for personal/family history, AND imaging is needed to evaluate ANY of the following:
 - A. EF
 - B. Extent of myocardial fibrosis with LGE
 - C. LV apical aneurysm
 - D. LV wall thickness
- iv. Left ventricular hypertrophy (LVH) is <u>known</u> and an alternate diagnosis (eg, athlete's heart, infiltrative or storage disease) is <u>suspected</u>.
- v. <u>TTE is non-diagnostic or indeterminate</u>, for diagnosis, management or operative planning
- vi. <u>TTE is non-diagnostic or indeterminate</u> and imaging is necessary for tissue characterization (degree of fibrosis) prior to ICD placement.
- e. Infiltrative disease (eg, amyloidosis, endomyocardial fibrosis, hemochromatosis, sarcoidosis) is suspected **AND** positron emission tomography (PET) has **NOT** been performed.
- f. Myocarditis, acute, is <u>suspected</u>, based on new, unexplained findings (eg, EKG changes, troponin elevation **NOT** related to acute myocardial infarction [MI]).
- g. Presyncope/syncope is known and cardiac etiology is suspected.
- h. Pulmonary hypertension is known and there is **NO** severe valvular disease.

References: [2] [36] [20] [38] [5] [11] [28] [49] [32] [31] [1] [45] [24] [26] [41] [42] [21]



- 3. Congenital heart disease (CHD) (eg, aortic coarctation, pulmonary stenosis, transposition of the great arteries) is suspected or known. (*NOTE: CT or CMR is appropriate.)

 *References: [2] [36] [25] [39] [44]
- 4. Coronary artery disease is <u>suspected</u> with **ANY** of the following:
 - a. Chronic chest pain **AND** there is **NO** known ischemic heart disease.
 - b. Stress echocardiogram (SE) OR myocardial perfusion imaging (MPI) is contraindicated or unavailable. (*NOTE: Alternative to myocardial perfusion imaging [MPI])

References: [2] [36] [27] [6]

- 5. Extra-cardiac and intra-cardiac structure evaluation for **ANY** of the following:
 - a. Cardiac mass, cardiac source of emboli, thrombus or tumor are suspected.
 - b. Coronary aneurysms or anomalous coronary arteries, for identification and characterization
 - c. Intracardiac mass re-evaluation, when findings may change therapy
 - d. Left ventricular pseudoaneurysm is known and <u>TTE is non-diagnostic or indeterminate</u>. [14]
 - e. Peri-cardial disease evaluation for structural and functional assessment **AND** to differentiate constrictive versus restrictive physiology.

References: [2] [36] [34] [35] [17] [34] [48]

6. Pericardial disease **OR** valvular disease is <u>suspected</u> with dyspnea, **AND NO** ischemia and cardiac arrhythmia,

References: [2] [36] [8]

- 7. Peri-procedural planning for **ANY** of the following:
 - a. Atrial septal defect (ASD) or patent foramen ovale (PFO) pre-procedure evaluation for closure for **EITHER** of the following:
 - i. Atrial septal anatomy and atrial septal aneurysm assessment
 - ii. Percutaneous device closure assessment for suitability
 - b. Left atrial appendage (LAA) is occluded **AND** transesophageal echocardiogram (TEE) **AND** heart CT were **NOT** completed for surveillance at 45 days (or at the guidance of the Food and Drug Administration (FDA)) **AND** evaluation for **ANY** of the following:
 - i. Device stability



- ii. Device leakage
- iii. Device migration
- c. Peri-procedural care to guide pre-procedure or invasive procedure planning, or post-procedural follow-up
- d. Pre-Radiofrequency ablation planning to evaluate left atrium and pulmonary veins, **AND NO** prior heart CT completed.
- e. Transaortic valve repair (TAVR) is planned **AND NO** prior heart CT is completed.
- f. Transcatheter mitral valve intervention is planned **AND** <u>TEE or TTE are non-diagnostic or indeterminate</u>.

References: [2] [36] [7] [3] [19]

- 8. Valvular heart disease is suspected or known and **ANY** of the following:
 - a. Bioprosthetic valvular dysfunction is suspected **AND** <u>TEE or TTE are non-diagnostic</u> or indeterminate.
 - b. Valvular stenosis, regurgitation **OR** valvular masses are suspected **AND** <u>TTE is</u> non-diagnostic or indeterminate.

References: [2] [36] [33] [40]



LCD 38396

See also, **LCD 38396**: Cardiology Non-Emergent Outpatient Stress Testing at https://www.cms.gov/medicare-coverage-database/search.aspx *if applicable to individual's healthplan membership*.



LCD 35083

See also, **LCD 35083**: Cardiology Non-emergent Outpatient Stress Testing at https://www.cms.gov/medicare-coverage-database/search.aspx *if applicable to individual's healthplan membership*.

MRI Heart Procedure Codes

Table 1. MRI Heart Associated Procedure Codes

CODE DESCRIPTION

75557 Cardiac magnetic resonance imaging for morphology and function without contrast material



CODE	DESCRIPTION
75559	Cardiac magnetic resonance imaging for morphology and function without contrast material; with stress imaging
75561	Cardiac magnetic resonance imaging for morphology and function without contrast material(s), followed by contrast material(s) and further sequences;
75563	Cardiac magnetic resonance imaging for morphology and function without contrast material(s), followed by contrast material(s) and further sequences; with stress imaging
0649T	Quantitative magnetic resonance for analysis of tissue composition (eg, fat, iron, water content), including multiparametric data acquisition, data preparation and transmission, interpretation and report, obtained with diagnostic MRI examination of the same anatomy (eg, organ, gland, tissue, target structure); single organ
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

MRI Heart Summary of Changes

MRI Heart guideline had the following version changes from 2023 to 2024:

- Added the following to keep in line with current research:
 - "Chronic chest pain is known"
 - "Dyspnea is known"
 - "Heart failure is new" under "Cardiomyopathy or heart failure"
 - "Turner's syndrome" under "Aortic pathology"
- Citations updated per the evidence.
- Mid-cycle update: added Pediatric Preamble

MRI Heart Definitions

Ablation therapy uses extremely high or low temperatures to destroy abnormal tissue or tumors, or to treat other conditions.

Aneurysm refers to weakness in an artery wall, allowing it to abnormally balloon out or widen. **Amyloidosis** is a disorder characterized by the deposition of a waxy translucent substance consisting primarily of protein in bodily organs and tissues.

Aneurysm occurs when part of an artery wall weakens, allowing it to abnormally balloon out or widen.

Arrhythmogenic right ventricular cardiomyopathy (ARVC) is a form of heart disease that usually appears in adulthood. ARVC is a disorder of the myocardium, which is the muscular wall of the heart. This condition causes part of the myocardium to break down over time, increasing the risk of an abnormal heartbeat (arrhythmia) and sudden death.



Arrhythmogenic right ventricular dysplasia (ARVD) (also called arrhythmogenic right ventricular cardiomyopathy, right ventricular cardiomyopathy or right ventricular dysplasia) is a rare type of cardiomyopathy that occurs when the muscle tissue in the right ventricle dies and is replaced with scar tissue. This disrupts the heart's electrical signals and causes arrhythmias. Symptoms include palpitations and fainting after physical activity. ARVD usually affects teens or young adults and can cause sudden cardiac arrest (SCA) in young athletes. Researchers believe that arrhythmogenic right ventricular dysplasia is an inherited disease.

Athlete's Heart Syndrome is a constellation of structural and functional changes that occur in the heart of people who train for prolonged durations (eg, at least 1 hour most days) and/or frequently at high intensities. The changes are asymptomatic.

Atrial fibrillation (AF) is a cardiac rhythm disorder characterized by uncontrolled atrial activation without effective atrial contraction. On the electrocardiogram (ECG), P waves are absent. AF is characterized by rapid oscillations or fibrillatory waves that vary in amplitude, shape and timing associated with an irregular ventricular response.

- **Paroxysmal AF** terminates spontaneously or with intervention within 7 days of onset. Episodes typically convert back to sinus rhythm within 48 hours.
- Persistent AF is continuous AF sustained beyond 7 days.

Atrial septal defect (ASD) is an opening in the septal wall that separates the two top chambers of the heart (the atria) that occurs before the birth of an individual. The defect can allow oxygenrich blood to leak into the oxygen-poor blood chambers in the heart.

Bicuspid aortic valve is an inherited form of heart disease in which two of the three leaflets of the aortic valve fuse together during development in utero, creating a less efficient two leaflet valve. The aortic valve plays a crucial role in ensuring the unidirectional flow of blood from **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.

Coarctation is a stricture or narrowing especially of a canal or vessel.

Computed tomography (CT) refers to a computerized X-ray imaging procedure in which a three-dimensional image of a body structure is revealed through a series of cross-sectional images or "slices."

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.

Dissection is the abnormal and usually abrupt formation of a tear or separation of the layers inside the wall of an artery.

Echocardiography is a diagnostic test which uses ultrasound waves to make images of the heart chambers, valves and surrounding structures. It can measure cardiac output and is a sensitive test for fluid around the heart (pericardial effusion). It can also be used to detect abnormal anatomy or infections of the heart valves.



Ehlers-Danlos syndrome is a group of hereditary connective tissue disorders that manifests clinically with skin hyperelasticity, hypermobility of joints, atrophic scarring, and fragility of blood vessels.

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.

Embolism is an obstruction of an artery, typically by a clot of blood or an air bubble. **Fibrosis** is thickening or scarring of the tissue.

Hemochromatosis is a hereditary disorder of metabolism involving the deposition of iron-containing pigments in the tissues that is characterized by joint or abdominal pain, weakness and fatigue and may lead to bronzing of the skin, arthritis, diabetes, cirrhosis or heart disease if untreated.

Hypertrophic cardiomyopathy (HCM) is any of several structural or functional diseases of heart muscle characterized by ventricular hypertrophy, especially of the left ventricle, which affects the interventricular septum more than the free ventricular wall, that may cause mitral insufficiency or obstructed left ventricle outflow, and that is symptomized chest pain, syncope and palpitations.

Implantable cardiac defibrillator (ICD) is a battery-powered device placed under the skin that keeps track of the heart rate. Thin wires connect the ICD to the heart. If an abnormal heart rhythm (heart beating chaotically or much to fast) is detected, the device will deliver a shock to restore a normal heartbeat.

Indeterminate findings are inconclusive or insufficient for treatment planning.

Intracardiac refers to the area within the heart (eg, muscles, ventricles).

Late gadolinium enhancement (LGE) is a method where cardiovascular magnetic resonance (CMR) images are obtained after the administration of gadolinium contrast material that accumulates into a tissue with increased extra cellular space. This method is suggestive of fibrosis in both the left and right ventricles.

Left Atrial Appendage (LAA) is a small, ear-shaped sac in the muscle wall of the left atrium of the heart.

Left ventricular hypertrophy (LVH) is a term for a heart's left pumping chamber that has thickened and may not be pumping efficiently. In response to this pressure overload, the inner walls of the heart may respond by getting thicker. These thickened walls can cause the left ventricle to weaken, stiffen and lose elasticity, which may prevent healthy blood flow.



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.

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 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.

Non-diagnostic is a result that does not lead to a confirmed diagnosis.

Patent Foramen Ovale (PFO) is a tunnel-like opening in the septum of the heart between the atria that remains open after birth. The small, flap-like foramen ovale is found between the right and left atria of the fetal heart and allows blood to bypass the lungs prior to birth.

Pediatric approximate ages are defined by the US Department of Health (USDH), the Food and Drug Administration (FDA), and the American Academy of Pediatrics (AAP) as the following:

- Infancy, between birth and 2 years of age
- Childhood, from 2 to 12 years of age
- Adolescence, from 12 to 21 years of age, further defined by the AAP into:
 - 1. Early (ages 11–14 years)
 - 2. Middle (ages 15–17 years),
 - 3. Late (ages 18–21 years)
 - 4. Older ages may be appropriate for children with special healthcare needs.

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.

Presyncope is the feeling that one is about to faint. Someone with pre-syncope may be lightheaded (dizzy) or nauseated, have a visual "gray out" or trouble hearing, have palpitations, or feel weak or suddenly sweaty.



Pseudoaneurysm, also called a false aneurysm, is a leakage of blood from an artery into the surrounding tissue. It occurs when there is a breach in the arterial wall.

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 stenosis is a heart valve disease that occurs when the pulmonary valve is too small, narrow, or stiff. The pulmonary valve controls the flow of blood from the heart's right ventricle to the lungs.

Sarcoidosis is a chronic disease of unknown cause, that is characterized by the formation of nodules, especially in the lymph nodes, lungs, bones and skin.

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

Stress Echocardiogram (ECHO) is a procedure that combines echocardiography with exercise to evaluate the heart's function at rest and with exertion. Echocardiography is an imaging procedure that creates a picture of the heart's movement, valves and chambers using high-frequency sound waves that come from a hand-held wand placed on the chest.

Sudden cardiac death (SCD) occurs when the heart malfunctions and unexpectedly and suddenly stops beating due to electrical impulse problems. Myocardial infarction increases the risk of SCD. Conditions associated with SCD include arrhythmogenic right ventricular dysplasia (ARVD), long QT syndrome, hypertrophic obstructive cardiomyopathy (HOCM) or Brugada syndrome.

Syncope is loss of consciousness resulting from insufficient blood flow to the brain.

Thrombosis is the formation of a blood clot (partial or complete blockage) within blood vessels, whether venous or arterial, limiting the natural flow of blood and resulting in clinical sequela.

Transcatheter aortic valve replacement (TAVR), also known as transcatheter aortic valve implantation (TAVI), is a minimally invasive catheter-based procedure to replace a narrowed aortic valve that fails to open properly (aortic valve stenosis). A bioprosthetic valve is inserted percutaneously using a catheter and implanted in the orifice of the aortic valve.

Transcatheter mitral valve repair (TMVR), also known as transcatheter edge-to-edge repair (TEER) is used in the treatment of mitral regurgitation (MR). A TEER device involves clipping together a portion of the mitral valve leaflets as treatment for reducing mitral regurgitation (MR).

Transesophageal echocardiography (TEE) uses high-frequency sound waves (ultrasound) to make detailed pictures of the heart and the blood vessels that lead to and from it. Unlike a standard echocardiogram, the echo transducer that produces the sound waves for TEE is attached to a thin tube that passes through the mouth and throat, and into the esophagus. The esophagus is close to the upper chambers of the heart and clear images of the heart structures and valves can be obtained.



Transpositon of the Great Arteries is a birth defect of the heart in which the two main arteries carrying blood out of the heart – the main pulmonary artery and the aorta – are switched in position, or "transposed."

Transthroacic echocardiogram (TTE) is a test that obtains views of the heart by moving a small instrument called a transducer to different locations on the chest or abdominal wall.

Troponin is a protein that's found in the cells of the heart muscle. Normally, troponin levels in blood are so low that only the most sensitive types of tests can measure them. But if the heart muscle is damaged, troponin leaks into the bloodstream, and the troponin blood levels will rise.

Truncus Arteriosus is a congentital defect of the heart that occurs when the blood vessel coming out of the heart in the developing baby fails to separate completely during development, leaving a connection between the aorta and pulmonary artery.

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.

MRI Heart References

- [1] Almeida, P.C., Lopes, V., . . . Donato, P. (2022). Role of Cardiac Magnetic Resonance in the Diagnosis of Infiltrative, Hypertrophic, and Arrhythmogenic Cardiomyopathies. *Frontiers in Bioscience*, *14*(1), 7.
- [2] American College of Radiology American College of Radiology. (2021). ACR–NASCI–SPR Practice Parameter for the Performance and Interpretation of Cardiac Magnetic Resonance Imaging. *American College of Radiology*. Retrieved: June 2024. https://www.acr.org/-/media/acr/files/practice-parameters/mr-cardiac.pdf
- [3] American College of Radiology. (2024). ACR Appropriateness Criteria Preprocedural Planning for Left Atrial Procedures in Atrial Fibrillation. *American College of Radiology*. Retrieved: May



- 2024. https://acsearch.acr.org/list/GetAppendix? TopicId=319&TopicName=Preprocedural%20Planning%20for%20Left%20Atrial%20Procedures%20in%20Atrial%20Fibrillation
- [4] Anfinogenova, N.D., Sinitsyn, V.E., . . . Ussov, W.Y. (2022). Existing and emerging approaches to risk assessment in patients with ascending thoracic aortic dilatation. *Journal of Imaging*, 8(10), 280.
- [5] Arbelo, E., Protonotarios, A., . . . Kaski, J.P. (2023). 2023 ESC Guidelines for the management of cardiomyopathies: Developed by the task force on the management of cardiomyopathies of the European Society of Cardiology (ESC). *European Heart Journal*, 44(37), 3503-3626.
- [6] Batlle, J.C., Kirsch, J., . . . Abbara, S. (2020). ACR Appropriateness Criteria Chest Pain-Possible Acute Coronary Syndrome. *Journal of the American College of Radiology, 17*(5S), S55-S69.
- [7] Bertsche, D., Rottbauer, W., . . . Schneider, L.M. (2022). Computed tomography angiography/magnetic resonance imaging-based preprocedural planning and guidance in the interventional treatment of structural heart disease. *Frontiers in Cardiovascular Medicine*, *9*, 931959.
- [8] Bolen, M.A., Saeedan, M.N.B., . . . Abbara, S. (2022). ACR Appropriateness Criteria Dyspnea-Suspected Cardiac Origin (Ischemia Already Excluded). *Journal of the American College of Radiology*, 19(5S), S37-S52.
- [9] Carpenter, J.P., Litt, H. & Gowda, M. (2023). Magnetic Resonance Imaging and Arteriography. A.N. Sidawy (Eds.). *Rutherford's Vascular Surgery and Endovascular Therapy* (30). (pp. 336-394.e4). Philadelphia, PA: Elsevier.
- [10] Chen, Stacey, C. & Cougtlin, P. (2023). A contemporary review of the diagnosis and management of vascular Ehlers–Danlos syndrome. *Journal of Vascular Societies Great Britain & Ireland*, 2(2), 83-90.
- [11] Cipriani, A., Mattesi, G., . . . Marra, M.P. (2023). Cardiac magnetic resonance imaging of arrhythmogenic cardiomyopathy: evolving diagnostic perspectives. *European Radiology,* 33(1), 270-282.
- [12] DeMolder, A., von Kodolitsch, Y., . . . De Backer, J. (2020). Myocardial Function, Heart Failure and Arrhythmia in Marfan Syndrome: A Systematic Literature Review. *Diagnostics*, 10(10), 751.
- [13] Doherty, J.U., Kort, S., . . . Wong, J.B. (2019). ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2019 Appropriate Use Criteria for Multimodality Imaging in the Assessment of Cardiac Structure and Function in Nonvalvular Heart Disease. *Journal of the American College of Cardiology*, 73(4), 488-516.
- [14] El ouazzani, J. & Jandou, I. (2022). Aneurysm and pseudoaneurysm of the left ventricle. Annals of Medicine and Surgery, 75, 103405.



- [15] Evangelista, A., Sitges, M., . . . Rodriguez-Palomares, J. (2023). Multimodality imaging in thoracic aortic diseases: a clinical consensus statement from the European Association of Cardiovascular Imaging and the European Society of Cardiology working group on aorta and peripheral vascular diseases. *European Heart Journal: Cardiovascular Imaging, 24*(5), e65-e85.
- [16] Fiot, E., Alauze, B., . . . Leger, J. (2022). Turner syndrome: French national diagnosis and care protocol (NDCP; national diagnosis and care protocol). *Orphanet Journal of Rare Diseases*, 17(1), 261.
- [17] Frommelt, P., Lopez, L., . . . Cohen, M.S. (2020). Recommendations for Multimodality Assessment of Congenital Coronary Anomalies: A Guide from the American Society of Echocardiography. *Journal of the American Society of Echocardiography*, 33(3), 259-294.
- [18] Gupta, S.K., Ya'qoub, L., . . . Saeed, I.M. (2020). Safety and Clinical Impact of MRI in Patients with Non–MRI-conditional Cardiac Devices. *Radiology: Cardiothoracic Imaging*, 2(5), e200086.
- [19] Hedgire, S.S., Saboo, S.S., . . . Steigner, M.L. (2023). ACR Appropriateness Criteria Preprocedural Planning for Transcatheter Aortic Valve Replacement: 2023 Update. *Journal of the American College of Radiology*, 20(11), S501-S512.
- [20] Heidenreich, P.A., Bozkurt, B., . . . Yancy, C.W. (2022). 2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure. *JACC (Journal of the American College of Cardiology)*, 79(17), e263–e421.
- [21] Humbert, M., Kovacs, G., . . . Rosenkranz, S. (2022). 2022 ESC/ERS Guidelines for the diagnosis and treatment of pulmonary hypertension. *European Heart Journal*, *43*(38), 3618–3731.
- [22] Isselbacher, E.M., Preventza, O., . . . Woo, Y.J. (2022). 2022 2022 ACC/AHA Guideline for the Diagnosis and Management of Aortic Disease. *JACC (Journal of the American College of Cardiology)*, 80(24), e223–e393.
- [23] Juiffermans, J.F., van Assen, H.C., . . . Westenberg, J.J.M. (2022). 4D Flow MRI in Ascending Aortic Aneurysms: Reproducibility of Hemodynamic Parameters. *Applied Sciences*, 12(8), 3912.
- [24] Khanna, S., Amarasekera, A.T., . . . Tan, T. (2022). The utility of cardiac magnetic resonance imaging in the diagnosis of adult patients with acute myocarditis: a systematic review and meta-analysis. *International Journal of Cardiology*, 363, 225-239.
- [25] Krishnamurthy, R., Suman, G., . . . Abbara, S. (2023). ACR Appropriateness Criteria Congenital or Acquired Heart Disease. *Journal of the American College of Radiology*, 20(11), S351-S381.
- [26] Lampejo, T., Durkin, S.M., . . . Guttmann, O. (2021). Acute myocarditis: aetiology, diagnosis and management. *Clinical Medicine*, *21*(5), e505-e510.



- [27] Litmanovich, D., Koweek, L.M.H., . . . Abbara, S. (2022). ACR Appropriateness Criteria Chronic Chest Pain-High Probability of Coronary Artery Disease: 2021 Update. *Journal of the American College of Radiology*, 19(5S), S1-S18.
- [28] Malik, N., Mukherjee, M., . . . Hays, A.G. (2022). Multimodality Imaging in Arrhythmogenic Right Ventricular Cardiomyopathy. *Circulation*, 15(2), e013725.
- [29] Mani, P., Reyaldeen, R. & Xu, B. (2021). Multimodality imaging assessment of bicuspid aortic valve disease, thoracic aortic ectasia, and thoracic aortic aneurysmal disease. *Cardiovascular Diagnosis & Therapy, 11*(3), 896-910.
- [30] Maralani, P.J., Schieda, N., . . . Weinreb, J. (2020). MRI safety and devices: An update and expert consensus. *Journal of Magnetic Resonance Imaging*, *51*(3), 657-674.
- [31] Ommen, S.R., Mital, S., . . . Sorajja, P. (2020). 2020 AHA/ACC Guideline for the Diagnosis and Treatment of Patients With Hypertrophic Cardiomyopathy. *Circulation*, *142*(25), e558-e631.
- [32] Ommen, S.R., Ho, C.Y., . . . Waldman, C.B. (2024). 2024 AHA/ACC/AMSSM/HRS/PACES/ SCMR Guideline fo the Management of Hypertrophic Cardiomyopathy. *Journal of the Americal College of Cardiology*, 1-82.
- [33] Otto, C.M., Nishimura, R.A., . . . Toly, C. (2021). 2020 ACC/AHA Guideline for the Management of Patients With Valvular Heart Disease. *Journal of the American College of Cardiology*, 77(4), e25–e197.
- [34] Parato, V.M., Nocco, S., . . . Petrella, L. (2022). Imaging of cardiac masses: an updated overview. *Journal of Cardiovascular*, *32*(2), 65-75.
- [35] Parenti, V.G., Vijay, K., . . . Dill, K.E. (2023). ACR Appropriateness Criteria Workup of Noncerebral Systemic Arterial Embolic Source. *Journal of the American College of Radiology,* 20(5), S285-S300.
- [36] Pontone, G., Di Cesare, E., . . . Franco, M. (2021). Appropriate use criteria for cardiovascular magnetic resonance imaging (CMR): SIC—SIRM position paper part 1 (ischemic and congenital heart diseases, cardio-oncology, cardiac masses and heart transplant). *La Radiologia Medica*, *126*, 365-379.
- [37] Qin, J.J., Obeidy, P., . . . Grieve, S.M. (2023). 4D-flow MRI derived wall shear stress for the risk stratification of bicuspid aortic valve aortopathy: A systematic review. *Frontiers in Cardivascular Medicine*, *9*, 1075833.
- [38] Rajiah, P., Kirsch, J., . . . Abbara, S. (2021). ACR Appropriateness Criteria Nonischemic Myocardial Disease with Clinical Manifestations (Ischemic Cardiomyopathy Already Excluded). *Journal of the American College of Radiology, 18*(5), S83-S105.
- [39] Sachdeva, R., Valente, A.M., . . . Zaidi, A.N. (2020). ACC/AHA/ASE/HRS/ISACHD/SCAI/ SCCT/SCMR/SOPE 2020 Appropriate Use Criteria for Multimodality Imaging During the Follow-Up Care of Patients With Congenital Heart Disease. *Journal of the American College* of Cardiology, 75(6), 657-703.



- [40] Sellers, S., Blanke, P., Leipsic, J.A. (2019). Bioprosthetic Heart Valve Degeneration and Dysfunction: Focus on Mechanisms and Multidisciplinary Imaging Considerations. *Radiology: Cardiothoracic Imaging*, 1(3), e190004.
- [41] Shen, W.K., Sheldon, R.S., . . . Yancy, C.W. (2017). 2017 2017 ACC/AHA/HRS Guideline for the Evaluation and Management of Patients With Syncope. *Journal of the American College of Cardiology*, 70(5), e39–e110.
- [42] Sirajuddin, A., Mirmomen, S.M., . . . Donnelly, E.F. (2022). ACR Appropriateness Criteria Suspected Pulmonary Hypertension: 2022 Update. *Journal of the American College of Radiology*, 19(11), S502-S512.
- [43] Stefil, M., Kotalczyk, A., . . . Lip, G.Y.H. (2023). Cardiovascular considerations in management of patients with Turner syndrome. *Trends in Cardiovascular Medicine*, *33*(3), 150-158.
- [44] Stout, K.K., Daniels, C.J., . . . Van Hare, G.F. (2019). 2018 AHA/ACC Guideline for the Management of Adults With Congenital Heart Disease. *Journal of the American College of Cardiology*, 73(12), e81-e192.
- [45] Tana, C., Mantini, C., . . . Giamberardino, M.A. (2021). Clinical Features and Diagnosis of Cardiac Sarcoidosis. *Journal of Clinical Medicine*, 10(9), 1941.
- [46] Unlu, O., Almarzooq, I., . . . Singh, P. (2020). Diagnosis and Surveillance of Aortic Root Dilation. J. Shuhaiber (Eds.). *Aortic Aneurysm and Aortic Dissection* . IntechOpen.
- [47] van Hout, M.J.P., Juffermans, J.F., . . . Westenberg, J.J. (2022). Ascending aorta curvature and flow displacement are associated with accelerated aortic growth at long-term follow-up: A MRI study in Marfan and thoracic aortic aneurysm patients. *IJC Heart & Vasculature, 38*, 100926.
- [48] Wang, T.K.M., Ayoub, C., . . . Klein, A.L. (2022). Cardiac Magnetic Resonance Imaging Techniques and Applications for Pericardial Diseases. *Circulation*, *15*(7), e0142083.
- [49] White, R.D., Kirsch, J., . . . Abbara, S. (2018). ACR Appropriateness Criteria Suspected New-Onset and Known Nonacute Heart Failure. *Journal of the American College of Radiology*, 15(11), S418-S431.
- [50] Witte, D.H. (2021). Advanced Imaging in Orthopaedics. F.M. Azar & J.H. Beaty (Eds.). *Campbell's Operative Orthopaedics* (14), (pp. 141-176). Philadelphia, PA: Elsevier.

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.

Registered Trademarks (®/™) and Copyright (©)

All trademarks, product names, logos, and brand names are the property of their respective owners and are used for purposes of information and/or illustration only. Current Procedural Terminology (CPT) $\mathbb{R}^{\mathbb{M}}$ is a registered trademark of the American Medical Association (AMA). No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, or otherwise, without permission from HealthHelp.

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.

For Internal Use Only:

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