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2025 Magnetic Resonance Angiography/Venography (MRA/MRV) Chest

Diagnostic Imaging

MRA-Chest-HH

Last Review Date: 05/09/2025
Previous Review Date: 10/28/2024
Guideline Initiated: 06/30/2019

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Magnetic Resonance Angiography/Magnetic Resonance Venography (MRA/MRV) Chest

MRA/MRV Chest Related National Coverage Determination (NCD)/Local Coverage Determination (LCD)

Please refer to https://www.cms.gov/medicare-coverage-database/search.aspx if applicable to the individual's health plan membership.

Type/ID Number	Title
NCD 220.2	Magnetic Resonance Imaging
LCD 33633	Magnetic Resonance Angiography
LCD 34372	Magnetic Resonance Angiography
LCD 34865	Magnetic Resonance Angiography

Clinical Judgment

These medical policies are designed to provide clinical guidance and do not supplant a provider's independent professional judgment. Physicians retain full and independent authority to determine appropriate care based on each patient's individual clinical circumstances. Although services may be subject to documentation requirements, medical necessity review, or coverage limitations, nothing in this policy is intended to restrict or interfere with a physician's independent medical judgment.

MRA Contraindications

An MRA is contraindicated for **ANY** of the following:

- Safety, related to clinical status (eg, body mass index exceeds MR capability, intravascular stents within recent 6 weeks)
- Safety, related to contrast material (eg, allergy, renal impairment)
- Safety, related to implanted devices (aneurysm clip, cochlear implant, insulin pump, spinal cord stimulator)

IMPORTANT
Some implanted devices that were once absolute contraindications to a MRI, may now be accepted. Considerations include if the MRI is able to accommodate the device, or the device is deemed safe for MRI.

References: [8] [26] [18] [12] [3]

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.

MRA/MRV Chest Guideline

Magnetic resonance angiography/magnetic resonance venography (MRA/MRV) of the chest for evaluation of intrathoracic blood vessels is considered medically appropriate when the documentation demonstrates **ANY** of the following:

1. Arterial occlusion of the upper extremity is known **AND** embolic source is suspected.
   References: [20]
2. Congenital malformations evaluation with **ANY** of the following:
   a. Coarctation of the aorta is suspected and transthoracic echocardiogram (TTE) is non-diagnostic or indeterminate.
   b. Congenital heart disease with pulmonary hypertension or vascular anomalies
   c. Pulmonary sequestration
   d. Thoracic malformation is suspected, based on prior imaging (eg, chest x-ray, echocardiogram [ECHO], gastrointestinal study) **OR** computed tomography (CT) is non-diagnostic or indeterminate.

   References: [11] [15] [4]
3. Peri-procedural chest intervention evaluation of **ANY** of the following:
   a. Atrial fibrillation **AND** ablation is planned.
   b. Open aortic vascular repair, with **NO** residual aortopathy: follow-up within 1st post-op year, then every 5 years (*__NOTE__: *if residual aortopathy is present, or surveillance findings are abnormal, follow-up annually*.)
   c. Post-surgical assessments for evaluation of complications or disease recurrence
   d. Thoracic endovascular aortic repair (TEVAR) follow-up at 1 month, 1 year post-op (if stable), then annually
   e. Transcatheter aortic valve replacement (TAVR), for pre-intervention planning, and computed tomography angiography (CTA) is non-diagnostic or indeterminate.

   References: [2] [25] [9] [6] [13] [25] [16]
4. Pulmonary arteriovenous malformation (PAVM) is suspected or known and **ANY** of the following:

a. PAVM follow-up after embolization.

b. PAVM is suspected and **ANY** of the following:

i. Asymptomatic, with family history of hereditary hemorrhagic telangiectasia (HHT) **OR** prior imaging (CT or chest X-ray) is non-diagnostic or indeterminate.

ii. Neurological pathology is present (eg, brain abscess, seizures, transient ischemic attack [TIA]) **AND** prior chest X-ray is positive for a lung nodule.

iii. Shortness of breath, hemothorax or hemoptysis is known, with history of epistaxis **AND** family history of HHT.

References: [21]

5. Thoracic aortic disease is suspected or known, CTA is non-diagnostic or indeterminate **OR contraindicated or unavailable** and **ANY** of the following:

a. Aneurysm is suspected based on prior imaging (ECHO, ultrasound or X-ray).

b. Aortic dissection, follow-up after medical treatment: acute dissection at 1 month, 6 months, then annually; chronic dissection, annually

c. Aortic syndrome, acute, is suspected with a sudden, painful ripping sensation **AND** clinically symptomatic (eg, cardiac tamponade, distant heart sounds, hypotension, new diastolic murmur, shock).

d. Bicuspid aortic valve personal history, for screening of the thoracic aorta, and transthoracic echocardiogram (TTE) is non-diagnostic or indeterminate; baseline and every 3 years thereafter.

e. Connective tissue disease (Ehlers-Danlos, Loeys-Dietz or Marfan syndromes) or genetic condition is known **AND** there is predisposal to aortic aneurysm or dissection, imaging is as follows:

i. Ehlers-Danlos, vascular; at diagnosis and every 18 months thereafter (more frequently if abnormalities are found)

ii. Fibromuscular dysplasia; 1-time vascular study from brain to pelvis

iii. Loeys-Dietz syndrome; at diagnosis and then every two years thereafter

iv. Marfan syndrome; at diagnosis and every 3 years thereafter **OR** annually for history of dissection, dilation of aorta beyond aortic root or prior aortic root ascending aorta TTE is non-diagnostic or indeterminate.

v. Takayasu's arteritis; at diagnosis and then clinically as indicated

vi. Turner’s syndrome-related screening when there is **NO** vascular abnormality; at diagnosis, every 5 years until 18 years old, then every

10 years thereafter **OR** annually for known aortic dilation, bicuspid aortic valve, coarctation of the aorta, hypertension

vii. Williams syndrome; concern for vascular disease is demonstrated on prior imaging or abnormal physical exam.

f. Dysphagia or expiratory wheezing, when a vascular cause is suspected **AND** prior imaging is abnormal, non-diagnostic or indeterminate.

g. First-degree relative (child, parent, sibling) with a bicuspid aortic valve

h. First-degree relatives (child, parent, sibling) with a known thoracic aortic aneurysm or dissection

i. Thoracic aorta aneurysm, for assessment of rate of change from most recent CT/MR, and **ANY** of the following:

i. 6 month follow-up after initial finding

ii. 4.4 cm or less; annual surveillance

iii. More than 4.4 cm; every 6 month follow-up

References: [5] [17] [11] [9] [10] [14] [15] [24] [19] [1]

6. Vascular disease evaluation for **ANY** of the following:

a. Pulmonary hypertension is suspected based on ECHO **OR** right-heart catheterization.

b. Superior vena cava (SVC) syndrome

c. Thoracic outlet syndrome [27]

References: [23] [22]

MRA/MRV Chest Summary of Changes

MRA/MRV Chest guideline had the following version changes from 2024 to 2025:

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Table 1. 2025 MRA Chest Summary of Changes

Date	Type of Change	Summary
05/09/2025	Annual	• Added the following to keep in line with current evidence: ▪ "Aortic syndrome, acute" under " Thoracic aortic disease" per EBM ▪ "Coarctation of the aorta is suspected" under "Congenital malformations are suspected or known" new indication per EBM ▪ "TTE is non-diagnostic or indeterminate" to " Bicuspid aortic valve history" under " Thoracic aortic aneurysm" as less advanced imaging is appropriate ▪ Under "Connective tissue disease (Ehlers-Danlos, Loeys-Dietz or Marfan syndromes) or genetic condition is known" per EBM ◦ "Fibromuscular dysplasia ◦ "Williams syndrome" ▪ Under "Peri-procedural" ◦ "Post-surgical assessment" in place of "Pre-operative evaluation" per EBM ◦ "Transcatheter aortic valve replacement (TAVR)" per EBM • Combined "Thoracic aortic disease for screening" and "Thoracic aneurysm screening" into 1 indication • Moved MRPA indications into main guideline: Pulmonary arteriovenous malformation (PAVM) is suspected" • Moved "Pulmonary hypertension" under "Vascular disease" • Removed the following as current evidence no longer supports the indication: ▪ "Ascending aortic dilation is suspected or known **OR** ascending aortic dissection is known" under "Thoracic aneurysm surveillance" per ACR ▪ Combination studies as they are redundant ▪ "Prior imaging MRA/MRV chest is non-diagnostic or indeterminate" as it is too broad ▪ "Subclavian steal syndrome" from under "vascular disease evaluation" due to lack of EBM ▪ Under "Thoracic aortic aneurysm surveillance" as it is combined into 1 surveillance per EBM ◦ "Aortic root or ascending aorta" ◦ "Descending aorta" ◦ "Genetically mediated"

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MRA/MRV Chest Procedure Codes

Table 1. MRA Chest Associated Procedure Codes

CODE	DESCRIPTION
71555	Magnetic resonance angiography, chest (excluding myocardium), with or without contrast material(s)
C8909	Magnetic resonance angiography with contrast, chest (excluding myocardium)
C8910	Magnetic resonance angiography without contrast, chest (excluding myocardium)
C8911	Magnetic resonance angiography without contrast followed by with contrast, chest (excluding myocardium)

MRA/MRV Chest Definitions

Ablation therapy is a medical procedure taht involves the destruction of abnormal tissue using various energy sources such as heat, cold or electrical energy.
Aneurysm refers to weakness in an artery wall, allowing it to abnormally balloon out or widen.
Aortopathy s defined as any disease of the aorta, often associated with conditions that predispose to aortic aneurysm, dissection, or rupture.
Aortic dissection is a serious condition in which the integrity of the body's main artery (aorta) is compromised and blood passes through the inner lining and between the layers of the arterial wall.
Aortic dissection types:

- **Type A** is the most common and dangerous type involves a tear in the part of the aorta where it exits the heart. The tear may also occur in the upper aorta (ascending aorta), which may extend into the abdomen.
- **Type B** involves a tear in the lower aorta only (descending aorta), which may also extend into the abdomen

Aortic root is the section of the aorta that extends from the aortic valve annulus to the sinotubular junction, including the aortic valve, sinuses of Valsalva, and the origin of the coronary arteries.
Artery occlusion is a condition where the flow of blood through an artery is partially or completely blocked. This blockage can lead to ischemia and tissue damage due to reduced blood flow.
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.is a type of arrhythmia, or abnormal heartbeat. Afib is caused by extremely fast and irregular beats from the upper chambers of the heart (usually more than 400 beats per minute).

Bicuspid aortic valve (BAV) is a heart defect that occurs when the aortic valve has two leaflets instead of three. BAV is the most common type of congenital heart disease. It's present from birth and can go unnoticed until later in life.
Coarctation is a stricture or narrowing especially of a canal or vessel.
Computed tomography (CT) is an imaging test that uses X-rays to computer analysis to generate cross sectional images of the internal structures of the body that can be displayed in multiple planes.
Congenital is a condition or trait present from birth.
Connective tissue diseases are a group of disorders that affect the connective tissue in the body, which provides support and structure to various organs, muscles, blood vessels, skin and bones. These diseases can be either inherited (caused by genetic mutations) or autoimmune (when the immune system mistakenly attacks healthy tissues). Examples of inherited connective tissue diseases include Marfan syndrome and Ehlers-Danlos syndrome, while autoimmune examples include systemic lupus erythematosus and systemic sclerosis.
D-dimer is a protein fragment that's produced when a blood clot breaks down in the body. D-dimer is usually undetectable or only detectable at very low levels unless the body is forming and breaking down significant blood clots.
Dissection refers to the separation of the layers within the wall of an artery, most commonly the aorta, due to a tear in the intimal layer, leading to the formation of a false lumen.
Dysphagia is difficulty with swallowing or the sensation of food getting stuck in the esophagus.
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.
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.
Endovascular aneurysm repair (EVAR) is a minimally invasive procedure that treats abdominal aortic aneurysms (AAAs). The procedure involves placing a stent-graft within the aorta to reduce the risk of rupture.
Epistaxis is the medical term for a nosebleed, which is bleeding from the inside of the nose.

Fibromuscular dysplasia is a rare blood vessel disorder that causes arteries to narrow and grow larger. FMD occurs when the strong, flexible cells in arteries are replaced with less strong, less flexible cells. This makes the arteries stiffer and more likely to be damaged.

Hemoptysis is the expectoration of blood from some part of the respiratory tract.

Hemothorax the accumulation of blood in the pleural space, typically following blunt or penetrating chest trauma, with the pleural fluid hematocrit being at least half that of the circulating hematocrit.

Hereditary hemorrhagic telangiectasia (HHT) also known as Osler-Weber-Rendu syndrome, is an autosomal dominant vascular disorder characterized by the development of vascular malformations (VMs) in the skin, mucous membranes, and various internal organs, including the brain, lungs, and liver.

Indeterminate findings are inconclusive or insufficient for treatment planning.

Loeys-Dietz syndrome is a rare autosomal dominant connective tissue disorder characterized by aggressive aortic aneurysms, arterial tortuosity, and distinctive craniofacial and skeletal features.

Magnetic resonance angiogram (MRA) is a test that uses a magnetic field and pulses of radio wave energy to provide images of blood vessels inside the body, allowing for evaluation of blood flow and blood vessel wall condition. MRA is used to look for aneurysms, clots, tears in the aorta, arteriovenous malformations and stenosis caused by plaque in the carotid arteries (neck) or blood vessels leading to the lungs, kidneys or legs.

Magnetic resonance venogram (MRV) is a diagnostic procedure that uses a combination of a large magnet, radiofrequencies, and a computer to produce detailed images of organs and structures within the body. An MRV uses magnetic resonance technology and intravenous (IV) contrast dye to visualize the veins. Contrast dye causes the blood vessels to appear opaque on the X-ray image, allowing the visualization the blood vessels being evaluated. MRV is useful in some cases because it can help detect causes of leg pain other than vein problems.

Marfan syndrome is a disorder of connective tissue inherited as a dominant trait, characterized by abnormal elongation of the long bones and often with ocular and circulatory defects.

Modified Wells criteria objectifies the risk for pulmonary embolism (PE) and provides an estimated pre-test probability. The physician can then chose what further testing is required for diagnosing pulmonary embolism (eg, d-dimer or CT angiogram). https://www.mdcalc.com/calc/115/wells-criteria-pulmonary-embolism

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

Open aortic vascular repair, also known as open aortic surgery (OAS) or open aortic repair (OAR), is a surgical procedure used to treat diseases of the aorta, the body's largest artery, by making an incision in the chest, abdomen, or both. The procedure aims to replace the diseased portion of the aorta with a prosthetic graft, typically a synthetic tube, to restore normal blood flow.

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:

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

Pulmonary embolism rule out criteria (PERC) scoring system is used to rule out pulmonary embolism in those where the clinical gestalt is that they are low risk (eg, less than 15% risk of pulmonary embolism).
Pulmonary embolism can be ruled out if **none** of the following features are identified:

1. Age is greater than or equal to 50 years old.
2. Heart rate is greater than or equal to 100 beats per minute (BPM).
3. Oxygen saturation is less than 95%.
4. Hemoptysis
5. Estrogen use
6. Prior DVT or PE
7. Unilateral leg swelling
8. Surgery/trauma within the past 4 weeks

In patients with a low pre-test probability of PE who meet any of these criteria, further testing could be considered to more definitely rule out pulmonary embolism. The PERC test calculator can be located at: https://reference.medscape.com/calculator/330/perc-rule-for-pulmonary-embolism
Pulmonary arteriovenous malformations (PAVMs) are abnormal connections between pulmonary arteries and veins, effectively bypassing the normal capillary network in the lungs. This bypass creates a right-to-left shunt, where oxygen-poor blood from the pulmonary veins bypasses the lungs and mixes with oxygen-rich blood returning to the heart.
Pulmonary embolism is an obstruction of a pulmonary artery or one of its branches that is usually produced by a blood clot originated in a vein of the leg or pelvis and traveled to the lungs that is marked by labored breathing, chest pain, fainting, rapid heart rate, cyanosis, shock and sometimes death.
Pulmonary hypertension is a chronic, progressive condition characterized by elevated pressure in the pulmonary arteries, defined as a mean pulmonary arterial pressure greater than 20 mm Hg at rest.

Pulmonary sequestration vascular syndrome is a condition in which a segment or lobe of dysplastic lung tissue exists with no communication with the rest of the tracheobronchial tree and receives an anomalous systemic vascular supply, separate from the rest of the lung. It is, therefore, a nonfunctional tissue.

Screening is the systematic application of a test or inquiry to identify individuals at sufficient risk of a specific disorder to warrant further investigation or direct preventive action, among persons who have not sought medical attention for symptoms of that disorder.

Subclavian steal syndrome (Vertebral artery flow reversal) is a phenomenon causing retrograde flow in an ipsilateral vertebral artery due to stenosis or occlusion of the subclavian artery, proximal to the origin of the vertebral artery.

Superior vena cava syndrome (SVC) is a condition characterized by elevated venous pressure of the upper extremities with accompanying distension of the affected veins and swelling of the face and neck. Caused by blockage (as by a thrombus or an aneurysm) or compression (as by a tumor) of the superior vena cava.

Surveillance in cancer is the ongoing, timely and systematic collection and analysis of information on new cancer cases, extent of disease, screening tests, treatment, survival and cancer deaths.

Takayasu's arteritis is a chronic inflammatory disease especially of the aorta and its major branches (the brachiocephalic artery and left common carotid artery) that result in progressive stenosis, occlusion and aneurysm formation marked by diminution or loss of the pulse (as in the arm) and ischemic symptoms.

Thoracic endovascular aortic repair (TEVAR) is a minimally invasive procedure that treats aneurysms in the upper part of the aorta, or body's largest artery. TEVAR is especially suited to treat aneurysms in the descending aorta, which moves down through the chest toward the abdomen.

Thoracic outlet syndrome is a condition caused by the compression of neurovascular structures as they pass through the thoracic outlet, leading to symptoms such as pain, paresthesia, and weakness in the upper extremity.

Transcatheter Aortic Valve Implantation/Replacement (TAVI/TAVR) is a minimally invasive procedure that replaces a diseased aortic valve with a man-made or animal tissue valve. TAVR is for patients with severe aortic stenosis, which is a narrowing of the valve opening. The procedure only requires a small cut in the skin and does not require open-heart surgery.

Turner's syndrome is a genetically determined condition that is typically associated with the presence of only one complete X chromosome and no Y chromosome. It is characterized by a female phenotype with underdeveloped (and usually infertile) ovaries and short stature.

Williams syndrome is a developmental disorder that affects many parts of the body. This condition is characterized by mild to moderate intellectual disability or learning problems, unique

personality characteristics, distinctive facial features and heart and blood vessel (cardiovascular) problems.

MRA/MRV Chest References

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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.

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