

# Clinical Appropriateness Guidelines: Advanced Imaging

Appropriate Use Criteria: Pediatric Chest

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Proprietary

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# Description and Application of the Guidelines



AIM's Clinical Appropriateness Guidelines (hereinafter "AIM's Clinical Appropriateness Guidelines" or the "Guidelines") are designed to assist providers in making the most appropriate treatment decision for a specific clinical condition for an individual. As used by AIM, the Guidelines establish objective and evidence-based, where possible, criteria for medical necessity determinations. In the process, multiple functions are accomplished:

- To establish criteria for when services are medically necessary
- To assist the practitioner as an educational tool
- To encourage standardization of medical practice patterns
- To curtail the performance of inappropriate and/or duplicate services
- To advocate for patient safety concerns
- To enhance the quality of healthcare
- To promote the most efficient and cost-effective use of services

AIM's guideline development process complies with applicable accreditation standards, including the requirement that the Guidelines be developed with involvement from appropriate providers with current clinical expertise relevant to the Guidelines under review and be based on the most up to date clinical principles and best practices. Relevant citations are included in the "References" section attached to each Guideline. AIM reviews all of its Guidelines at least annually.

AIM makes its Guidelines publicly available on its website twenty-four hours a day, seven days a week. Copies of AIM's Clinical Appropriateness Guidelines are also available upon oral or written request. Although the Guidelines are publicly-available, AIM considers the Guidelines to be important, proprietary information of AIM, which cannot be sold, assigned, leased, licensed, reproduced or distributed without the written consent of AIM.

AIM applies objective and evidence-based criteria and takes individual circumstances and the local delivery system into account when determining the medical appropriateness of health care services. The AIM Guidelines are just guidelines for the provision of specialty health services. These criteria are designed to guide both providers and reviewers to the most appropriate services based on a patient's unique circumstances. In all cases, clinical judgment consistent with the standards of good medical practice should be used when applying the Guidelines. Guideline determinations are made based on the information provided at the time of the request. It is expected that medical necessity decisions may change as new information is provided or based on unique aspects of the patient's condition. The treating clinician has final authority and responsibility for treatment decisions regarding the care of the patient and for justifying and demonstrating the existence of medical necessity for the requested service. The Guidelines are not a substitute for the experience and judgment of a physician or other health care professionals. Any clinician seeking to apply or consult the Guidelines is expected to use independent medical judgment in the context of individual clinical circumstances to determine any patient's care or treatment.

The Guidelines do not address coverage, benefit or other plan specific issues. If requested by a health plan, AIM will review requests based on health plan medical policy/guidelines in lieu of AIM's Guidelines.

The Guidelines may also be used by the health plan or by AIM for purposes of provider education, or to review the medical necessity of services by any provider who has been notified of the need for medical necessity review, due to billing practices or claims that are not consistent with other providers in terms of frequency or some other manner.

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# Administrative Guideline: Ordering of Multiple Studies



Requests for multiple imaging studies to evaluate a suspected or identified condition and requests for repeated imaging of the same anatomic area are subject to additional review to avoid unnecessary or inappropriate imaging.

## Simultaneous Ordering of Multiple Studies

In many situations, ordering multiple imaging studies at the same time is not clinically appropriate because:

- Current literature and/or standards of medical practice support that one of the requested imaging studies is more appropriate in the clinical situation presented; or
- One of the imaging studies requested is more likely to improve patient outcomes based on current literature and/or standards of medical practice; or
- Appropriateness of additional imaging is dependent on the results of the lead study.

When multiple imaging studies are ordered, the request will often require a peer-to-peer conversation to understand the individual circumstances that support the medical necessity of performing all imaging studies simultaneously.

Examples of multiple imaging studies that may require a peer-to-peer conversation include:

- CT brain and CT sinus for headache
- MRI brain and MRA brain for headache
- MRI cervical spine and MRI shoulder for pain indications
- MRI lumbar spine and MRI hip for pain indications
- MRI or CT of multiple spine levels for pain or radicular indications
- MRI foot and MRI ankle for pain indications
- Bilateral exams, particularly comparison studies

There are certain clinical scenarios where simultaneous ordering of multiple imaging studies is consistent with current literature and/or standards of medical practice. These include:

- Oncologic imaging – Considerations include the type of malignancy and the point along the care continuum at which imaging is requested
- Conditions which span multiple anatomic regions – Examples include certain gastrointestinal indications or congenital spinal anomalies

## Repeated Imaging

In general, repeated imaging of the same anatomic area should be limited to evaluation following an intervention, or when there is a change in clinical status such that imaging is required to determine next steps in management. At times, repeated imaging done with different techniques or contrast regimens may be necessary to clarify a finding seen on the original study.

Repeated imaging of the same anatomic area (with same or similar technology) may be subject to additional review in the following scenarios:

- Repeated imaging at the same facility due to motion artifact or other technical issues
- Repeated imaging requested at a different facility due to provider preference or quality concerns
- Repeated imaging of the same anatomic area (MRI or CT) based on persistent symptoms with no clinical change, treatment, or intervention since the previous study
- Repeated imaging of the same anatomical area by different providers for the same member over a short period of time

# Administrative Guideline: Pre-Test Requirements



Critical to any finding of clinical appropriateness under the guidelines for specific imaging exams is a determination that the following are true with respect to the imaging request:

- A clinical evaluation has been performed prior to the imaging request (which should include a complete history and physical exam and review of results from relevant laboratory studies, prior imaging and supplementary testing) to identify suspected or established diseases or conditions.
- **For suspected diseases or conditions:**
  - Based on the clinical evaluation, there is a reasonable likelihood of disease prior to imaging; and
  - Current literature and standards of medical practice support that the requested imaging study is the most appropriate method of narrowing the differential diagnosis generated through the clinical evaluation and can be reasonably expected to lead to a change in management of the patient; and
  - The imaging requested is reasonably expected to improve patient outcomes based on current literature and standards of medical practice.
- **For established diseases or conditions:**
  - Advanced imaging is needed to determine whether the extent or nature of the disease or condition has changed; and
  - Current literature and standards of medical practice support that the requested imaging study is the most appropriate method of determining this and can be reasonably expected to lead to a change in management of the patient; and
  - The imaging requested is reasonably expected to improve patient outcomes based on current literature and standards of medical practice.
- If these elements are not established with respect to a given request, the determination of appropriateness will most likely require a peer-to-peer conversation to understand the individual and unique facts that would supersede the pre-test requirements set forth above. During the peer-to-peer conversation, factors such as patient acuity and setting of service may also be taken into account.

# Computed Tomography (CT) Chest – Pediatrics



## CPT Codes

- 71250..... Chest CT without contrast
- 71260..... Chest CT with contrast
- 71270..... Chest CT without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Lung apices through costophrenic sulci
- Scan coverage may vary, depending on the specific clinical indication

## Technology Considerations

- In the majority of clinical situations, chest radiographs should be performed prior to advanced imaging with CT, preferably within 30 days of the chest CT exam request.
- CT chest is not appropriate for cardiac and coronary artery imaging. Please review guidelines for cardiac CT and CCTA.
- When the purpose of the study is imaging of the heart, including the coronary arteries, requesting a chest CT in addition to a dedicated cardiac/coronary artery CT (CCTA) (CPT 75574) is inappropriate.

## Common Diagnostic Indications

This section contains general chest, pulmonary, mediastinal and hilar, and pleural, chest wall and diaphragm indications.

### General Chest

**Abnormality detected on other imaging study which requires further clarification to direct treatment**

#### Bronchiolitis obliterans

**Note:** Includes Swyer-James syndrome

#### Chest wall deformity

(any **one** of the following)

- Post-operative evaluation for complications or recurrence<sup>1</sup>
- Pre-operative evaluation<sup>1</sup> (any **one** of the following)
  - Evaluation for cardiac displacement or pulmonary impingement following non-diagnostic radiograph
  - Evaluation of chest wall anatomy (includes asymmetry, sternal torsion, or elevation<sup>2</sup>)
  - Measurement of the Haller/pectus index (HI)
  - Nuss bar length design

**Note:** Chest wall deformities include pectus excavatum, pectus carinatum, and Poland syndrome

#### Congenital pulmonary airway malformation

- Diagnosis and management (any **one** of the following)
  - Congenital cystic adenomatoid malformation
  - Congenital lobar emphysema
  - Pulmonary sequestration

#### Congenital thoracic anomaly

- Diagnosis and management (any **one** of the following)
  - Bronchial atresia
  - Bronchopulmonary foregut malformation (includes bronchogenic cyst, esophageal duplication cyst, or neurenteric cysts)
  - Pulmonary agenesis, aplasia, or hypoplasia
  - Scimitar syndrome (hypogenetic lung)

# Common Diagnostic Indications

## Cough, chronic<sup>3</sup>

- Persisting more than four (4) weeks (**any one of the following**)
  - Following non-diagnostic radiograph
  - Immunosuppressed patient

**Note:** *If there is clinical concern, see associated indications: **Bronchiectasis, Pneumonia, Tuberculosis, Interstitial lung disease, or Malignancy***

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## Fever of unknown origin

(**any one of the following**)

- Lasting more than three (3) weeks following standard work-up (such as chest x-ray, urine, and/or blood work) to localize the source
  - Immunocompromised patient (**any one♦ of the following**)
    - Chronic steroid use
    - Dialysis patients
    - Immune defects
    - Neutropenia
    - Use of an immune-blocking biologic agent
- 

## Hemoptysis

- Following non-diagnostic chest radiograph

**Note:** *Bronchoscopy is a complementary modality to assess for hemoptysis*

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## Horner's syndrome

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## Infectious or inflammatory process not otherwise specified

- For initial evaluation or surveillance

**Note:** *Includes lung abscess, mediastinal abscess, and other infectious processes. This indication is used for evaluation of infectious/inflammatory processes not specifically referenced elsewhere in this guideline (e.g., **Pneumonia complications, Mediastinitis, Sternal infection and dehiscence, and Abnormal pleural fluid collection**)*

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## Tumor, benign or malignant

(**any one of the following**)

- Diagnosis or management of benign neoplasms
  - For staging and periodic follow-up of documented malignancy
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## Mediastinitis

**Note:** *Includes mediastinal infection/abscess and fibrosing mediastinitis*

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## Paraneoplastic syndrome with unknown primary

**Note:** *This includes opsoclonus-myoclonus ataxia, limbic encephalitis, and anti-NMDAR encephalitis*

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## Pneumonia, complications<sup>4</sup>

(**any one of the following**)

- Following non-diagnostic chest radiograph
- Immunosuppressed patient

**Note:** *Complications of the mediastinum, lung parenchyma, or pleura include abscess, bronchopleural fistula, complicated or loculated parapneumonic effusion, empyema, necrotic pneumonia, and purulent pericarditis*

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## Pneumonia, persistent or recurrent

- Following non-diagnostic radiograph when the patient is refractory to at least four (4) weeks of medical treatment

**Note:** *Defined as two or more episodes of pneumonia in one year or three (3) or more in a lifetime (recurrent)<sup>6</sup>*

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# Common Diagnostic Indications

## Positive sputum cytology for malignancy

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### Post-operative or post-procedure evaluation

**Note:** For post-operative evaluation of conditions not specifically referenced elsewhere in this guideline

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### Pre-operative or pre-procedure evaluation

**Note:** For pre-operative evaluation of conditions not specifically referenced elsewhere in this guideline

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## Pulmonary embolism

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### Sarcoidosis

- Initial evaluation and periodic follow-up
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### Sternal infection and dehiscence

**Note:** Rare complication of cardiothoracic surgery

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### Trauma

- Injury involving the chest wall, cardiomeastinal structures and/or lungs
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## Mediastinal and Hilar

### Evaluation of the thoracic aorta

(any **one** of the following)

- Evaluation when there is concern for complications (such as dissection)
- Further characterization of suspected aneurysm based on prior diagnostic or imaging study
- Patient with confirmed aortic dissection experiencing new or worsening symptoms
- Periodic surveillance (**any one** of the following)
  - High risk patient (patient with connective tissue disease or coarctation of the aorta)
  - Patient with known thoracic aneurysm
- Post-operative evaluation
- Preoperative evaluation

**Note:** Echocardiogram is generally recommended as a first line modality for evaluation of the ascending aorta in pediatric patients

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### Hilar and/or mediastinal lymphadenopathy/mass

- Periodic follow-up
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### Hilar enlargement on recent chest X-ray

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### Hoarseness, dysphonia, or vocal cord weakness - suspected to result from recurrent laryngeal nerve pathology<sup>14-17</sup>

- When hoarseness persists more than one month
- When laryngoscopy is non-diagnostic or shows vocal cord paralysis

**Note:** Dysphonia is defined as a disorder characterized by altered vocal quality, pitch, loudness, or vocal effort that impairs communication or otherwise reduces quality of life

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### Mediastinal widening on recent chest X-ray

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### Superior vena cava (SVC) syndrome

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# Common Diagnostic Indications

## Thymoma

(any one of the following)

- Evaluation of thymoma
- Patient with history of myasthenia gravis

**Note:** *Approximately 15% of patients with myasthenia gravis will have a thymoma*

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## Tracheobronchial lesion evaluation

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## Traumatic aortic injury

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## Vasculitis of the thoracic aorta or branch vessel

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## Pleural, Chest Wall and Diaphragm

### Abnormal pleural fluid collection, including effusion, hemothorax, empyema and chylothorax

**Note:** *Ultrasound should be considered as initial imaging modality and prior to a diagnostic or therapeutic pleural tap<sup>7-10</sup>*

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### Chest wall mass

- When further characterization is needed following non-diagnostic radiograph or ultrasound

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### Diaphragmatic hernia

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### Pleural mass

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### Pneumothorax, unexplained or recurrent

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### Thoracic outlet syndrome

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### Unexplained diaphragmatic elevation or immobility

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## Pulmonary

### Arteriovenous malformation (AVM), pulmonary

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### Bronchiectasis

**Note:** *Consider high resolution chest CT (HRCT) technique*

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### Hyperlucent lung

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### Interstitial lung disease/pulmonary fibrosis

**Note:** *Consider high resolution chest CT (HRCT) technique*

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### Pulmonary mass or suspicious parenchymal abnormality on recent chest X-ray or other imaging exam

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## CT is generally not indicated in the following clinical situations

The indications listed in this section generally do not require advanced imaging using CT. If there are circumstances that require CT imaging, a peer-to-peer discussion may be required.

### Foreign body aspiration (FBA), tracheobronchial

**Note:** *Advanced imaging is generally not indicated. Bronchoscopy is the standard of care for suspected FBA<sup>5,11-13</sup>*

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# CT Angiography (CTA) Chest (Non-Coronary) – Pediatrics



## CPT Codes

71275..... CTA of chest (non-coronary), with contrast material(s), including non-contrast images, if performed, and image post-processing

*Angiography includes imaging of all blood vessels, including arteries and veins. The code above includes CT Venography.*

## Standard Anatomic Coverage

- Scan coverage varies depending on the clinical indication. This exam does not include cardiac and coronary artery indications
- Chest CTA may be used for anatomic depiction from the pulmonary apices through the costophrenic sulci

## Technology Considerations

### Advantages of CTA

- Rapidly acquired exam, with excellent anatomic detail afforded by most multidetector CT scanners

### Disadvantages of CTA

- Potential complications from use of intravascular iodinated contrast administration

### Biosafety Issues

- Ordering and imaging providers are responsible for considering safety issues prior to the CTA exam. One of the most significant considerations is the requirement for intravascular iodinated contrast material, which may have an adverse effect on patients with a history of documented allergic contrast reactions or atopy, as well as on individuals with renal impairment, who are at greater risk for contrast-induced nephropathy

### Ordering Issues

- CTA chest is not appropriate for cardiac and coronary artery imaging. Please review guidelines for cardiac CT and CCTA
- Pulmonary embolus is rare in the absence of elevated blood D-dimer levels and certain specific risk factors

## Common Diagnostic Indications

This section contains general chest, thoracic aorta and great vessel, and pulmonary artery and vein indications.

### General Chest

#### **Congenital pulmonary or thoracic vascular malformation**

- Diagnosis and management of (**any one♦ of the following**)
  - Aortic coarctation
  - Double aortic arch
  - Hypoplastic or atretic pulmonary arteries
  - Inferior vena caval interruption
  - Partial anomalous pulmonary venous return (includes Scimitar)
  - Persistent left-sided superior vena cava
  - Pulmonary sequestration
  - Right-sided aortic arch
  - Total anomalous pulmonary venous return
  - Truncus arteriosus

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### Post-traumatic vascular injury

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### Subclavian steal syndrome

## Common Diagnostic Indications

### Systemic venous thrombosis or occlusion

**Note:** Includes superior vena cava (SVC) syndrome

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### Thoracic outlet syndrome

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### Vascular involvement from neoplasm in the chest

### Pulmonary Artery and Vein

### Arteriovenous malformation (AVM), pulmonary

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### Pulmonary arterial hypertension

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### Pulmonary embolism

(any **one** of the following)

- When there is a moderate or high clinical suspicion of pulmonary embolism
- When recurrent thromboembolism is a concern in patients on adequate medical therapy

**Note:** Conditions where thromboembolism is a concern: sickle cell disease, coagulopathy, prolonged non-ambulatory state, patient taking oral contraceptive pills (OCP)

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### Thoracic Aorta and Great Vessel

#### Evaluation of the thoracic aorta

(any **one** of the following)

- Evaluation when there is concern for complications (such as dissection)
- Further characterization of suspected aneurysm based on prior diagnostic or imaging study
- Patient with confirmed aortic dissection experiencing new or worsening symptoms
- Periodic surveillance (**any one** of the following)
  - High risk patient (patient with connective tissue disease or coarctation of the aorta)
  - Patient with known thoracic aneurysm
- Post-operative evaluation
- Preoperative evaluation

**Note:** Echocardiogram is generally recommended as a first line modality for evaluation of the ascending aorta in pediatric patients

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### Hematoma

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### Post-operative or post-procedure evaluation

**Note:** For post-operative evaluation of conditions not specifically referenced elsewhere in this guideline

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### Stent graft evaluation

(any **one** of the following)

- Post-procedure follow-up
- Pre-procedure assessment

**Note:** Includes detection of an endoleak

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### Vasculitis

# Magnetic Resonance Imaging (MRI) Chest – Pediatrics



## CPT Codes

- 71550..... MRI chest, without contrast
- 71551..... MRI chest, with contrast
- 71552..... MRI chest, without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Chest MRI studies are often performed as problem-solving exams, following chest CT. In these circumstances, anatomic coverage will depend on the specific indication for the study.
- This guideline excludes cardiac indications, which are covered under the cardiac MRI section and corresponding CPT codes (75557-75563, 75565).

## Technology Considerations

### Hemoptysis

- Rare in children most common causes are pneumonia and aspirated foreign body
- Chest radiograph will be normal in about 1/3 of patients
- Additional radiographic views including decubitus should be performed if there is concern for an aspirated foreign body

### Advantages of chest MRI:

- Chest MRI may be helpful after a CT in the following scenarios:
  - Defining mediastinal and hilar lymphadenopathy (particularly after an unenhanced chest CT exam)
  - Determining direct lung tumor invasion into the mediastinum and hilar structures, without the need for iodinated contrast material in CT
  - Assessing spinal canal extension from a posteromedial thoracic mass
  - Evaluating a suspected Pancoast tumor (also referred to as apical pleuropulmonary groove or superior pulmonary sulcus tumors) for direct chest wall extension, given the multiplanar capability of MRI

### Disadvantages of chest MRI:

- Lung lesions are usually better imaged with CT when compared with MRI, given the superior spatial resolution of CT.
- MRI should not be performed in patients with certain implanted devices that are not MRI compatible, such as pacemakers.

### Ordering issues:

- For initial evaluation of most thoracic lesions, such as pulmonary nodules and masses, chest CT is considered the study of choice.
- Contrast utilization for chest MRI is at the discretion of the ordering and imaging providers.
- For cardiac and coronary artery imaging, see Cardiac MRI guidelines.

# Common Diagnostic Indications

## Chest wall deformity

(any one of the following)

- Post-operative evaluation for complications or recurrence<sup>1</sup>
- Pre-operative evaluation<sup>1</sup> (any one of the following)
  - Evaluation for cardiac displacement or pulmonary impingement following non-diagnostic radiograph
  - Evaluation of chest wall anatomy (includes asymmetry, sternal torsion, or elevation<sup>2</sup>)
  - Measurement of the Haller/pectus index (HI)
  - Nuss bar length design

**Note:** Chest wall deformities include *pectus excavatum*, *pectus carinatum*, and *Poland syndrome*

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## Chest wall mass

- When further characterization is needed following non-diagnostic radiograph or ultrasound
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## Developmental anomaly of the thoracic vasculature

(any one of the following)

- Aortic coarctation
  - Double aortic arch
  - Hypoplastic or atretic pulmonary arteries
  - Inferior vena caval interruption
  - Partial anomalous pulmonary venous return
  - Persistent left-sided superior vena cava
  - Right-sided aortic arch
  - Total anomalous pulmonary venous return
  - Truncus arteriosus
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## Evaluation of the thoracic aorta

(any one of the following)

- Evaluation when there is concern for complications (such as dissection)
- Further characterization of suspected aneurysm based on prior diagnostic or imaging study
- Patient with confirmed aortic dissection experiencing new or worsening symptoms
- Periodic surveillance (any one of the following)
  - High risk patient (patient with connective tissue disease or coarctation of the aorta)
  - Patient with known thoracic aneurysm
- Post-operative evaluation
- Preoperative evaluation

**Note:** *Echocardiogram is generally recommended as a first line modality for evaluation of the ascending aorta in pediatric patients*

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## Hemoptysis

- Following non-diagnostic chest radiograph when there is a concern for a congenital vascular anomaly
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## Horner's syndrome

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## Mediastinal and hilar mass lesions

(any one of the following)

- Assess vascular invasion by tumor
- Detect spinal extension from a posteromedial chest mass
- Differentiate mediastinal and hilar lesions from vascular structures

## Common Diagnostic Indications

Superior vena cava syndrome

Thoracic outlet syndrome

### Thymoma

(any **one** of the following)

- Evaluation of thymoma
- Patient with history of myasthenia gravis

**Note:** *Approximately 15% of patients with myasthenia gravis will have a thymoma*

### Tumor, benign or malignant

(any **one** of the following)

- Diagnosis or management of benign neoplasms
- For staging and periodic follow-up of documented malignancy

## References

1. Sarwar ZU, DeFlorio R, O'Connor SC. Pectus excavatum: current imaging techniques and opportunities for dose reduction. *Semin Ultrasound CT MR.* 2014;35(4):374-381.
2. Colombani PM. Preoperative assessment of chest wall deformities. *Semin Thorac Cardiovasc Surg.* 2009;21(1):58-63.

## CPT Codes

71555..... MRA of chest (excluding the myocardium) without contrast, followed by re-imaging with contrast

*Angiography includes imaging of all blood vessels, including arteries and veins. The code above includes MR Venography.*

## Standard Anatomic Coverage

- Scan coverage varies depending on the clinical indication
- Chest MRA may be used for vascular anatomic depiction, from the pulmonary apices through the costophrenic sulci

## Technology Considerations

### Advantages of Chest MRA

- Use of MR imaging is advantageous over CT in avoiding ionizing radiation and allowing for direct multiplanar imaging

### Disadvantages of Chest MRA

- With MRA, artifact due to patient motion may have a particularly significant impact on exam quality
- MRA cannot be performed in patients with certain implanted devices that are not MRI compatible, such as pacemakers

## Common Diagnostic Indications

This section contains common chest MRA, thoracic aorta and great vessel, and pulmonary artery and vein indications.

### General Chest

#### Developmental anomaly of the thoracic vasculature

(any **one**♦ of the following)

- Aortic coarctation
- Double aortic arch
- Hypoplastic or atretic pulmonary arteries
- Inferior vena caval interruption
- Partial anomalous pulmonary venous return
- Patent ductus arteriosus
- Persistent left-sided superior vena cava
- Right-sided aortic arch
- Total anomalous pulmonary venous return
- Transposition of the great vessels
- Truncus arteriosus

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#### Post-traumatic vascular injury

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#### Subclavian steal syndrome

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#### Systemic venous thrombosis or occlusion

**Note:** Includes superior vena cava (SVC) syndrome

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#### Thoracic outlet syndrome

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#### Vascular involvement from neoplasm in the chest



# Common Diagnostic Indications

## Pulmonary Artery and Vein

### Arteriovenous malformation (AVM), pulmonary

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### Pulmonary arterial hypertension

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### Pulmonary embolism

(any **one** of the following)

- Pulmonary embolism is clinically suspected
- Follow-up when recurrent thromboembolism is a concern in patients on adequate medical therapy

**Note:** MRA/MRV is rarely requested to evaluate pulmonary embolism. It is used only in selected cases. For example, intravenous iodinated contrast material for a CTA is contraindicated due to significant iodinated contrast allergy, and a diagnostic ventilation/perfusion (V/Q) study cannot be obtained

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### Pulmonary sequestration

## Thoracic Aorta and Great Vessel

### Evaluation of the thoracic aorta

(any **one** of the following)

- Evaluation when there is concern for complications (such as dissection)
- Further characterization of suspected aneurysm based on prior diagnostic or imaging study
- Patient with confirmed aortic dissection experiencing new or worsening symptoms
- Periodic surveillance (**any one** of the following)
  - High risk patient (patient with connective tissue disease or coarctation of the aorta)
  - Patient with known thoracic aneurysm
- Post-operative evaluation
- Preoperative evaluation

**Note:** Echocardiogram is generally recommended as a first line modality for evaluation of the ascending aorta in pediatric patients

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### Hematoma

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### Post-operative or post-procedure evaluation

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### Vasculitis