



# CLINICAL GUIDELINES

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## Pediatric Chest Imaging Policy

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eviCore healthcare Clinical Decision Support Tool Diagnostic Strategies: This tool addresses common symptoms and symptom complexes. Imaging requests for individuals with atypical symptoms or clinical presentations that are not specifically addressed will require physician review. Consultation with the referring physician, specialist and/or individual's Primary Care Physician (PCP) may provide additional insight.

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## PEDIATRIC CHEST IMAGING GUIDELINES

<b>Procedure Codes Associated with Chest Imaging</b>	
<b>MRI</b>	<b>CPT®</b>
Chest MRI without contrast	71550
Chest MRI with contrast (rarely used)	71551
Chest MRI without and with contrast	71552
Unlisted MRI procedure (for radiation planning or surgical software)	76498
<b>MRA</b>	<b>CPT®</b>
Chest MRA (non-cardiac)	71555
<b>CT</b>	<b>CPT®</b>
Chest CT without contrast	71250
Chest CT with contrast	71260
Chest CT without and with contrast (rarely used)	71270
CT Guidance for Placement of Radiation Therapy Fields	77014
Unlisted CT procedure (for radiation planning or surgical software)	76497
<b>CTA</b>	<b>CPT®</b>
Chest CTA (non-coronary)	71275
<b>Nuclear Medicine</b>	<b>CPT®</b>
PET Imaging; limited area (this code not used in pediatrics)	78811
PET Imaging; skull base to mid-thigh (this code not used in pediatrics)	78812
PET Imaging; whole body (this code not used in pediatrics)	78813
PET with concurrently acquired CT; limited area (this code rarely used in pediatrics)	78814
PET with concurrently acquired CT; skull base to mid-thigh	78815
PET with concurrently acquired CT; whole body	78816
Pulmonary Ventilation (e.g., Aerosol or Gas) Imaging	78579
Pulmonary Perfusion Imaging	78580
Pulmonary Ventilation (e.g., Aerosol or Gas) and Perfusion Imaging	78582
Quantitative Differential Pulmonary Perfusion, Including Imaging When Performed	78597
Quantitative Differential Pulmonary Perfusion and Ventilation (e.g., Aerosol or Gas), Including Imaging When Performed	78598
<b>Ultrasound</b>	<b>CPT®</b>
Ultrasound, chest (includes mediastinum, chest wall, and upper back)	76604
Ultrasound, axilla	76882
Ultrasound, breast; <i>unilateral</i> , including axilla when performed; complete	76641
Ultrasound, breast; <i>unilateral</i> , including axilla when performed; limited	76642

## **PEDIATRIC CHEST IMAGING GUIDELINES**

### **PEDCH-1~GENERAL GUIDELINES**

#### **PEDCH-1.1 Pediatric Chest Imaging Age Considerations**

Many conditions affecting the chest in the pediatric population are different diagnoses than those occurring in the adult population. For those diseases which occur in both pediatric and adult populations, minor differences may exist in management due to patient age, comorbidities, and differences in disease natural history between children and adults.

- ✓ Patients age <18 years old should be imaged according to the Pediatric Chest Imaging Guidelines, and patients age ≥18 years should be imaged according to the Chest Imaging Guidelines, except where directed otherwise by a specific guideline section.

#### **PEDCH-1.2 Pediatric Chest Imaging Appropriate Clinical Evaluation**

- ✓ A recent (within 60 days) face-to-face evaluation including a detailed history, physical examination, and appropriate laboratory studies should be performed prior to considering advanced imaging, unless the patient is undergoing guideline-supported scheduled follow-up imaging evaluation.
- ✓ Unless otherwise stated in a specific guideline section, the use of advanced imaging to screen asymptomatic patients for disorders involving the chest is not supported. Advanced imaging of the chest should only be approved in patients who have documented active clinical signs or symptoms of disease involving the chest.
- ✓ Unless otherwise stated in a specific guideline section, repeat imaging studies of the chest are not necessary unless there is evidence for progression of disease, new onset of disease, and/or documentation of how repeat imaging will affect patient management or treatment decisions.

#### **PEDCH-1.3 Pediatric Chest Imaging Modality General Considerations**

- ✓ MRI
  - MRI Chest is generally performed without and with contrast (CPT<sup>®</sup> 71552) unless the patient has a documented contraindication to gadolinium or otherwise stated in a specific guideline section
  - Due to the length of time for image acquisition and the need for stillness, anesthesia is required for almost all infants and young children (age <7 years), as well as older children with delays in development or maturity. In this patient population, MRI imaging sessions should be planned with a goal of avoiding a short-interval repeat anesthesia exposure due to insufficient information using the following considerations:

- MRI should always be performed without and with contrast, unless there is a specific contraindication to gadolinium use since the patient already has intravenous access for anesthesia.
  - If multiple body areas are supported by eviCore guidelines for the clinical condition being evaluated, MRI of all necessary body areas should be obtained concurrently in the same anesthesia session.
  - The presence of surgical hardware or implanted devices may preclude MRI
  - The selection of best examination may require coordination between the provider and the imaging service.
- ✓ CT
- CT Chest is generally performed either with contrast (CPT<sup>®</sup> 71260) or without contrast (CPT<sup>®</sup> 71250).
    - There are no generally accepted pediatric indications for CT Chest without and with contrast (CPT<sup>®</sup> 71270).
  - CT should not be used to replace MRI in an attempt to avoid sedation unless listed as a recommended study in a specific guideline section.
  - The selection of best examination may require coordination between the provider and the imaging service.
- ✓ Ultrasound
- Ultrasound of the chest (CPT<sup>®</sup> 76604) or axilla (CPT<sup>®</sup> 76882) is indicated as an initial study for evaluating adenopathy, palpable chest wall lesions, pleural effusion or thickening, and patency of thoracic vasculature.
  - For those patients who do require advanced imaging, ultrasound can be very beneficial in selecting the proper modality, body area, image sequences, and contrast level that will provide the most definitive information for the patient.
- ✓ Nuclear Medicine
- Nuclear medicine studies other than PET/CT are very rarely used in evaluation of the pediatric chest.
  - Pulmonary Ventilation-Perfusion Imaging (CPT<sup>®</sup> 78582) has been replaced by CTA (CPT<sup>®</sup> 71275) or CT (CPT<sup>®</sup> 71260) Chest with contrast, but can be approved for evaluation of suspected pulmonary embolism if CT is unavailable.
    - See **CH-27~PULMONARY EMBOLISM (PE)** for additional imaging guidelines
  - Pulmonary Perfusion Imaging (CPT<sup>®</sup> 78580) should generally not be approved in lieu of CPT<sup>®</sup> 78582 for initial evaluation of suspected pulmonary embolism, but can be approved for follow up of an equivocal or positive recent ventilation-perfusion lung scan (CPT<sup>®</sup> 78582) to evaluate for interval change.
  - Pulmonary Ventilation Imaging (CPT<sup>®</sup> 78579) should not be approved in lieu of CPT<sup>®</sup> 78582 for evaluation of suspected pulmonary embolism, but can be

approved for additional evaluation of an abnormal perfusion-only scan (CPT<sup>®</sup> 78580).

- Pulmonary split crystal function study (CPT<sup>®</sup> 78597 or CPT<sup>®</sup> 78598), also known as Quantitative Differential Pulmonary Perfusion, is indicated for preoperative planning of segmental, lobar, or lung resection.
- Radiopharmaceutical nuclear medicine imaging (CPT<sup>®</sup> 78805, CPT<sup>®</sup> 78806, or CPT<sup>®</sup> 78807) is rarely performed, but is indicated for evaluation of sarcoidosis or toxicity from drug toxicity (cyclophosphamide, busulfan, bleomycin, amiodarone, or nitrofurantoin).

The guidelines listed in this section for certain specific indications are not intended to be all-inclusive; clinical judgment remains paramount and variance from these guidelines may be appropriate and warranted for specific clinical situations.

## **References**

1. ACR–SPR Practice Parameter For the Performance and Interpretation of Pediatric Magnetic Resonance Imaging (MRI) Amended 2014, available at: [http://www.acr.org/~media/ACR/Documents/PGTS/guidelines/MRI\\_Pediatric.pdf](http://www.acr.org/~media/ACR/Documents/PGTS/guidelines/MRI_Pediatric.pdf)
2. ACR–ASER–SCBT–MR–SPR Practice Parameter for the Performance of Pediatric Computed Tomography (CT) Revised 2014, available at: [http://www.acr.org/~media/ACR/Documents/PGTS/guidelines/CT\\_Pediatric.pdf](http://www.acr.org/~media/ACR/Documents/PGTS/guidelines/CT_Pediatric.pdf)
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8. Nevin MA, Pulmonary Embolism, Infarction, and Hemorrhage, *Nelson Textbook of Pediatrics*, eds Kliegman RM, Stanton BF, Schor NF, St. Geme JW III, and Behrman RE, 19<sup>th</sup> edition 2011, pp 1500-1504.
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<http://www.acr.org/~media/ACR/Documents/AppCriteria/Diagnostic/AcuteNonspecificChestPainLowProbabilityCoronaryArteryDisease.pdf>.
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## PEDIATRIC CHEST IMAGING GUIDELINES

### **PEDCH-2~LYMPHADENOPATHY**

- ✓ Axillary lymphadenopathy imaging indications in pediatric patients are identical to those for adult patients. See **CH-2.2~Axillary Lymphadenopathy** for imaging guidelines.
- ✓ Supraclavicular adenopathy in pediatric patients is almost always pathologic, and advanced imaging is indicated prior to excisional biopsy. Fine needle aspiration, while common in adults prior to advanced imaging, is inappropriate for evaluating lymphadenopathy in pediatric patients. Any of the following studies may be approved for evaluation of supraclavicular adenopathy in children:
  - CT Chest with contrast (CPT<sup>®</sup> 71260)
  - MRI Chest without and with contrast (CPT<sup>®</sup> 71552)
  - Ultrasound of the chest (CPT<sup>®</sup> 76604)
- ✓ If malignancy is suspected, see the appropriate imaging guidelines as below:
  - Lymphoma: **PEDONC-5~Pediatric Lymphomas**
  - Soft tissue sarcoma: **PEDONC-8~Pediatric Soft Tissue Sarcomas**
  - Neuroblastoma: **PEDONC-6~Neuroblastoma**

### **Reference**

1. Kilburn LB, Siegel SE, and Steuber CP, Clinical Assessment and Differential Diagnosis of the Child with Suspected Cancer, *Principles and Practice of Pediatric Oncology*, eds Pizzo PA & Poplack DG, 6<sup>th</sup> edition 2011, pp 123-137.



## PEDIATRIC CHEST IMAGING GUIDELINES

### **PEDCH-3~MEDIASTINAL MASS**

The causes of mediastinal masses in children are generally different than those in adults, and the imaging considerations are different.

- ✓ Chest x-ray is indicated as an initial study for all patients with suspected mediastinal mass.
- ✓ CT Chest with contrast (CPT<sup>®</sup> 71260) is indicated for any pediatric patient with a mediastinal mass.
  - Masses can be very large and anterior masses frequently cause compression of the trachea and/or mediastinal blood vessels.
- ✓ MRI Chest without and with contrast (CPT<sup>®</sup> 71552) is indicated for any pediatric patient with:
  - A posterior (paravertebral) mediastinal mass
  - CT findings are inconclusive regarding specific anatomy.
  - MRI should not be used for patients with large anterior mediastinal masses if anesthesia is necessary to complete the study.
- ✓ If lymphoma is strongly suspected or there is evidence of tracheal compression on CT imaging, PET/CT (CPT<sup>®</sup> 78815) is indicated prior to biopsy in pediatric patients. See **PEDONC-5 Pediatric Lymphoma** for imaging guidelines.
- ✓ If neuroblastoma is strongly suspected, MIBG (CPT<sup>®</sup> 78804) is indicated and can be approved prior to biopsy in pediatric patients. See **PEDONC-6~Neuroblastoma** for imaging guidelines.
- ✓ Ultrasound can be approved in children younger than 5 years old to distinguish prominent but otherwise normal thymus from true mediastinal mass
- ✓ A single repeat CT Chest with contrast (CPT<sup>®</sup> 71260) can be approved to confirm stability and avoid biopsy for patients with NONE of the following features:
  - Anterior mediastinal mass
  - Enlarged lymph nodes anywhere in the imaging field
  - Lymphopenia
  - Pleural effusion

### **References**

1. Thacker PG, Mahani MG, Heider A, and Lee EY, Imaging Evaluation of Mediastinal Masses in Children and Adults, *J Thorac Imaging* 2015;30:247-264.
2. Mullen EA and Gratias EJ, Oncologic Emergencies, *Nathan and Oski's Hematology and Oncology of Infancy and Childhood*, eds Orkin SH, Fisher DE, Ginsburg D, Look AT, Lux SE, and Nathan DG, 8<sup>th</sup> edition 2015, pp 2267-2291..

3. Trinavarat P and Riccabonna M, Potential of ultrasound in the pediatric chest, *Eur J Radiol* 2014;83:1507-1518.
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## PEDIATRIC CHEST IMAGING GUIDELINES

### **PEDCH-4~HEMOPTYSIS**

#### **PEDCH-4.1 Imaging**

- ✓ True hemoptysis is rare in pediatric patients, and a face-to-face evaluation including a detailed history, physical examination, and appropriate laboratory studies should be performed prior to considering advanced imaging.
  - Aspirated blood from epistaxis or emesis frequently presents as hemoptysis, and history and physical examination will aid in this assessment.
- ✓ Chest X-ray is indicated as an initial study for stable patients.
  - Advanced imaging is not indicated for patients with epistaxis and a normal chest radiograph and no personal or family history of underlying lung disease or bleeding disorder.
- ✓ Chest CT with contrast (CPT<sup>®</sup> 71260) is indicated for all other pediatric patients with hemoptysis.
  - Chest CT without contrast (CPT<sup>®</sup> 71250) can be approved for patients with a documented allergy to CT contrast or significant renal dysfunction.
- ✓ MRI is not indicated in the evaluation of pediatric hemoptysis.

#### **References**

1. Singh D, Bhalla AS, Veedu PT, and Arora A, *World J. Clin Pediatr* 2013; 2:54-64.
2. Nevin MA, Pulmonary Hemorrhage and Hemoptysis, *Nelson Textbook of Pediatrics*, eds Kliegman RM, Stanton BF, Schor NF, St. Geme JW III, and Behrman RE, 19<sup>th</sup> edition 2011, pp 1503-1504.

## PEDIATRIC CHEST IMAGING GUIDELINES

### **PEDCH-5~CYSTIC FIBROSIS AND BRONCHIECTASIS**

#### **PEDCH-5.1 Cystic Fibrosis**

- ✓ Chest x-ray is the primary study for initial evaluation of acute clinical symptoms in patients with cystic fibrosis
- ✓ CT Chest without contrast (CPT<sup>®</sup> 71250) or with contrast (CPT<sup>®</sup> 71260) is indicated for the following (without initial chest x-ray):
  - Hemoptysis
  - Pneumonia worsening despite antibiotic therapy
  - Pleural effusion or empyema
  - Suspected fungal pneumonia
  - Monitoring treatment changes on bronchiectasis
  - Expiratory CT for evaluating small airways disease
- ✓ Low dose CT Chest without contrast (CPT<sup>®</sup> 71250) is indicated every 2 years for monitoring of bronchiectasis and small airways disease

#### **PEDCH-5.2 Bronchiectasis Not Associated with Cystic Fibrosis**

- ✓ Bronchiectasis not associated with cystic fibrosis is rare in pediatric patients, and imaging indications are identical to those for adult patients. See **CH-7~BRONCHIECTASIS** for imaging guidelines.

#### **References**

1. Egan M, Cystic Fibrosis, *Nelson Textbook of Pediatrics*, eds Kliegman RM, Stanton BF, Schor NF, St. Geme JW III, and Behrman RE, 19<sup>th</sup> edition 2011, pp 1481-1497.
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## PEDIATRIC CHEST IMAGING GUIDELINES

### **PEDCH-6~BRONCHIOLITIS**

Bronchiolitis is a self-limiting viral infection causing lower respiratory tract illness, most common in infants under 12 months of age.

- ✓ Advanced imaging is not indicated for routine evaluation or monitoring of bronchiolitis, but can be approved for the following:
  - Pleural effusion or empyema on recent chest x-ray.
  - Immunocompromised patient with acute pulmonary symptoms.
  - Abnormality on recent chest x-ray suggesting condition other than bronchiolitis.

#### **Reference**

1. Watts KD and Goodman DM, Wheezing in Infants: Bronchiolitis, *Nelson Textbook of Pediatrics*, eds Kliegman RM, Stanton BF, Schor NF, St. Geme JW III, and Behrman RE, 19<sup>th</sup> edition 2011, pp 1456-1459.

## PEDIATRIC CHEST IMAGING GUIDELINES

### **PEDCH-7~PNEUMONIA**

- ✓ Pneumonia imaging indications in pediatric patients are very similar to those for adult patients. See CH-13~PNEUMONIA for imaging guidelines.
- ✓ Pediatric-specific imaging considerations include the following:
  - Immunocompromised patients with acute pulmonary symptoms should be imaged using CT Chest with contrast (CPT<sup>®</sup> 71260).
  - Patients with recurrent lower respiratory tract infections should undergo CT Chest without contrast (CPT<sup>®</sup> 71250) or with contrast (CPT<sup>®</sup> 71260).
  - Ultrasound of the chest (CPT<sup>®</sup> 76604) can be approved for evaluation of childhood pneumonia.

### **References**

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4. Goh Y and Kapur J, Sonography of the Pediatric Chest, *J Ultrasound Med* 2016;35:1067-1080.

## PEDIATRIC CHEST IMAGING GUIDELINES

### **PEDCH-8~SOLITARY PULMONARY NODULE**

The Fleischner Society guidelines for solitary pulmonary nodule management do not apply to pediatric patients. An incidental solitary pulmonary nodule in a child representing a primary lung carcinoma has never been reported in the literature. Similarly, an extrathoracic malignancy presenting with an incidental solitary pulmonary nodule in an otherwise healthy child is very rare.

- ✓ All children with a pulmonary nodule incidentally discovered on other imaging should have CT Chest with contrast (CPT<sup>®</sup> 71260) as a one-time evaluation.
- ✓ Follow up imaging of incidental solitary pulmonary nodules in asymptomatic healthy children is not necessary.
  - Follow up imaging is indicated for the following:
    - Immunocompromised patients
    - Malignancy (see below)
    - Invasive infection
    - New or worsening pulmonary symptoms
- ✓ Children with a malignant solid tumor who have pulmonary nodules of any size should have imaging according to the guideline section for the specific cancer type. See **Pediatric Oncology Imaging Guidelines** for specific imaging indications.
- ✓ This guideline section does not apply to multiple pulmonary nodules, which are imaged according to the underlying disorder in pediatric patients.

### **References**

1. Assefa D and Atlas A, Natural History of Incidental Pulmonary Nodules in Children, *Pediatr Pulmonol* 2015; 50:456-459.
2. Westra SJ, Broday AS, Mahani MG et al, The incidental pulmonary nodule in a child, Part 1; recommendations from the SPR Thoracic Imaging Committee regarding characterization, significance, and follow up, *Pediatr Radiol* 2015;45:628-633.
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4. Strouse PJ, The incidental pulmonary nodule in a child: a conundrum, *Pediatr Radiol* 2015; 45:627.

## PEDIATRIC CHEST IMAGING GUIDELINES

### **PEDCH-9~POSITIVE PPD OR TUBERCULOSIS**

- ✓ Positive PPD and tuberculosis imaging indications in pediatric patients are identical to those for adult patients. See **CH-14~Positive PPD or Tuberculosis (TB)** for imaging guidelines.
- ✓ Radiopharmaceutical nuclear medicine imaging (CPT<sup>®</sup> 78805, 78806, or 78807) is rarely performed, but is indicated for evaluation of tuberculosis.

#### **References**

1. Liu AH, Covar RA, Spahn JD, and Leung DYM, Childhood Asthma, *Nelson Textbook of Pediatrics*, eds Kliegman RM, Stanton BF, Schor NF, St. Geme JW III, and Behrman RE, 19<sup>th</sup> edition 2011, pp 780-801.
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## PEDIATRIC CHEST IMAGING GUIDELINES

### **PEDCH-10~ASTHMA**

- ✓ Advanced imaging is not indicated for routine evaluation or monitoring of asthma, but CT Chest without (CPT<sup>®</sup> 71250) or with (CPT<sup>®</sup> 71260) contrast can be approved for the following:
  - Pleural effusion or empyema on recent chest x-ray.
  - Immunocompromised patient with acute pulmonary symptoms.
  - Abnormality on recent chest x-ray suggesting condition other than asthma.

#### **Reference**

1. Liu AH, Covar RA, Spahn JD, and Leung DYM, Childhood Asthma, *Nelson Textbook of Pediatrics*, eds Kliegman RM, Stanton BF, Schor NF, St. Geme JW III, and Behrman RE, 19<sup>th</sup> edition 2011, pp 780-801.

## PEDIATRIC CHEST IMAGING GUIDELINES

### **PEDCH-11~PECTUS DEFORMITIES**

- ✓ CT Chest without contrast (CPT<sup>®</sup> 71250) is indicated in patients with a pectus deformity for:
  - Preoperative planning
  - Significant cardiac displacement after chest x-ray and echocardiography (CPT<sup>®</sup> 93306)
  - Evidence of pulmonary impingement after chest x-ray and pulmonary function tests (PFTs) if increasing shortness of breath. Note: It may not be possible to obtain PFTs in children younger than 9 years old.
  - CT Chest with contrast (CPT<sup>®</sup> 71260) is indicated when suspected congenital heart disease or Marfan's syndrome in those with Pectus Carinatum.

### **References**

1. Shaul D, Phillips JD, Gilbert J et al, Pectus Carinatum Guidelines, *American Pediatric Surgical Association*, August 8, 2012 – Approved by the APSA Board of Governors.
2. Frantz FW, Indications and guidelines for pectus excavatum repair, *Curr Opin Pediatr* 2011; 23:486-491.
3. Koumbourlis AC, Chest Wall Abnormalities and their Clinical Significance in Childhood, *Paediatr Resp Rev* 2014; 15:246-255.

**PEDIATRIC CHEST IMAGING GUIDELINES**

**PEDCH-12~BREAST MASSES**

- ✓ See **PEDONC-17~Pediatric Breast Masses** for imaging guidelines.

## PEDIATRIC CHEST IMAGING GUIDELINES

### **PEDCH-13~VASCULAR MALFORMATIONS**

#### **PEDCH-13.1 Vascular Ring**

Vascular rings generally present with either respiratory symptoms (stridor, wheezing, tachypnea, cough) or feeding difficulties (dysphagia, slow feeding, hyperextension of the head while feeding, weight loss, failure to thrive) but can also be discovered incidentally on imaging obtained for other purposes.

- ✓ Chest x-ray is the recommended initial study in patients with respiratory symptoms.
- ✓ Barium esophagram is the recommended initial study in patients with feeding difficulties.
- ✓ Either Chest CTA (CPT<sup>®</sup> 71275) or Chest MRA (CPT<sup>®</sup> 71555) can be approved in patients with known or suspected vascular ring after chest x-ray or barium esophagram.
- ✓ Echocardiogram can be approved to rule out associated congenital heart disease.
  - CPT<sup>®</sup> codes 93303, 93306, 93320, and 93325 can be approved for initial evaluation of patients with vascular ring and no prior echocardiograms.

#### **PEDCH-13.2 Other Vascular Malformations**

See **PEDPVD-2~Vascular and Lymphatic Malformations** for imaging guidelines.

#### **Reference**

1. Licari A, Manca E, Rispoli GA et al, Congenital Vascular Rings: A Clinical Challenge for the Pediatrician, *Pediatr Pulmonol* 2015; 50:511-524.