CLINICAL GUIDELINES

Pediatric Chest Imaging Guidelines

Effective Date: February 1, 2025

Instructions for use

The following coverage policy applies to health benefit plans administered by Cigna. Coverage policies are intended to provide guidance in interpreting certain standard Cigna benefit plans and are used by medical directors and other health care professionals in making medical necessity and other coverage determinations. Please note the terms of a customer's particular benefit plan document may differ significantly from the standard benefit plans upon which these coverage policies are based. For example, a customer's benefit plan document may contain a specific exclusion related to a topic addressed in a coverage policy.

In the event of a conflict, a customer's benefit plan document always supersedes the information in the coverage policy. In the absence of federal or state coverage mandates, benefits are ultimately determined by the terms of the applicable benefit plan document. Coverage determinations in each specific instance require consideration of:

1. The terms of the applicable benefit plan document in effect on the date of service
2. Any applicable laws and regulations
3. Any relevant collateral source materials including coverage policies
4. The specific facts of the particular situation

Coverage policies relate exclusively to the administration of health benefit plans. Coverage policies are not recommendations for treatment and should never be used as treatment guidelines.

This evidence-based medical coverage policy has been developed by EviCore, Inc. Some information in this coverage policy may not apply to all benefit plans administered by Cigna.

These guidelines include procedures EviCore does not review for Cigna. Please refer to the **Cigna CPT code list** for the current list of high-tech imaging procedures that EviCore reviews for Cigna.

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General Guidelines (PEDCH-1)

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Procedure Codes Associated with Chest Imaging

CHP.GG.ProcedureCodes.A
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MRI	CPT®
MRI Chest without contrast	71550
MRI Chest with contrast (rarely used)	71551
MRI Chest without and with contrast	71552
Unlisted MRI procedure (for radiation planning or surgical software)	76498

MRA	CPT®
MRA Chest (non-cardiac)	71555

CT	CPT®
CT Chest without contrast	71250
CT Chest with contrast	71260
CT Chest 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

CTA	CPT®
CTA Chest (non-coronary)	71275

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Nuclear Medicine	CPT®
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

Ultrasound	CPT®
Ultrasound, chest (includes mediastinum, chest wall, and upper back)	76604
Ultrasound, axilla	76882
Ultrasound, breast; *unilateral*, including axilla when performed; complete	76641
Ultrasound, breast; *unilateral*, including axilla when performed; limited	76642

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General Guidelines (PEDCH-1.0)

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- A pertinent clinical evaluation since the onset or change in symptoms, including a detailed history, physical examination, and appropriate laboratory, and basic imaging such as plain radiography or ultrasound should be performed prior to considering advanced imaging (CT, MRI, Nuclear Medicine), unless the individual is undergoing guideline-supported scheduled imaging evaluation. A meaningful technological contact (telehealth visit, telephone call, electronic mail or messaging) since the onset or change in symptoms can serve as a pertinent clinical evaluation.
- Unless otherwise stated in a specific guideline section, the use of advanced imaging to screen asymptomatic individuals for disorders involving the chest is not supported. Advanced imaging of the chest is only supported in individuals 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 individual management or treatment decisions.

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Pediatric Chest Imaging Age Considerations (PEDCH-1.1)

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- 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, differences may exist in management due to individual age, comorbidities, and differences in disease natural history between children and adults.
- Individuals who are 18 years old or younger[15] should be imaged according to the Pediatric Chest Imaging Guidelines if discussed. Any conditions not specifically discussed in the Pediatric Chest Imaging Guidelines should be imaged according to the General Chest Imaging Guidelines. Individuals who are >18 years old should be imaged according to the General Chest Imaging Guidelines, except where directed otherwise by a specific guideline section.

Pediatric Chest Imaging Modality General Considerations (PEDCH-1.3)

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- MRI
  - MRI Chest is generally performed without and with contrast (CPT® 71552) unless the individual has a documented contraindication to gadolinium or otherwise stated in a specific guideline section.
  - Due to the length of time required for MRI acquisition and the need to minimize individual movement, anesthesia is usually required for almost all infants (except neonate) and young individuals (age <7 years), as well as older individuals with delays in development or maturity. This anesthesia may be administered via oral or intravenous routes. In this individual population, MRI sessions should be planned with a goal of minimizing anesthesia exposure by adhering to the following considerations:
    - MRI procedures can be performed without and/or with contrast use as supported by these condition-based guidelines. If intravenous access will already be present for anesthesia administration and there is no contraindication for using contrast, imaging without and with contrast may be appropriate if requested. By doing so, the requesting provider may avoid repetitive anesthesia administration to perform an MRI with contrast if the initial study without contrast is inconclusive.
      - Recent evidence-based literature demonstrates the potential for gadolinium deposition in various organs including the brain, after the use of MRI contrast.
      - The U.S. Food and Drug Administration (FDA) has noted that there is currently no evidence to suggest that gadolinium retention in the brain is harmful and restricting gadolinium-based contrast agents (GBCAs) use is not warranted at this time. It has been recommended that GBCA use should be limited to circumstances in which additional information provided by the contrast agent is necessary and the necessity of repetitive MRIs with GBCAs should be assessed.
  - If multiple body areas are supported by the guidelines for the clinical condition being evaluated, MRI of all necessary body areas should be obtained concurrently.
  - 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

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- CT Chest is generally performed either with contrast (CPT® 71260) or without contrast (CPT® 71250).
  - There are no generally accepted pediatric indications for CT Chest without and with contrast (CPT® 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 chest (CPT® 76604) or axilla (CPT® 76882) is indicated as an initial study for evaluating adenopathy, palpable chest wall lesions, pleural effusion or thickening, patency of thoracic vasculature, and diaphragm motion abnormalities.
  - For those individuals 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 individual.
- Nuclear Medicine
  - Nuclear medicine studies other than PET/CT are rarely used in evaluation of the pediatric chest.
  - Pulmonary Ventilation-Perfusion Imaging (CPT® 78582) has been replaced by CTA Chest (CPT® 71275) or CT Chest with contrast (CPT® 71260), but are appropriate for evaluation of suspected pulmonary embolism if CT is unavailable.
    - See **Pulmonary Embolism (PE) (CH-25.1)** in the Chest Imaging Guidelines.
  - Pulmonary Perfusion Imaging (CPT® 78580) are generally not appropriate in lieu of CPT® 78582 for initial evaluation of suspected pulmonary embolism, but is appropriate for follow up of an equivocal or positive recent ventilation-perfusion lung scan (CPT® 78582) to evaluate for interval change.
  - Pulmonary Ventilation Imaging (CPT® 78579) is not appropriate in lieu of CPT® 78582 for evaluation of suspected pulmonary embolism, but is appropriate for additional evaluation of an abnormal perfusion-only scan (CPT® 78580).
  - Pulmonary split crystal function study (CPT® 78597 or CPT® 78598), also known as Quantitative Differential Pulmonary Perfusion, is indicated for preoperative planning of segmental, lobar, or lung resection.
  - Quantitative Differential Pulmonary Perfusion Lung Scan (CPT® 78597 or CPT® 78598), can be performed for post lung transplant individuals to detect regional perfusion abnormalities.
  - Radiopharmaceutical nuclear medicine imaging of an inflammatory process (CPT® 78800, CPT® 78801, CPT® 78802, or CPT® 78803) is rarely performed, but is indicated for evaluation of sarcoidosis or toxicity from drug toxicity (cyclophosphamide, busulfan, bleomycin, amiodarone, or nitrofurantoin).
- 3D Rendering

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- 3D Rendering indications in pediatric chest imaging are identical to those in the general imaging guidelines. See **3D Rendering (Preface-4.1)** in the Preface Imaging Guidelines.

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 (PEDCH-1)

v1.0.2025

1. Siegel MJ. Chest. In: *Pediatric Sonography*. Philadelphia. Wolters Kluwer. 2018;156-195.
2. ACR Practice parameter for performing and interpretating of magnetic resonance imaging (MRI). Revised 2017. (Resolution 10).
3. ACR–ASER–SCBT-MR–SPR Practice Parameter for the Performance of Pediatric Computed Tomography (CT). Revised 2019. (Resolution 6).
4. Trinavarat P and Riccabonna M. Potential of ultrasound in the pediatric chest. *Eur J Radiol*. 2014;83(9):1507-1518.
5. Goh Y, Kapur J. Sonography of the pediatric chest. *J Ultrasound Med*. 2016 May;35(5):1067-1080.
6. Reighard C, Junaid S, Jackson WM, et al. Anesthetic Exposure During Childhood and Neurodevelopmental Outcomes. *JAMA Netw Open*. 2022;5(6):e2217427. doi: 10.1001/jamanetworkopen.2022.17427.
7. Nevin MA. Chapter 407: Pulmonary embolism, infarction, and hemorrhage. In: Kliegman RM, Stanton BF, St. Geme JW III, et al., eds. *Nelson Textbook of Pediatrics*. 20th ed. 2016;2123-2128.
8. Kirsch J, Brown KJ, Henry TS, et al. Suspected pulmonary embolism. *ACR Appropriateness Criteria®*. Revised 2016.
9. ACR–SPR–STR Practice Parameter for the Performance of Pulmonary Scintigraphy. Revised 2018. (Resolution 30).
10. Blumfield E, Swenson DW, Iyer RS, Stanescu AL. Gadolinium-based contrast agents — review of recent literature on magnetic resonance imaging signal intensity changes and tissue deposits, with emphasis on pediatric patients. *Pediatr Radiol*. 2019;49(4):448-457. doi: 10.1007/s00247-018-4304-8.
11. Fraum TJ, Ludwig DR, Bashir MR, Fowler KJ. Gadolinium-based contrast agents: A comprehensive risk assessment. *J Magn Reson Imaging*. 2017;46(2):338-353. doi: 10.1002/jmri.25625.
12. Update on FDA approach to safety issue of gadolinium retention after administration of gadolinium-based contrast agents. Available at: https://www.fda.gov/media/116492/download. September 20, 2018.
13. Implementation Guide: Medicaid State Plan Eligibility Eligibility Groups Mandatory Coverage Infants and Children under Age 19. Available at: https://www.hhs.gov/guidance/document/implementation-guide-medicaid-state-plan-eligibility-eligibility-groups-aeu-mandatory-2. Issue date: July 14, 2017.

Lymphadenopathy (PEDCH-2)

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Lymphadenopathy (PEDCH-2.1)

CHP.LY.0002.1.A

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- Axillary lymphadenopathy imaging indications in pediatric individuals are identical to those for adult individuals. See **Axillary Lymphadenopathy (and Mass) (CH-2.2)** in the Chest Imaging Guidelines.
- Supraclavicular adenopathy in pediatric individuals 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 individuals. ANY of the following studies are appropriate for evaluation of supraclavicular adenopathy in individuals:
  - CT Chest with contrast (CPT® 71260)
  - MRI Chest without and with contrast (CPT® 71552)
  - Ultrasound Chest (CPT® 76604)
- If malignancy is suspected, see the appropriate imaging guidelines as below:
  - Lymphoma: **Pediatric Lymphomas (PEDONC-5)** in the Pediatric Oncology Imaging Guidelines.
  - Soft tissue sarcoma: **Pediatric Soft Tissue Sarcomas (PEDONC-8)** in the Pediatric Oncology Imaging Guidelines.
  - Neuroblastoma: **Neuroblastoma (PEDONC-6)** in the Pediatric Oncology Imaging Guidelines.

Reference (PEDCH-2)

v1.0.2025

1. Allen-Rhoades W and Steuber CP. Clinical assessment and differential diagnosis of the child with suspected cancer. In: Pizzo PA, Poplack DG, eds. *Principles and Practice of Pediatric Oncology*. 7th ed. 2015;101-111.

Mediastinal Mass (PEDCH-3)

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Mediastinal Mass (PEDCH-3.1)

CHP.MM.0003.1.A

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- The causes of mediastinal masses in individuals are generally different than those in adults, and the imaging considerations are different. Up to half of all pediatric mediastinal masses are malignant.[7]
- Chest x-ray is indicated as an initial study for all individuals with suspected mediastinal mass.
- CT Chest with contrast (CPT® 71260) is indicated for any pediatric individual with a mediastinal mass identified on chest x-ray.
  - 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® 71552) is indicated for any pediatric individual with:
  - a posterior (paravertebral) mediastinal mass on CT Chest that invades the spinal canal
  - CT findings are inconclusive regarding specific anatomy
  - MRI should not be used for individuals with large anterior mediastinal masses if anesthesia is necessary to complete the study.
- PET/CT (CPT® 78815) is indicated prior to biopsy in pediatric individuals if lymphoma is known or strongly suspected or there is evidence of tracheal compression on CT imaging. See **Pediatric Lymphoma (PEDONC-5)** in the Pediatric Oncology Imaging Guidelines.
- MIBG (CPT® 78800, CPT® 78802, CPT® 78803, or CPT® 78804) is indicated and is supported prior to biopsy in pediatric individuals if neuroblastoma is known or strongly suspected. See **Neuroblastoma (PEDONC-6)** in the Pediatric Oncology Imaging Guidelines.
- Ultrasound chest (CPT® 76604) is appropriate in individuals younger than 5 years old to distinguish prominent but otherwise normal thymus from true mediastinal mass.
- A single repeat CT Chest with contrast (CPT® 71260) is appropriate to confirm stability and avoid biopsy for individuals with NONE of the following features:
  - anterior mediastinal mass
  - enlarged lymph nodes anywhere in the imaging field
  - lymphopenia
  - pleural effusion

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References (PEDCH-3)

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1. Thacker PG, Mahani MG, Heider A, et al. Imaging evaluation of mediastinal masses in children and adults. *J Thorac Imaging.* 2015;30(4):247-264.
2. Mullen EA and Gratias EJ. Oncologic emergencies. In: Orkin SH, Fisher DE, Ginsburg D, et al., eds. *Nathan and Oski's Hematology and Oncology of Infancy and Childhood*. 8th ed. 2015:2267-2291.
3. Trinavarat P and Riccabonna M. Potential of ultrasound in the pediatric chest. *Eur J Radiol*. 2014; 83(9):1507-1518.
4. Naeem F, Metzger ML, Arnold SR, et al. Distinguishing benign mediastinal masses from malignancy in a histoplasmosis-endemic region. *J Pediatr.* 2015;167(2):409-415.
5. Manson DE. Magnetic resonance imaging of the mediastinum, chest wall and pleura in children. *Pediatr Radiol.* 2016;46(6):902-915.
6. *American College of Radiology ACR Appropriateness Criteria*® Imaging of Mediastinal Masses. Revised 2020.
7. Sreedher G, Tadros SS, Janitz E. Pediatric mediastinal masses. *Pediatr Radiol*. Published online June 8, 2022. doi: 10.1007/s00247-022-05409-4.

Hemoptysis (PEDCH-4)

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Hemoptysis – Imaging (PEDCH-4.1)

CHP.BL.0004.1.A

v1.0.2025

- True hemoptysis is rare in pediatric individuals, and 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 individuals.
  - Advanced imaging is not indicated for individuals with epistaxis and a normal chest radiograph and no personal or family history of underlying lung disease or bleeding disorder.
  - CT Chest with contrast (CPT® 71260) is indicated for all other pediatric individuals with hemoptysis.
    - CT Chest without contrast (CPT® 71250) for individuals with a documented allergy to CT contrast or significant renal dysfunction.
- MRI is not indicated in the evaluation of pediatric hemoptysis.

References (PEDCH-4)

v1.0.2025

1. Gupta A, Sands M, Chauhan NR. Massive hemoptysis in pulmonary infections: bronchial artery embolization. *J Thorac Dis*. 2018;10(S28):S3458-S3464. doi: 10.21037/jtd.2018.06.147.
2. Nevin MA. Chapter 436: Pulmonary embolism, infarction, and hemorrhage. In: Kliegman RM, St. Geme JW III, Blum NJ, Shah SS, Tasker RC, Wilson KM, eds. *Nelson Textbook of Pediatrics*. 21st ed. 2020:2309-2314.

Cystic Fibrosis and Bronchiectasis (PEDCH-5)

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Cystic Fibrosis (PEDCH-5.1)

CHP.CF.0005.1.A

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- Chest x-ray is the primary study for initial evaluation of acute clinical symptoms in individuals with cystic fibrosis.
- CT Chest without contrast (CPT® 71250) or with contrast (CPT® 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
  - pre- and post-lung transplant evaluation
- Low dose CT Chest without contrast (CPT® 71250) is indicated **every 2 years** for monitoring of bronchiectasis and small airways disease.
- Cystic fibrosis associated liver disease develops in 5-10% of individuals with cystic fibrosis. Advanced imaging may be appropriate if concerned for liver disease. See **Liver Disease (PEDAB-16)** in the Pediatric Abdomen Imaging Guidelines.

Bronchiectasis Not Associated with Cystic Fibrosis (PEDCH-5.2)

CHP.CF.0005.2.A

v1.0.2025

- Bronchiectasis not associated with cystic fibrosis is rare in pediatric individuals, and imaging indications are identical to those for adult individuals. See **Bronchiectasis (CH-7.1)** in the Chest Imaging Guidelines.

References (PEDCH-5)

v1.0.2025

1. Egan M, Shechter MS, Voynow JA. Cystic fibrosis. Chapter 432. In: Kliegman RM, St. Geme JW III, Blum NJ, Shah SS, Tasker RC, Wilson KM, eds. *Nelson Textbook of Pediatrics*. 21st ed. 2020:2282-2297.
2. Szczesniak R, Turkovic L, Andrinopoulou E-R, Tiddens HA. Chest imaging in cystic fibrosis studies: What counts, and can be counted? *J Cyst Fibros*. 2017;16(2):175-185. doi: 10.1016/j.jcf.2016.12.008.
3. Paranjape SM and Mogayzel Jr PJ. Cystic fibrosis. *Pediatr Rev.* 2014; 35 (5):194-205.
4. Tiddens HAM, Stick SM, and Davis S. Multi-modality monitoring of cystic fibrosis lung disease: the role of chest computed tomography. *Paediatr Resp Rev.* 2014; 15(1):92-97.
5. Murphy KP, Maher MM, Oconnor OJ. Imaging of Cystic Fibrosis and Pediatric Bronchiectasis. *AJR Am J Roentgenol*. 2016;206(3):448-454. doi: 10.2214/ajr.15.14437.
6. Lasker OJ. Bronchectasis. Chapter 430. In: Kliegman RM, St. Geme JW III, Blum NJ, Shah SS, Tasker RC, Wilson KM, eds. *Nelson Textbook of Pediatrics*. 21st ed. 2020:2278-2280.

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Bronchiolitis (PEDCH-6)

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Bronchiolitis (PEDCH-6.1)

CHP.BR.0006.1.A
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Bronchiolitis is a self-limiting viral infection causing inflammation of the small airways, most common in infants under 12 months of age.

- Chest x-rays are indicated when there is a clinical suspicion of pneumonia or other complications.
- Advanced imaging is not indicated for routine evaluation or monitoring of bronchiolitis, but CT Chest with contrast (CPT® 71260) is appropriate for the following:
  - pleural effusion or empyema on recent chest x-ray
  - immunocompromised individual with acute pulmonary symptoms
  - abnormality on recent chest x-ray suggesting condition other than bronchiolitis

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References (PEDCH-6)

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1. House SA, Ralston SL. Chapter 418: Wheezing in infants: bronchiolitis. In: Kliegman RM, St. Geme JW III, Blum NJ, Shah SS, Tasker RC, Wilson KM, eds. *Nelson Textbook of Pediatrics*. 21st ed. 2020:2217-2220.
2. Chang AB, Bush A, Grimwood K. Bronchiectasis in children: diagnosis and treatment. *Lancet*. 2018;392(10150):866-879. doi: 10.1016/s0140-6736(18)31554-x.
3. Darras KE, Roston AT, Yewchuk LK. Imaging Acute Airway Obstruction in Infants and Children. *RadioGraphics*. 2015;35(7):2064-2079. doi: 10.1148/rg.2015150096.

Pneumonia (PEDCH-7)

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Pneumonia (PEDCH-7.1)

CHP.PN.0007.1.A

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- Pneumonia imaging indications in pediatric individuals are very similar to those for adult individuals. See **Pneumonia (CH-13.1)** in the Chest Imaging Guidelines.
- Pediatric-specific imaging considerations include the following:
  - Chest x-ray and/or Ultrasound chest (CPT® 76604) is indicated when the individual's condition does not respond to standard therapy.
  - CT Chest with contrast (CPT® 71260) for immunocompromised individuals with acute pulmonary symptoms.
  - CT Chest without contrast (CPT® 71250) or with contrast (CPT® 71260) for individuals with recurrent lower respiratory tract infections.
  - Ultrasound chest (CPT® 76604) for evaluation of complicated or recurrent childhood pneumonia.

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Coronavirus Disease 2019 (COVID-19) (PEDCH-7.2)

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- Pediatric imaging for COVID-19 positive individuals are similar to those for adult individuals. See **Coronavirus Disease 2019 (COVID-19) (CH-13.2)** in the Chest Imaging Guidelines.
- Pediatric-specific imaging considerations include the following:
  - chest x-ray is the initial imaging test for all pediatric individuals
  - for concerns involving **Multisystem Inflammatory Syndrome in Children (MIS-C)** see **(PEDCD-12)**

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References (PEDCH-7)

v1.0.2025

1. Kelly MS and Sandora TJ. Chapter 428: Community-acquired pneumonia. In: Kliegman RM, St. Geme JW III, Blum NJ, Shah SS, Tasker RC, Wilson KM, eds. *Nelson Textbook of Pediatrics*. 21st ed. 2020:2266-2274.
2. O'Grady K-AF, Torzillo PJ, Frawley K, Chang AB. The radiological diagnosis of pneumonia in children. *Pneumonia*. 2014;5(S1):38-51. doi: 10.15172/pneu.2014.5/482.
3. Andronikou S, Goussard P, Sorantin E. Computed tomography in children with community-acquired pneumonia. *Pediatr Radiol*. 2017;47(11):1431-1440. doi: 10.1007/s00247-017-3891-0.
4. Stadler JAM, Andronikou S, Zar HJ. Lung ultrasound for the diagnosis of community-acquired pneumonia in children. *Pediatr Radiol*. 2017;47(11):1412-1419. doi: 10.1007/s00247-017-3910-1.
5. El–Saied MM, Mohie El Deen ZM, Askar GA. Recurrent Pneumonia in Children Admitted to Assiut University Children Hospital. Magnitude of the Problem and Possible Risk Factors. *Med Res J*. 2019;4(1):13-24. doi: 10.5603/mrj.a2019.0001.
6. Pereda MA, Chavez MA, Hooper-Miele CC, et al. Lung ultrasound for the diagnosis of pneumonia in children: a meta-analysis. *Pediatrics*. 2015;135(4):714-722
7. Goh Y and Kapur J. Sonography of the pediatric chest. *J Ultrasound Med*. 2016; 35 (5):1067-1080
8. American College of Radiology ACR Appropriateness Criteria® Pneumonia in the Immunocompetent Child. New 2019.
9. Tsou PY, Chen KP, Wang YH, et al. Diagnostic Accuracy of Lung Ultrasound Performed by Novice Versus Advanced Sonographers for Pneumonia in Children: A Systematic Review and Meta#analysis. *Acad Emerg Med*. 2019;26(9):1074-1088. doi: 10.1111/acem.13818.
10. Foust AM, McAdam AJ, Chu WC, et al. Practical guide for pediatric pulmonologists on imaging management of pediatric patients with COVID#19. *Pediatr Pulmonol*. 2020;55(9):2213-2224. doi: 10.1002/ppul.24870.
11. Nino G, Zember J, Sanchez-Jacob R, Gutierrez MJ, Sharma K, Linguraru MG. Pediatric Lung Imaging Features of Covid-19: A Systematic Review and Meta-Analysis. *Pediatr Pulmonol*. Published online September 14, 2020. doi: 10.1002/ppul.25070.
12. Wang J, Mo Y, Su Y, et al. Computed tomography features of COVID-19 in children. *Medicine*. 2021;100(38):e22571. doi: 10.1097/md.0000000000022571.

Solitary Pulmonary Nodule (PEDCH-8)

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Solitary Pulmonary Nodule (PEDCH-8.1)

CHP.PM.0008.1.A
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The Fleischner Society guidelines for solitary pulmonary nodule management do not apply to pediatric individuals. An incidental solitary pulmonary nodule in a individual 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 individual is very rare.

- CT Chest with contrast (CPT® 71260) as a one-time evaluation for all individuals with a pulmonary nodule incidentally discovered on other imaging.
- Follow up imaging of incidental solitary pulmonary nodules in asymptomatic healthy individuals is not necessary.[6]
  - Follow up imaging is indicated for the following:
    - immunocompromised individuals
    - malignancy (see below)
    - invasive infection
    - new or worsening pulmonary symptoms
- Individuals 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 individuals.

Background and Supporting Information

A **nodule** is any pulmonary or pleural lesion that is a discrete, spherical opacity 2-30 mm in diameter surrounded by normal lung tissue. A larger nodule is called a mass. Entities that are not nodules, and are considered benign, include non-spherical linear, sheet-like, two-dimensional or scarring opacities.

References (PEDCH-8)

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1. Assefa D and Atlas A. Natural history of incidental pulmonary nodules in children. *Pediatr Pulmonol.* 2015;50(5):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(5):628-633.
3. Westra SJ, Thacker PG, Podberesky DJ, et al. The incidental pulmonary nodule in a child, Part 2; commentary and suggestions for clinical management, risk communication and prevention. *Pediatr Radio*l. 2015;45(5):634-639.
4. Strouse PJ. The incidental pulmonary nodule in a child: a conundrum. *Pediatr Radiol.* 2015;45(5):627.
5. Kanne JP, Jensen LE, Mohammed TL, et al. ACR appropriateness Criteria® radiographically detected solitary pulmonary nodule.*J Thorac Imaging*. 2013;28(1):W1-W3. doi:10.1097/RTI.0b013e31827657c8.
6. Liang TI and Lee EY. Pediatric Pulmonary Nodules. Imaging Guidelines and Recommendations. *Radiol Clin N Am*. 2022;60:55-67.

Positive PPD or Tuberculosis (PEDCH-9)

Guideline Page

Positive PPD or Tuberculosis (PEDCH-9.1)

CHP.TB.0009.1.A

v1.0.2025

- Positive PPD and tuberculosis imaging indications in pediatric individuals are similar to those for adult individuals.
  - See **PPD or TB (Mycobacterium tuberculosis and Nontuberculous Mycobacterial Pulmonary Disease [NTM-PD]) (CH-14.1)** in the Chest Imaging Guidelines.
- Pediatric-specific imaging considerations include the following:
  - MRI Spine with and without contrast is appropriate at symptomatic levels in individuals with concern for spinal involvement of tuberculosis.

Background and Supporting Information

- Chest x-ray can be useful as the initial imaging study when TB is suspected[5]

References (PEDCH-9)

v1.0.2025

1. Cameron LH, Starke, JR. Chapter 242: Tuberculosis (Mycobacterium tuberculosis). In: Kliegman RM, St. Geme JW III, Blum NJ, Shah SS, Tasker RC, Wilson KM, eds. *Nelson Textbook of Pediatrics*. 21st ed. 2020:1564-1582.
2. Sodhi KS, Bhalla AS, Mahomed N, Laya BF. Imaging of thoracic tuberculosis in children: current and future directions. *Pediatr Radiol*. 2017;47(10):1260-1268. doi: 10.1007/s00247-017-3866-1.
3. Skoura E, Zumla A, Bomanji J. Imaging in tuberculosis. *Int J Infect Dis*. 2015;32:87-93. doi: 10.1016/j.ijid.2014.12.00.7
4. Concepcion NDP, Laya BF, Andronikou S, et al. Standardized radiographic interpretation of thoracic tuberculosis in children. *Pediatr Radiol*. 2017;47(10):1237-1248. doi: 10.1007/s00247-017-3868-z.
5. Andronikou S, Miranda-Schaeubinger M, Goussard P, et al. Changes in the Role of Chest Radiographs for Diagnosing and Managing Children with Tuberculosis: the 2022 World Health Organization Consolidated Guidelines on Tuberculosis. *Pediatr Radiology*. 2023;53:566-570. doi. 10.1007/s00247-022-05544-y.

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Asthma (PEDCH-10)

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Asthma (PEDCH-10.1)

CHP.AS.0010.1.A

v1.0.2025

- Chest x-ray and/or Ultrasound chest (CPT® 76604) is indicated when the individual's condition does not respond to standard therapy, to identify complications, such as pneumonia or to rule out other causes of respiratory distress.
- Advanced imaging is not indicated for routine evaluation or monitoring of asthma, but CT Chest without (CPT® 71250) or with (CPT® 71260) contrast is appropriate for the following:
  - pleural effusion or empyema on recent chest x-ray
  - immunocompromised individual with acute pulmonary symptoms
  - abnormality on recent chest x-ray suggesting condition other than asthma, including suspected foreign body
  - asthma and poor response to bronchodilators or conventional inhaled corticosteroid therapy in whom associated conditions, such as allergic bronchopulmonary aspergillosis and eosinophilic pneumonia can mimic asthma

References (PEDCH-10)

v1.0.2025

1. Liu AH, Spahn JD, and Sicherer SH. Chapter 169: Childhood asthma. In: Kliegman RM, St. Geme JW III, Blum NJ, Shah SS, Tasker RC, Wilson KM, eds. *Nelson Textbook of Pediatrics*. 21st ed. 2020:1186-1209.
2. Ash SY, Diaz AA. The role of imaging in the assessment of severe asthma. *Curr Opin Pulmon Med*. 2017;23(1):97-102. doi: 10.1097/mcp.0000000000000341.
3. Allie EH, Dingle HE, Johnson WN, et al. ED chest radiography for children with asthma exacerbation is infrequently associated with change of management. *Am J Emerg Med*. 2018;36(5):769-773. doi: 10.1016/j.ajem.2017.10.009.
4. Darras KE, Roston AT, Yewchuk LK. Imaging Acute Airway Obstruction in Infants and Children. *RadioGraphics*. 2015;35(7):2064-2079. doi: 10.1148/rg.2015150096.
5. *American College of Radiology ACR Appropriateness Criteria*® Pneumonia in the Immunocompetent Child. New 2019.

Pectus Deformities (PEDCH-11)

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Pectus Deformities (PEDCH-11.1)

CHP.PD.0011.1.A

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- CT Chest without contrast (CPT® 71250), MRI Chest with and without contrast (CPT® 71552), or MRI Chest without contrast (CPT® 71550) is indicated in individuals with a pectus deformity for:
  - preoperative planning
  - significant cardiac displacement after chest x-ray and echocardiography (CPT® 93306)
  - evidence of pulmonary impingement after chest x-ray and pulmonary function tests (PFTs) if there is increasing shortness of breath
    - Note: It may not be possible to obtain PFTs in individuals younger than 9 years old.
  - evaluation of congenital heart disease or Marfan's syndrome when suspected in those individuals with pectus deformities

References (PEDCH-11)

v1.0.2025

1. Buziashvili D, Gopman JM, Weissler H, Bodenstein L, Kaufman AJ, Taub PJ. An Evidence-Based Approach to Management of Pectus Excavatum and Carinatum. *Ann Plast Surg*. 2019;82(3):352-358. doi: 10.1097/sap.0000000000001654.
2. Frantz FW. Indications and guidelines for pectus excavatum repair. *Curr Opin Pediatr.* 2011;23(4):486-491.
3. Koumbourlis AC. Chest wall abnormalities and their clinical significance in childhood. *Paediatr Resp Rev*. 2014;15(3):246-255.
4. Dore M, Junco PT, Bret M, et al. Advantages of cardiac magnetic resonance imaging for severe pectus excavatum assessment in children. *Eur J Pediatr Surg*. 2017.
5. Marcovici PA, Losasso BE, Kruk P, Dwek JR. MRI for the evaluation of pectus excavatum. *Pediatr Radiol*. 2011;41(6):757-758. doi: 10.1007/s00247-011-2031-5.
6. Junco PT, Bret M, Cervantes MG, et al. Advantages of Cardiac Magnetic Resonance Imaging for Severe Pectus Excavatum Assessment in Children. *Eur J Pediatr Surg*. 2017;28(01):034-038. doi: 10.1055/s-0037-1604427.
7. Sun J, Chen C, Peng Y, et al. Comparison of magnetic resonance imaging and computed tomography to measure preoperative parameters of children with pectus excavatum.*Pediatr Investig*. 2019;3(2):102-109. Published 2019 Jun 25. doi:10.1002/ped4.12132.

Breast Masses (PEDCH-12)

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Breast Masses (PEDCH-12.1)

CHP.MS.0012.1.A
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See **Pediatric Breast Masses (PEDONC-17)** in the Pediatric Oncology Imaging Guidelines.

Vascular Malformations (PEDCH-13)

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Vascular Ring (PEDCH-13.1)

CHP.VM.0013.1.A
v1.0.2025

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 individuals with respiratory symptoms. A chest x-ray is not needed for individuals diagnosed with a vascular ring on prenatal imaging studies.
- Barium esophagram is the recommended initial study in individuals with feeding difficulties.
- CT Chest with contrast (CPT® 71260), CTA Chest (CPT® 71275) or MRA Chest (CPT® 71555) in individuals with known or suspected vascular ring after prenatal imaging studies, chest x-ray, or barium esophagram.
- Echocardiogram is appropriate to rule out associated congenital heart disease.
  - CPT® 93303, CPT® 93306, CPT® 93320, and CPT® 93325 is appropriate for initial evaluation of individuals with vascular ring and no prior echocardiograms.

Other Vascular Malformations (PEDCH-13.2)

CHP.VM.0013.2.A
v1.0.2025

See **Pulmonary Arteriovenous Malformations (PEDCH-14.2)** for Pulmonary AVMs.

See **Vascular Anomalies (PEDPVD-2)** in the Pediatric Peripheral Vascular Disease Imaging Guidelines.

References (PEDCH-13)

v1.0.2025

1. Licari A, Manca E, Rispoli GA, et al. Congenital vascular rings: a clinical challenge for the pediatrician. *Pediatr Pulmonol*. 2015;50 (5): 511-524.
2. Poletto E, Mallon MG, Stevens RM, et al. Imaging review of aortic vascular rings and pulmonary sling. *J Am Osteopath Coll Radiol*. 2017;6(2): 5-14.
3. Hanneman K, Newman B, Chan F. Congenital Variants and Anomalies of the Aortic Arch. *RadioGraphics*. 2017;37(1):32-51. doi: 10.1148/rg.2017160033.
4. Etesami M, Ashwath R, Kanne J, Gilkeson RC, Rajiah P. Computed tomography in the evaluation of vascular rings and slings. *Insights Imaging*. 2014;5(4):507-521. doi: 10.1007/s13244-014-0343-3.
5. Backer CL, Mongé MC, Popescu AR, Eltayeb OM, Rastatter JC, Rigsby CK. Vascular rings. *Semin Pediatr Surg*. 2016;25(3):165-175. doi: 10.1053/j.sempedsurg.2016.02.009.
6. Sommburg O, Helling-Bakki A, Alrajab A, et al. Assessment of Suspected Vascular Rings and Slings and/or Airway Pathologies Using Magnetic Resonance Imaging Rather Than Computed Tomography. *Respiration*. 2018;97(2):108-118. doi: 10.1159/000492080.
7. Hart A, Lee EY. Pediatric Chest Disorders: Practical Imaging Approach to Diagnosis. *IDKD Springer Series Diseases of the Chest, Breast, Heart and Vessels*. 2019-2022. 2019:107-125. doi:10.1007/978-3-030-11149-6_10.

Congenital Chest Diseases (PEDCH-14)

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Congenital Cystic Lung Diseases (PEDCH-14.1)

CHP.CD.0014.1.A
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- This section includes common congenital cystic lung lesions such as:
  - bronchogenic cyst
  - congenital pulmonary airway malformation (congenital cystic adenomatoid malformation)
  - congenital lobar overinflation
- CT Chest with contrast (CPT® 71260) is appropriate when a cystic lung lesion is suspected.
- MRI Chest with and without contrast (CPT® 71552) is appropriate if CT is inconclusive or if requested for pre-operative planning.

Background and Supporting Information

- Cystic lung disease may be first identified on prenatal ultrasound, or discovered incidentally on chest x-ray.

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Pulmonary Arteriovenous Malformations (PEDCH-14.2)

CHP.CD.0014.2.A

v1.0.2025

- Pulmonary arteriovenous malformations (PAVMs) are vascular structures that most commonly result from abnormal communication between pulmonary arteries and pulmonary veins.
  - Chest x-ray are indicated as an initial imaging modality for individuals with known AVMs, or individuals presenting with hypoxemia and/or hemoptysis.
  - CTA or MRA is appropriate in individuals with known AVM or abnormal chest x-ray suggesting AVM for treatment planning.

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Congenital Diaphragmatic Hernia (PEDCH-14.3)

CHP.CD.0014.3.A

v1.0.2025

- Congenital Diaphragmatic hernia (CDH) is a defect in the diaphragm which may allow the abdominal organs to enter the chest cavity, and may lead to compromised pulmonary function or may be associated with congenital heart disease.
  - Over 90% of the hernias occur in the posterolateral diaphragm (Bochdalek hernia) typically on the left side.
  - Most of the rest of the hernias are in the anteromedial diaphragm (Morgagni hernia).
- The vast majority of CDH are diagnosed prenatally (see **Fetal MRI [PV-15.1]**) in the Pelvis Imaging Guidelines), or as an inpatient shortly after delivery.
- If there is clinical concern for CDH, chest x-ray and/or US Chest (CPT® 76604) is indicated as the initial imaging study.
- CT Chest with contrast (CPT® 71260) or MRI Chest with and without contrast (CPT® 71552) is appropriate when chest x-ray and/or US are inconclusive, or if requested for treatment planning.[11]

References (PEDCH-14)

v1.0.2025

1. Chowdhury MM, Chakraborty S. Imaging of congenital lung malformations. *Semin Pediatr Surg*. 2015;24(4):168-175.
2. Blatter JA, Finder JD. Chapter 423: Congenital Disorders of the Lung. In: Kliegman RM, St. Geme JW III, Blum NJ, Shah SS, Tasker RC, Wilson KM, eds. *Nelson Textbook of Pediatrics*. 21st ed. 2020.
3. Liszewski MC, Lee EY. Neonatal Lung Disorders: Pattern Recognition Approach to Diagnosis. *AJR Am J Roentgenol*. 2018;210(5):964-975. doi: 10.2214/ajr.17.19231.
4. Hanley M, Ahmed O, Chandra A, et al. ACR Appropriateness Criteria Clinically Suspected Pulmonary Arteriovenous Malformation. *J Am Coll Radiol*. 2016;13(7):796-800. do: 10.1016/j.jacr.2016.03.020.
5. Hosman AE, Gussem EMD, Balemans WAF, et al. Screening children for pulmonary arteriovenous malformations: Evaluation of 18 years of experience. *Pediatr Pulmonol*. 2017;52(9):1206-1211. doi: 10.1002/ppul.23704.
6. Restrepo R, Lee EY. Chapter 61: The Diaphragm. In: Coley B, Saunders E., eds. *Caffey's Pediatric Diagnostic Imaging*. Philadelphia PA. 2013:587-592.
7. Ahlfeld SK. Chapter 122.10: Diaphragmatic Hernia. In: Kliegman RM, St. Geme JW III, Blum NJ, Shah SS, Tasker RC, Wilson KM, eds. *Nelson Textbook of Pediatrics*. 21st ed. 2020:944-946.
8. Karmazyn B, Shold AJ, Delaney LR, et al. Ultrasound evaluation of right diaphragmatic eventration and hernia. *Pediatr Radiol*. 2019;49(8):1010-1017. doi: 10.1007/s00247-019-04417-1.
9. Corsini I, Parri N, Coviello C, Leonardi V, Dani C. Lung ultrasound findings in congenital diaphragmatic hernia. *Eur J Pediatr*. 2019;178(4):491-495. doi: 10.1007/s00431-019-03321-y.
10. Brown, B., Eklund, M., Mehollin-Ray, A. Congenital Diaphragmatic Hernia. In: Otero, H.J., Kaplan, S.L., Medina, L.S., Blackmore, C.C., Applegate, K.E., eds. *Evidence-Based Imaging in Pediatrics. Evidence-Based Imaging*. Springer, Cham. Published online 2022 Nov;1-7. doi: 10.1007/978-3-030-38095-3_45-1.

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