Cigna Medical Coverage Policies – Radiology
Chest Imaging Guidelines

Effective May 17, 2024

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.

Table of Contents

Guideline Page

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

General Guidelines (CH-1)

Abbreviations for Chest Guidelines

CH.GG.Abbreviations.A
v2.0.2024

Abbreviations for Chest Guidelines	
AAA	abdominal aortic aneurysm
ACE	angiotensin-converting enzyme
AVM	arteriovenous malformation
BP	blood pressure
CAD	computer-aided detection
CBC	Complete blood count
COPD	chronic obstructive pulmonary disease
CT	computed tomography
CTA	computed tomography angiography
CTV	computed tomography venography
DVT	deep venous thrombosis
ECG	electrocardiogram
EM	electromagnetic
EMG	electromyogram
FDA	Food and Drug Administration
FDG	fluorodeoxyglucose
FNA	fine needle aspiration
GERD	gastroesophageal reflux disease
GI	gastrointestinal
HRCT	high resolution computed tomography
IPF	idiopathic pulmonary fibrosis
LFTP	localized fibrous tumor of the pleura
MRA	magnetic resonance angiography
MRI	magnetic resonance imaging
MRV	magnetic resonance venography
NCV	nerve conduction velocity
PE	pulmonary embolus
PET	positron emission tomography
PFT	pulmonary function tests

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924

Abbreviations for Chest Guidelines	
PPD	purified protein derivative of tuberculin
RODEO	Rotating Delivery of Excitation Off-resonance MRI
SPN	solitary pulmonary nodule
SVC	superior vena cava

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

General Guidelines (CH-1.0)

CH.GG.0001.0.A
v2.0.2024

- A pertinent clinical evaluation since the onset or change in symptoms is required prior to considering advanced imaging.
  - A pertinent clinical evaluation should include the following:
    - A detailed history and physical examination
    - Appropriate laboratory studies and basic imaging, such as plain radiography or ultrasound
      - A recent chest x-ray since the onset or change in symptoms that has been over read by a radiologist would be performed in many of these cases prior to considering advanced imaging.[1,2]
        - Identify and compare with previous chest films to determine presence and stability.
  - For an established individual 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.

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

General Guidelines – Chest X-Ray (CH-1.1)

CH.GG.0001.1.A
v2.0.2024

- Chest x-ray can help identify previously unidentified disease and direct proper advanced imaging for such conditions as:
  - Pneumothorax (See **Pneumothorax/Hemothorax (CH-19.1)**)
  - Pneumomediastinum (See **Pneumothorax/Hemothorax (CH-19.1)**
  - Fractured ribs (See **Chest Trauma (CH-21.1)**)
  - Chest wall mass (See **Chest Wall Mass (CH-22.1)**)
  - Acute and chronic infections (See **Pneumonia and Coronavirus Disease 2019 (COVID-19) (CH-13)** and **Other Chest Infections (CH-14)**)
  - Malignancies
- Exceptions to preliminary chest x-ray include such conditions as:
  - Supraclavicular lymphadenopathy (See **Supraclavicular Region (CH-2.1)**)
  - Known Bronchiectasis (See **Bronchiectasis (CH-7.1)**)
  - Suspected Interstitial lung disease (See **Interstitial Lung Disease (ILD)/Diffuse Lung Disease (DLD) (CH-11.1)**)
  - Positive PPD or tuberculosis (See **Other Chest Infections (CH-14)**)
  - Suspected Pulmonary AVM (See **Pulmonary Hypertension (CH-26.1)**)

General Guidelines – Chest Ultrasound (CH-1.2)

CH.GG.0001.2.A
v2.0.2024

- Chest ultrasound (CPT® 76604) includes transverse, longitudinal, and oblique images of the chest wall with measurements of chest wall thickness, and also includes imaging of the mediastinum.
  - Chest ultrasound:
    - CPT® 76604
  - Breast ultrasound:
    - CPT®76641: unilateral, complete.
    - CPT®76642: unilateral, limited.
    - CPT®76641 and CPT®76642 should be reported only once per breast, per imaging session
  - Axillary ultrasound:
    - CPT® 76882 (unilateral); if bilateral, can be reported as CPT® 76882 x 2

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

General Guidelines – CT Chest (CH-1.3)

CH.GG.0001.3.A
v2.0.2024

- Intrathoracic abnormalities found on chest x-ray, fluoroscopy, CT Abdomen, or other imaging modalities can be further evaluated with CT Chest with contrast (CPT® 71260).
- CT Chest without contrast (CPT® 71250) can be used for the following:
  - Individual has contraindication to contrast
  - Follow-up of pulmonary nodule(s)
  - High Resolution CT (HRCT)
- Low-dose CT Chest (CPT® 71271) See **Lung Cancer Screening (CH-33)**
- CT Chest without and with contrast (CPT® 71270) does not add significant diagnostic information above and beyond that provided by CT Chest with contrast, unless a question regarding calcification, most often within a lung nodule, needs to be resolved.[1]

CT Chest Coding Notes:

- High resolution CT Chest should be reported only with an appropriate code from the set CPT® 71250-CPT® 71270.
  - No additional CPT® codes should be reported for the “high resolution” portion of the scan. The “high resolution” involves additional slices which are not separately billable.

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

General Guidelines – CTA Chest (CPT® 71275) (CH-1.4)

CH.GG.0001.4.A
v2.0.2024

- CTA Chest (CPT® 71275) can be considered for suspected Pulmonary Embolism and Thoracic Aortic disease.
  - CTA prior to minimally invasive or robotic surgery (See **Transcatheter Aortic Valve Replacement (TAVR) (CD-4.8)** in the Cardiac Imaging Guidelines).

General Guidelines – MRI Chest without and with Contrast (CPT® 71552) (CH-1.5)

CH.GG.0001.5.A
v2.0.2024

- Indications for MRI Chest are infrequent and may relate to concerns about CT contrast such as renal insufficiency or contrast allergy. MRI may be indicated:
  - Clarification of some equivocal findings on previous imaging studies, which are often in the thymic mediastinal region or determining margin (vascular/soft tissue) involvement with tumor and determined on a case-by-case basis.
    - Certain conditions include:
      - Chest wall mass (See **Chest Wall Mass (CH-22.1)**)
      - Chest muscle tendon injuries (See **Muscle/Tendon Unit Injuries/Diseases (MS-11.1)** in the Musculoskeletal Imaging Guidelines)
      - Pectoralis tendon rupture (See **Shoulder (MS-19)**)
      - Brachial plexopathy (See **Brachial Plexus (PN-4.1)** in the Peripheral Nerve Disorders Imaging Guidelines)
      - Thymoma (See **Thymoma and Thymic Carcinoma - Suspected/Diagnosis (ONC-10.5)** in the Oncology Imaging Guidelines)

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

Navigational Bronchoscopy (CH-1.7)

CH.GG.0001.7.A
v2.0.2024

- CPT® 76497 (Unlisted CT procedure) can be considered if:
  - A CT Chest has been performed within the last 6 weeks and study is needed for navigational bronchoscopy.
- CT Chest without contrast (CPT® 71250) can be considered for:
  - Previous diagnostic scan was ≥6 weeks ago and study is needed for navigational bronchoscopy

Background and Supporting Information

- Navigational Bronchoscopy: This is a form of guided bronchoscopy. A special sensor inside a bronchoscopy is used to navigate to the desired location within the lung. Computer software generates a virtual bronchial tree which provides a road map to the target lesion. A thin-cut CT Chest with optimized reconstruction parameters is required to generate the virtual map of the lungs. A previous CT Chest may not be usable for navigation if it was not formatted correctly, even if done just a few days prior.

References (CH-1)

v2.0.2024

1. Raoof S, Feigin D, Sung A, Raoof S, Irugulpati L, Rosenow EC 3rd. Interpretation of plain chest roentgenogram. *Chest*. 2012;141(2):545-558. doi:10.1378/chest.10-1302
2. Eisen LA, Berger JS, Hegde A, Schneider RF. Competency in chest radiography. A comparison of medical students, residents, and fellows. *J Gen Intern Med*. 2006;21(5):460-465. doi:10.1111/j.1525-1497.2006.00427.x
3. Rawson JV, Pelletier AL. When to Order a Contrast-Enhanced CT. *Am Fam Physician*. 2013;88(5):312-316.
4. *RECOMMENDED CT SCAN and RECONSTRUCTION PARAMETERS SUPPLEMENT*. https://www.medtronic.com/content/dam/covidien/library/us/en/product/interventional-lung-solutions/illumisite-platform-scan-parameters-information-sheet.pdf
5. Gildea TR, Mazzone PJ, Karnak D, Meziane M, Mehta AC. Electromagnetic navigation diagnostic bronchoscopy: a prospective study. *Am J Respir Crit Care Med*. 2006;174(9):982-989. doi:10.1164/rccm.200603-344OC
6. Mehta AC, Hood KL, Schwarz Y, Solomon SB. The Evolutional History of Electromagnetic Navigation Bronchoscopy: State of the Art. *Chest*. 2018;154(4):935-947. doi:10.1016/j.chest.2018.04.029

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

Lymphadenopathy (CH-2)

Supraclavicular Region (CH-2.1)

CH.LA.0002.1.A
v2.0.2024

- Ultrasound (CPT® 76536) is the initial study for palpable or suspected lymphadenopathy.
  - Allows simultaneous ultrasound-guided core needle biopsy (CPT® 76942)
  - CT Neck with contrast (CPT® 70491) or CT Chest with contrast (CPT® 71260) if ultrasound is indeterminate
    - See **General Guidelines (Neck-1.0)** in the Neck Imaging Guidelines

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

Axillary Lymphadenopathy (and Mass) (CH-2.2)

CH.LA.0002.2.A
v2.0.2024

- There is no evidence-based support for advanced imaging of clinically evidenced axillary lymphadenopathy prior to a biopsy.[2,3] If axillary node biopsy reveals benign findings, advanced imaging is not indicated. If axillary node biopsy reveals findings concerning for malignancy, pathology results will determine the need for further advanced imaging. See **Carcinoma of Unknown Primary Site (ONC-31.7)** in the Oncology imaging Guidelines for imaging recommendations for carcinoma found in an axillary lymph node.
- Localized axillary lymphadenopathy:
  - Axillary US (CPT® 76882)
    - Initial evaluation of any axillary mass or enlarged node
  - Search for adjacent hand or arm injury or infection, and
  - 3-4 week observation if benign clinical picture (for ipsilateral COVID vaccination-related adenopathy, observation for 12 or more weeks is recommended)[4]. Follow-up imaging with ultrasound can be obtained if there is a significant risk of metastatic adenopathy (e.g., breast, head and neck, upper extremity/trunk melanoma or lymphoma[5])
    - If axillary adenopathy is unchanged, then consider additional follow up 6 months after initial presentation[4]
  - Ultrasound directed core needle biopsy or surgical excisional biopsy of the most abnormal lymph node if condition persists, or malignancy is suspected, or surgical excisional biopsy if core needle biopsy results are non-diagnostic.
  - No advanced imaging indicated.
- Generalized axillary lymphadenopathy:
  - Axillary US (CPT® 76882)
    - Initial evaluation of any axillary mass or enlarged node
  - Ultrasound directed core needle biopsy or surgical excisional biopsy of the most abnormal lymph node if condition persists, if malignancy is suspected, or surgical excisional biopsy if core needle biopsy results are non-diagnostic.
  - Diagnostic work-up, including serological tests, for systemic diseases
  - See **Non-Hodgkin Lymphomas (ONC-27)** in the Oncology Imaging Guidelines.
- Occult Primary Cancer in axillary lymph node(s):
  - See **Metastatic Cancer, Carcinoma of Unknown Primary Site, and Other Types of Cancer (ONC-31)** in the Oncology Imaging Guidelines.

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

Background and Supporting Information

- Adenocarcinoma is the most common histology, with breast cancer seen most often; non-palpable breast cancer and axillary metastases accounts for less than 0.5% of all breast cancers. Carcinomas of the lung, thyroid, stomach, colon, rectum, and pancreas have the potential to spread to axillary lymph nodes, but these metastases are rarely the first manifestations of disease.
- COVID-19 vaccine-related unilateral axillary adenopathy has been well documented to occur in 12% of recipients after the first dose and up to 16% after the second dose.[1] In some series the incidence has been as high as 53%.[2] Adenopathy usually develops within the first few days after vaccination and lasts a mean of 10 days. However, 29% had lymphadenopathy which persisted >6 weeks.[3] PET-CT can provide false positive results of unilateral axillary adenopathy up to 7-10 weeks post vaccination. Due to these concerns, in individuals with cancer history it is recommended that the vaccination be provided in the contralateral arm, especially in case of unilateral breast cancer.
- The Society for Breast Imaging (SBI) recommends that for unilateral axillary adenopathy on screening exams who received a recent COVID-19 vaccination in the ipsilateral upper extremity, a follow up interval of 12 or more weeks is recommended. If axillary adenopathy persists after short term follow up, then consider lymph node sampling to exclude breast and non-breast malignancy.[4] Imaging for urgent cancer related clinical indication should not be delayed in relationship to COVID vaccine timing. For routine surveillance, screening and similar non-urgent indications, postponement of imaging for at least 6 weeks after vaccinations should be considered.[5] However, the SBI no longer recommends delaying screening mammograms around COVID-19 vaccinations.[4, 5]

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

Mediastinal Lymphadenopathy (CH-2.3)

CH.LA.0002.3.A
v2.0.2024

- CT Chest with contrast (CPT® 71260) if mediastinal abnormalities are detected on a chest x-ray (over read by a radiologist), other non-dedicated advanced chest imaging, or clarification of mediastinal abnormalities on a non-contrast CT Chest.
  - Follow-up CT Chest (CPT® 71260) after 3-6 months if:
    - Enlarged lymph nodes, ≥15 mm, are in the mediastinum with no other thoracic abnormalities; and
    - Low risk or no clinical suspicion for malignancy.
    - Thereafter, stability or decreasing size, does not require further advanced imaging.
  - Further evaluations:
    - Lymph node biopsy (see methods below) should be considered for:
      - Persistent or increasing lymphadenopathy on follow-up CT Chest; or
      - Suspected malignancy.
      - See **Non-Hodgkin Lymphomas (ONC-27)** and/or **Hodgkin Lymphoma (ONC-28)** in the Oncology Imaging Guidelines for suspicion of Lymphoma
- PET/CT (CPT® 78815) can be considered for enlarged lymph nodes, ≥15 mm with no explainable disease or increasing lymph node size on follow-up CT Chest

Background and Supporting Information

- Incidentally detected lymph nodes <15 mm (in short axis) in individuals with no other findings do not require further evaluation.
- Most benign nodes have smooth and well-defined borders, show uniform and homogeneous attenuation, and demonstrate a central fatty hilum
- Explainable disease such as emphysema, interstitial lung disease, sarcoidosis, cardiac disease.
- Unexplained causes, consider lymphoma, undiagnosed metastatic disease, including testicular carcinoma in young male, and infection.
- Lymphadenopathy from neoplasms as well as from benign sources of inflammation can result in a positive PET scan. Therefore, the use of PET may not be helpful prior to histologic diagnosis.
- Less invasive methods of mediastinal biopsies are CT or ultrasound directed percutaneous biopsy, transbronchial biopsy, transbronchial biopsy using endobronchial ultrasound, and endoscopic ultrasound-guided FNA.
- More invasive and traditional methods are mediastinoscopy or thoracoscopy/thoracotomy.

References (CH-2)

v2.0.2024

1. Mehta N, Sales RM, Babagbemi K, et al. Unilateral axillary Adenopathy in the setting of COVID-19 vaccine. *Clin Imaging*. 2021;75:12-15. doi:10.1016/j.clinimag.2021.01.016
2. Eifer M, Tau N, Alhoubani Y, et al. COVID-19 mRNA Vaccination: Age and Immune Status and Its Association with Axillary Lymph Node PET/CT Uptake. *J Nucl Med*. 2022;63(1):134-139. doi:10.2967/jnumed.121.262194
3. Garreffa E, Hamad A, O'Sullivan CC, et al. Regional lymphadenopathy following COVID-19 vaccination: Literature review and considerations for patient management in breast cancer care. *Eur J Cancer*. 2021;159:38-51. doi:10.1016/j.ejca.2021.09.033
4. Grimm L, Destounis S, Dogan B, et al. Revised SBI Recommendations for the Management of Axillary Adenopathy in Patients with Recent COVID-19 Vaccination Society of Breast Imaging Patient Care and Delivery Committee. https://assets-002.noviams.com/novi-file-uploads/sbi/pdfs-and-documents/policy-and-position-statements/2022/SBI-recommendations-for-managing-axillary-adenopathy-post-COVID-vaccination_updatedFeb2022.pdf.
5. Becker AS, Perez-Johnston R, Chikarmane SA, et al. Multidisciplinary Recommendations Regarding Post-Vaccine Adenopathy and Radiologic Imaging: *Radiology* Scientific Expert Panel. *Radiology*. 2021;300(2):E323-E327. doi:10.1148/radiol.2021210436
6. van Overhagen H, Brakel K, Heijenbrok MW, et al. Metastases in supraclavicular lymph nodes in lung cancer: assessment with palpation, US, and CT. *Radiology*. 2004;232(1):75-80. doi:10.1148/radiol.2321030663
7. Lehman CD, DeMartini W, Anderson BO, Edge SB. Indications for breast MRI in the patient with newly diagnosed breast cancer. *J Natl Compr Canc Netw.* 2009;7(2):193-201. doi:10.6004/jnccn.2009.0013
8. Yamaguchi H, Ishikawa M, Hatanaka K, Uekusa T, Ishimaru M, Nagawa H. Occult breast cancer presenting as axillary metastases. *Breast*. 2006;15(2):259-262. doi:10.1016/j.breast.2005.04.018
9. Stigt JA, Boers JE, Oostdijk AH, van den Berg JW, Groen HJ. Mediastinal incidentalomas. *J Thorac Oncol*. 2011;6(8):1345-1349. doi:10.1097/JTO.0b013e31821d41c8
10. English BS, Ray CE, Chang JY, et al. Expert Panel on Interventional Radiology. ACR Appropriateness Criteria® Radiologic Management of Thoracic Nodules and Masses. Am Coll Radiol (ACR); Date of Origin: 1996. Revised: 2015. https://acsearch.acr.org/docs/69343/Narrative/
11. Munden RF, Carter BW, Chiles C, et al. Managing Incidental Findings on Thoracic CT: Mediastinal and Cardiovascular Findings. A White Paper of the ACR Incidental Findings Committee. *J Am Coll Radiol*. 2018;15(8):1087-1096. doi:10.1016/j.jacr.2018.04.029

Cough (CH-3)

Cough (CH-3.1)

CH.CH.0003.1.C
v2.0.2024

- Initial evaluation should include a recent chest x-ray after the current episode of cough started or changed.[1,2]
  - In addition all medications known to cause coughing (e.g. ACE inhibitors, Sitagliptin) should be discontinued.[1,2,3]
- CT Chest (either with contrast [CPT® 71260] or without contrast [CPT® 71250]), if the initial chest x-ray is without abnormalities and all medications known to cause coughing have been discontinued, for the following:
  - Non-Smoker cough after the following sequence for a total 3-week trial and investigation after ALL of the following:[4]
    - Antihistamine and decongestant or intranasal glucocorticoid treatment.[1,2,7]
    - Spirometry and/or pulmonary function tests (PFT's).[1,4,8]
    - Empiric trial of corticosteroids (oral or inhaled) and/or leukotriene receptor antagonist (e.g. Montelukast).[1,2,4,8,9]
    - Treatment of gastroesophageal reflux disease (GERD).[1,2,4,8,9]
      - See **Sinus and Facial Imaging (HD-29.1)** in the Head Imaging Guidelines.
  - Current or past cigarette smokers with either:[4]
    - New cough lasting greater than 2 weeks.
    - Changed chronic cough in worsening frequency or character
      - See **Hemoptysis (CH-6.1)**
  - For any abnormalities present on the initial chest x-ray, advanced chest imaging can be performed according to the relevant Chest Imaging Guidelines section.[1]
- CT Maxillofacial without contrast (CPT® 70486) or CT Sinus, limited without contrast (CPT® 76380) is indicated in those with suspicion of Upper Airway Cough Syndrome (UACS) in the following:[4,5,6]
  - Clinical criteria for chronic rhinosinusitis (CRS) or acute/recurrent rhinosinusitis are met, as per **Sinus and Facial Imaging (HD 29.1)**; **OR** ALL of the following:
    - At least a one week trial of daily antihistamine/decongestant
    - Initial evaluation with a chest x-ray and/or CT Chest after the current episode of cough started or changed
    - All medications known to cause cough have been discontinued

Background and Supporting Information

- The resolution of cough usually will occur at a median time of 26 days of stopping use of the angiotensin-converting enzyme (ACE) inhibitor drug.[2] Smoking cessation is “almost always effective” in resolving cough in smoker.[2]
- Cough after URI (Upper Respiratory Infection) can typically last beyond 2-3 weeks.[3]

- Objective evidence of classic asthmatic cough conventionally requires some evidence of variable airflow obstruction such as peak flow variability, or reversibility to bronchodilator of >12-15%.[8]
- In adult patients with chronic cough suspected to be due to reflux-cough syndrome, it is recommended that treatment include (1) diet modification to promote weight loss in overweight or obese patients; (2) head of bed elevation and avoiding meals within 3 hours of bedtime; and (3) in patients who report heartburn or regurgitation, PPI's, H-2 receptor antagonists, alginate or antacid therapy sufficient to control these symptoms.[9]

References (CH-3)

v2.0.2024

1. Gibson P, Wang G, McGarvey L, et al. Treatment of Unexplained Chronic Cough: CHEST Guideline and Expert Panel Report. *Chest*. 2016;149(1):27-44.doi:10.1378/chest.15-1496
2. Pratter MR, Brightling CE, Boulet LP, Irwin RS. An empiric integrative approach to the management of cough: ACCP evidence-based clinical practice guidelines. *Chest*. 2006;129(1 Suppl):222S-231S. doi:10.1378/chest.129.1_suppl.222S
3. Ebell MH, Lundgren J, Youngpairoj S. How long does a cough last? Comparing patients' expectations with data from a systematic review of the literature. *Ann Fam Med*. 2013;11(1):5-13. doi:10.1370/afm.1430
4. Irwin RS, French CL, Chang AB, Altman KW; CHEST Expert Cough Panel*. Classification of Cough as a Symptom in Adults and Management Algorithms: CHEST Guideline and Expert Panel Report. *Chest*. 2018;153(1):196-209. doi:10.1016/j.chest.2017.10.016
5. Pratter MR. Chronic upper airway cough syndrome secondary to rhinosinus diseases (previously referred to as postnasal drip syndrome): ACCP evidence-based clinical practice guidelines. *Chest*. 2006;129(1 Suppl):63S-71S. doi:10.1378/chest.129.1_suppl.63S
6. Donaldson AM. Upper Airway Cough Syndrome. *Otolaryngol Clin North Am*. 2023;56(1):147-155. doi:10.1016/j.otc.2022.09.011
7. Dykewicz MS, Wallace DV, Amrol DJ, et al. Rhinitis 2020: A practice parameter update. *J Allergy Clin Immunol*. 2020;146(4):721-767. doi:10.1016/j.jaci.2020.07.007
8. Morice AH, Millqvist E, Bieksiene K, et al. ERS guidelines on the diagnosis and treatment of chronic cough in adults and children [published correction appears in Eur Respir J. 2020 Nov 19;56(5):]. *Eur Respir J*. 2020;55(1):1901136. Published 2020 Jan 2. doi:10.1183/13993003.01136-2019
9. Kahrilas PJ, Altman KW, Chang AB, et al. Chronic Cough Due to Gastroesophageal Reflux in Adults: CHEST Guideline and Expert Panel Report. *Chest*. 2016;150(6):1341-1360. doi:10.1016/j.chest.2016.08.1458

Non-Cardiac Chest Pain (CH-4)

Non-Cardiac Chest Pain (CH-4.0)

CH.CP.0004.0.A
v2.0.2024

- See the following guidelines:
  - **Pulmonary Embolism (PE) (CH-25.1)**
  - **General Guidelines (CD-1)** in the Cardiac Imaging Guidelines
- "Evidence is not conclusive whether Triple-rule-out CT (CAD, PE, and AD) will improve efficiency of patient management" with acute chest pain.[1]
- MRI is not supported in the evaluation of chest pain.

Non-Cardiac Chest Pain – Imaging (CH-4.1)

CH.CP.0004.1.A
v2.0.2024

- Initial evaluation should include a chest x-ray.
  - CT Chest with contrast (CPT® 71260) or CTA Chest (CPT® 71275) if x-ray is abnormal. See **Pneumonia (CH-13.1)**
- Sub-Sternal Non-Cardiac Chest Pain:
  - If x-ray is normal and the chest pain is substernal, the individual should undergo evaluation of other possible causes of pain prior to advanced imaging (CT Chest with contrast or CTA Chest) including:[1,2,3]
    - Cardiac evaluation[1,2] (See **General Guidelines (CD-1)** in the Cardiac Imaging Guidelines)
    - GI any ONE of the following since GERD is the cause in almost 60%:
      - Trial of anti-reflux medication, or pH probe, or esophageal manometry[1] or
      - Barium swallow or endoscopy
    - Pulmonary Function Test (PFT's)[1,2]
  - CT Chest with contrast (CPT® 71260) if persistent:
    - The initial chest x-ray reveals no abnormalities with known Sickle cell disease[2]
- Non-Cardiac Chest Pain, other than Sub-Sternal:
  - If x-ray is normal and the chest pain is in a location other than substernal:
    - CT Chest with (CPT® 71260) or without (CPT® 71250) contrast and/or bone scan for:
      - Known or suspected malignancy, including individuals with chest pain associated with cough and weight loss
    - CT Chest with (CPT® 71260) or without (CPT® 71250) contrast for:
      - Suspected infectious or inflammatory condition
      - History of prior chest intervention (surgery, Radiation Therapy)
    - MRI Chest without and with contrast (CPT® 71552) for:
      - Necrotizing fasciitis
      - Surgical planning prior to debridement procedures

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

Costochondritis/Other Musculoskeletal Chest Wall Syndrome (CH-4.2)

CH.CP.0004.2.C
v2.0.2024

- Costochondritis or other suggested musculoskeletal chest wall syndrome does not require advanced imaging (CT or MRI) unless it meets other criteria in these guidelines.

Background and Supporting Information

- Chest x-ray could identify pneumothorax, pneumomediastinum, fractured ribs, acute and chronic infections, and malignancies.[1]
- Costochondritis can be readily diagnosed with palpation tenderness and/or hooking maneuver and imaging is non-specific.[3]

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

References (CH-4)

v2.0.2024

1. Hoffmann U, Akers SR, Brown RK, et al. ACR Appropriateness Criteria® Acute Nonspecific Chest Pain-Low Probability of Coronary Artery Disease [published correction appears in J Am Coll Radiol. 2016 Feb;13(2):231]. *J Am Coll Radiol*. 2015;12(12 Pt A):1266-1271. doi:10.1016/j.jacr.2015.09.004
2. Expert Panel on Cardiac Imaging: Shah AB, Kirsch J, et al. ACR Appropriateness Criteria® Chronic Chest Pain-Noncardiac Etiology Unlikely-Low to Intermediate Probability of Coronary Artery Disease. *J Am Coll Radiol*. 2018;15(11S):S283-S290. doi:10.1016/j.jacr.2018.09.021
3. Proulx A, Zryd TW. Costochondritis: diagnosis and treatment. *Am Fam Physician*. 2009;80(6):617-620.
4. Expert Panel on Thoracic Imaging, Stowell JT, Walker CM, et al. ACR Appropriateness Criteria® Nontraumatic Chest Wall Pain. *J Am Coll Radiol*. 2021;18(11S):S394-S405. doi:10.1016/j.jacr.2021.08.004

Dyspnea/Shortness of Breath (CH-5)

Dyspnea/Shortness of Breath (CH-5.1)

CH.SB.0005.1.A
v2.0.2024

- Initial evaluation should include a recent chest x-ray.[1,2]
  - CT Chest without contrast (CPT® 71250) if x-ray is abnormal.[1,2]
  - CT Chest without contrast (CPT® 71250, including HRCT), or CT Chest with contrast (CPT® 71260) if the initial chest x-ray is indeterminate and the following evaluations have been conducted and are indeterminate:[2]
    - ECG, echocardiogram or stress testing,[2] and
    - Pulse oximetry and pulmonary function studies (PFT's)[2]
- If pulmonary embolus (PE) is suspected, See **Pulmonary Embolism (PE) (CH-25)**.

Background and Supporting Information

- Dyspnea is the subjective experience of breathing discomfort.

Pre-Operative Assessment (CH-5.2)

CH.SB.0005.2.A
v2.0.2024

- For pre-operative assessment prior to a planned segmental, lobar or lung removal,[3,4] as well as for pre-interventional assessment prior to a planned endobronchial valve (e.g. Zephyr valve) placement, the following can be considered:
  - "Split Function Studies" (CPT® 78597-Quantitative Differential Pulmonary Perfusion, Including Imaging When Performed or CPT® 78598-Quantitative Differential Pulmonary Perfusion and Ventilation (e.g., Aerosol or Gas), Including Imaging When Performed) or SPECT/CT (CPT® 78830)
    AND/OR
  - CT Chest (CPT® 71250, CPT® 71260 or CPT® 71270) for pre-interventional procedure assessment prior to a planned endobronchial valve (e.g. Zephyr Valve) placement.

Post Endobronchial Valve (EBV) Placement (CH-5.3)

CH.SB.0005.3.A
v2.0.2024

- Suspected Post EBV Complication:
  - Initial evaluation should include a recent chest x-ray
    - CT Chest without contrast (CPT® 71250) or CT Chest with contrast (CPT® 71260) is appropriate for:
      - Acute loss of benefit, lack of initial benefit, increased dyspnea, sudden chest pain, increased cough, suspected valve malposition/migration, or to evaluate target lobe volume reduction

References (CH-5)

v2.0.2024

1. Expert Panel on Thoracic Imaging:, McComb BL, Ravenel JG, et al. ACR Appropriateness Criteria® Chronic Dyspnea-Noncardiovascular Origin. *J Am Coll Radiol*. 2018;15(11S):S291-S301. doi:10.1016/j.jacr.2018.09.015
2. Expert Panel on Cardiac Imaging:, Vogel-Claussen J, Elshafee ASM, et al. ACR Appropriateness Criteria® Dyspnea-Suspected Cardiac Origin. *J Am Coll Radiol*. 2017;14(5S):S127-S137. doi:10.1016/j.jacr.2017.01.032
3. Morton K. Chapter 4. In: Morton K, eds. *Diagnostic Imaging: Nuclear Medicine*. Amirsys;2007:2-15.
4. Thrall JH, Ziessman HA. *Nuclear Medicine: The Requisites*. 2nd ed. Mosby; 2001:145-165.
5. Sciurba FC, Ernst A, Herth FJ, et al. A randomized study of endobronchial valves for advanced emphysema. *N Engl J Med*. 2010;363(13):1233-1244. doi:10.1056/NEJMoa0900928
6. Davey C, Zoumot Z, Jordan S, et al. Bronchoscopic lung volume reduction with endobronchial valves for patients with heterogeneous emphysema and intact interlobar fissures (the BeLieVeR-HIFi study): a randomised controlled trial. *Lancet*. 2015;386(9998):1066-1073. doi:10.1016/S0140-6736(15)60001-0
7. Klooster K, ten Hacken NH, Hartman JE, Kerstjens HA, van Rikxoort EM, Slebos DJ. Endobronchial Valves for Emphysema without Interlobar Collateral Ventilation. *N Engl J Med*. 2015;373(24):2325-2335. doi:10.1056/NEJMoa1507807
8. Kristiansen JF, Perch M, Iversen M, Krakauer M, Mortensen J. Lobar Quantification by Ventilation/Perfusion SPECT/CT in Patients with Severe Emphysema Undergoing Lung Volume Reduction with Endobronchial Valves. *Respiration*. 2019;98(3):230-238. doi:10.1159/000500407
9. Koster TD, Klooster K, Ten Hacken NHT, van Dijk M, Slebos DJ. Endobronchial valve therapy for severe emphysema: an overview of valve-related complications and its management. *Expert Rev Respir Med*. 2020;14(12):1235-1247. doi:10.1080/17476348.2020.1813571
10. Slebos DJ, Shah PL, Herth FJ, Valipour A. Endobronchial Valves for Endoscopic Lung Volume Reduction: Best Practice Recommendations from Expert Panel on Endoscopic Lung Volume Reduction. *Respiration*. 2017;93(2):138-150. doi:10.1159/000453588

Hemoptysis (CH-6)

Hemoptysis (CH-6.1)

CH.HS.0006.1.A
v2.0.2024

- Following a chest x-ray performed after hemoptysis started or worsened the following is indicated:
  - CT Chest with contrast (CPT® 71260) or CTA Chest (CPT® 71275)
- For recurrent hemoptysis, (hemoptysis occurring after medical therapy or embolization), the following is indicated:
  - CTA Chest (CPT® 71275)

NOTE:

- CT Chest without contrast, (CPT® 71250), is only warranted in individuals with poor renal function or life-threatening contrast allergy.
- There is no data to support the use of CT Chest without and with contrast, (CPT® 71270), in the diagnosis of hemoptysis.

Background and Supporting Information

- Chest x-ray has been shown to predict the side and cause of bleeding in up to 82% of individuals and can be abnormal in up to 90% of cases. The most common cause of hemoptysis was acute bronchitis with the second most common cause as respiratory tract neoplasm. Bronchiectasis and tuberculosis were additional common causes

Reference (CH-6)

v2.0.2024

1. Expert Panel on Thoracic Imaging, Olsen KM, Manouchehr-Pour S, et al. ACR Appropriateness Criteria® Hemoptysis. *J Am Coll Radiol*. 2020;17(5S):S148-S159. doi:10.1016/j.jacr.2020.01.043

Bronchiectasis (CH-7)

Bronchiectasis (CH-7.1)

CH.BR.0007.1.A
v2.0.2024

- High resolution CT Chest (HRCT) without contrast (CPT® 71250) for ANY of the following:[4,5]
  - To confirm suspected diagnosis of bronchiectasis after an initial x-ray.[1,2]
  - For known bronchiectasis with worsening symptoms or worsening PFT's.[2]
  - For hemoptysis with known or suspected bronchiectasis.[3]

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

Adult Cystic Fibrosis (CH-7.2)

CH.BR.0007.2.A
v2.0.2024

- CT Chest without contrast (CPT® 71250) or with contrast (CPT® 71260) is indicated for the following (without initial Chest x-ray):
  - Suspected or initial diagnosis of Cystic Fibrosis
  - Biennially, (every 2 years), for routine surveillance
  - Persistent respiratory symptoms with reduced lung function despite therapy
  - Exacerbations when Chest x-ray is indeterminate
  - Hemoptysis
  - Suspected fungal pneumonia
  - Pre and post-lung transplant evaluation
- See **Bronchiectasis (CH-7.1)**

References (CH-7)

v2.0.2024

1. Schneebaum N, Blau H, Soferman R, et al. Use and yield of chest computed tomography in the diagnostic evaluation of pediatric lung disease. *Pediatrics*. 2009;124(2):472-479. doi:10.1542/peds.2008-2694
2. Rosen MJ. Chronic cough due to bronchiectasis: ACCP evidence-based clinical practice guidelines. *Chest*. 2006;129(1 Suppl):122S-131S. doi:10.1378/chest.129.1_suppl.122s
3. Pasteur MC, Bilton D, Hill AT; British Thoracic Society Bronchiectasis non-CF Guideline Group. British Thoracic Society guideline for non-CF bronchiectasis. *Thorax*. 2010;65 Suppl 1:i1-i58. doi:10.1136/thx.2010.136119
4. Expert Panel on Thoracic Imaging, Olsen KM, Manouchehr-Pour S, et al. ACR Appropriateness Criteria® Hemoptysis. *J Am Coll Radiol*. 2020;17(5S):S148-S159. doi:10.1016/j.jacr.2020.01.043
5. Hansell DM. Bronchiectasis. *Radiol Clin North Am*. 1998;36(1):107-128. doi:10.1016/s0033-8389(05)70009-9
6. Ciet P, Bertolo S, Ros M, et al. State-of-the-art review of lung imaging in cystic fibrosis with recommendations for pulmonologists and radiologists from the “iMAging managEment of cySTic fibROsis” (MAESTRO) consortium. *Eur Respir Rev*. 2022;31(163):210173. Published 2022 Mar 23. doi: 10.1183/16000617.0173-2021
7. Averill S, Lubner MG, Menias CO, et al. Multisystem Imaging Findings of Cystic Fibrosis in Adults: Recognizing Typical and Atypical Patterns of Disease. *AJR Am J Roentgenol*. 2017;209(1):3-18. doi:10.2214/AJR.16.17462

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

Bronchitis (CH-8)

Bronchitis (CH-8.1)

CH.BH.0008.1.A
v2.0.2024

- Advanced imaging is not needed for bronchitis.[1,2]
- Chest x-ray to determine if any abnormality is present.

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

References (CH-8)

v2.0.2024

1. Braman SS. Chronic cough due to acute bronchitis: ACCP evidence-based clinical practice guidelines. *Chest*. 2006;129(1 Suppl):95S-103S. doi:10.1378/chest.129.1_suppl.95s
2. *Eligible Population Key Components Assessment Diagnosis Treatment Education and Counseling Approved by MQIC Medical Directors*.; 2020. http://www.mqic.org/pdf/mqic_management_of_uncomplicated_acute_bronchitis_in_adults_cpg.pdf

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

Asbestos Exposure (CH-9)

Asbestos Exposure (CH-9.1)

CH.AE.0009.1.A
v2.0.2024

- Chest x-ray as radiographic screening for asbestos exposure.[1,2]
  - Stable calcified pleural plaques on chest x-ray do not require advanced imaging of the chest.[2]
- CT Chest should not be used to screen populations at risk for asbestos-related diseases.[2]
- High resolution CT Chest (HRCT) (CPT® 71250) for ANY of the following:[2]
  - Any change seen on chest x-ray.
  - Progressive respiratory symptoms that may indicate the development or progression of asbestos related interstitial fibrosis.

Background and Supporting Information

- Asbestosis and asbestos-related diseases include: pleural effusion, pleural plaques, lung cancer, and malignant mesothelioma. The risk of developing mesothelioma increases with increasing intensity and duration of exposure.

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

References (CH-9)

v2.0.2024

1. OSHA, Occupational Safety and Health Standards, Medical surveillance guidelines for asbestos, 1910.1001 App H. https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=9995.
2. Banks DE, Shi R, McLarty J, et al. American College of Chest Physicians consensus statement on the respiratory health effects of asbestos. Results of a Delphi study. *Chest*. 2009;135(6):1619-1627. doi:10.1378/chest.08-1345
3. Agency for Toxic Substances and Disease Registry. Asbestos. Updated 2011. https://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=4.

Chronic Obstructive Pulmonary Disease (COPD) (CH-10)

COPD (CH-10.1)

CH.PD.0010.1.A
v2.0.2024

- Chest x-ray should be performed initially.
  - CT Chest without contrast (CPT® 71250) or CT Chest with contrast (CPT® 71260)[1,2] can be performed if:
    - Emphysema is known or suspected and a pre-operative study for Lung Volume Reduction Surgery (LVRS) is being requested.[1] OR
    - Definitive diagnosis is not yet determined by PFT's, appropriate laboratory studies and chest x-ray and ONE of the following is suspected:
      - Bronchiectasis
      - Sarcoidosis
      - Emphysema
      - Pneumoconiosis
      - Idiopathic pulmonary fibrosis
      - Langerhans cell histiocytosis
      - Hypersensitivity pneumonitis
      - Bronchiolitis obliterans
      - Lipoid pneumonia
      - Drug toxicity
      - Lymphangitic cancer[2]
      - Alpha-1-Antitrypsin Deficiency
- Lung cancer screening is discussed in the following guideline:
  - See "Screening Indications" in **Lung Cancer Screening (CH-33)**
- Pre-interventional lung procedure assessment prior to a planned endobronchial valve (e.g. Zephyr valve) placement
  - See **Pre-Operative Assessment (CH-5.2)**

Background and Supporting Information

- COPD includes asthmatic bronchitis, chronic bronchitis, and emphysema. COPD is airflow reduction (FEV1/FVC ratio <0.7 or FEV1 <80% predicted) in the presence of respiratory symptoms, such as dyspnea. Advanced chest imaging is not typically indicated in COPD exacerbation, which is an acute change in baseline dyspnea, cough, and/or sputum beyond normal day-to-day variations.[2]

References (CH-10)

v2.0.2024

1. Expert Panel on Thoracic Imaging:, McComb BL, Ravenel JG, et al. ACR Appropriateness Criteria® Chronic Dyspnea-Noncardiovascular Origin. *J Am Coll Radiol*. 2018;15(11S):S291-S301. doi:10.1016/j.jacr.2018.09.015
2. Austin JH. Pulmonary emphysema: imaging assessment of lung volume reduction surgery [published correction appears in Radiology 1999 Sep;212(3):912]. *Radiology*. 1999;212(1):1-3. doi:10.1148/radiology.212.1.r99jl521

Interstitial Disease (CH-11)

Interstitial Lung Disease (ILD)/Diffuse Lung Disease (DLD) (CH-11.1)

CH.ID.0011.1.A
v2.0.2024

- High resolution CT Chest (HRCT) without contrast (CPT® 71250) is the diagnostic modality of choice to evaluate or CT Chest with contrast (CPT® 71260)[10] (See **Background and Supporting Information**) for:
  - Interstitial changes or diffuse parenchymal changes identified on other imaging (including chest x-ray) in individuals with pulmonary symptoms and abnormal pulmonary function studies (PFT's) (See **Dyspnea/Shortness of Breath (CH-5.1)**)[1-6]
  - In individuals with pulmonary symptoms and abnormal pulmonary function studies (PFT's) and normal chest x-ray with high clinical suspicion for ILD or DLD, including but not limited to entities such as Hypersensitivity Pneumonitis, Cryptogenic Organizing Pneumonia (COP, formally known as BOOP), and Eosinophilic Pneumonia, as chest x-ray can be normal in up to 10% of ILD[8,9]
  - Initial imaging to identify interstitial disease with a connective tissue disease diagnosis, or significant exposures including (chest x-ray not required):
    - Rheumatoid arthritis
    - Scleroderma
    - Idiopathic inflammatory myopathies (polymyositis, dermatomyositis, inclusion body myositis)
    - Systemic lupus erythematosus
    - Sjögren's syndrome
    - Mixed connective tissue disease
    - Significant exposure and concern for:
      - Asbestosis
      - Silicosis
      - Coal miner's lung disease[1-6,11]
  - At any time for detection of Progressive Pulmonary Fibrosis (PPF), in individuals with ILD of known or unknown etiology, defined by at least one of the following:[12]
    - New or worsening respiratory symptoms
    - Worsening PFT's, defined as decline of either:
      - FVC of 5% or greater within the past year
      - DLCO of 10% or greater within the past year
  - Once a year in individuals with known pulmonary fibrosis if needed for:[10]
    - Serial examination for improvements in diagnostic accuracy, or
    - Evaluation of disease reversibility, stability, or progression.
- Concern for interstitial lung disease post-COVID See **Coronavirus Disease 2019 (COVID-19) (CH-13.2)**

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

Background and Supporting Information

- DLD refers to diffuse parenchymal lung diseases or interstitial lung diseases. There are a multitude of pathologies that demonstrate involvement of the alveola, airways, or both, in addition to the pulmonary interstitium. A single term of ILD would not fully address the entities that are mostly parenchymal in nature, hence the term Diffuse Lung Disease is more technically correct. Both terms are included here for convenience and recognition.
- There is no relevant literature to support the use of CT with IV contrast for initial or follow-up imaging of ILD; however, IV contrast may be of use in evaluation of alternative diagnoses with overlapping clinical features or conditions that also involve the pleura, mediastinum, and pulmonary vessels.
- Progression of fibrosis is typically assessed visually, relying on the percentage of lung volume containing fibrotic features in the upper, mid, and lower lung zones. An increased extent of fibrotic features denotes progression. These may include increased traction bronchiectasis and bronchiolectasis, new ground-glass opacity with traction bronchiectasis, new fine reticulation, increased coarseness of reticular abnormality, new or increased honeycombing, and increased lobar volume loss.[12]

E-cigarette, or Vaping, Product Use–Associated Lung Injury (EVALI) (CH-11.2)

CH.ID.0011.2.A
v2.0.2024

- CT Chest with or without contrast (CPT® 71250 or CPT® 71260) if EVALI is suspected.[7]

References (CH-11)

v2.0.2024

1. Expert Panel on Thoracic Imaging, Cox CW, Chung JH, et al. ACR Appropriateness Criteria® Occupational Lung Diseases. *J Am Coll Radiol*. 2020;17(5S):S188-S197. doi:10.1016/j.jacr.2020.01.022
2. Expert Panel on Thoracic Imaging:, McComb BL, Ravenel JG, et al. ACR Appropriateness Criteria® Chronic Dyspnea-Noncardiovascular Origin. *J Am Coll Radiol.* 2018;15(11S):S291-S301. doi:10.1016/j.jacr.2018.09.015
3. Misumi S, Lynch DA. Idiopathic pulmonary fibrosis/usual interstitial pneumonia: imaging diagnosis, spectrum of abnormalities, and temporal progression. *Proc Am Thorac Soc*. 2006;3(4):307-314.doi:10.1513/pats.200602-018TK
4. Bradley B, Branley HM, Egan JJ, et al. Interstitial lung disease guideline: the British Thoracic Society in collaboration with the Thoracic Society of Australia and New Zealand and the Irish Thoracic Society [published correction appears in Thorax. 2008 Nov;63(11):1029. multiple author names added]. *Thorax*. 2008;63 Suppl 5:v1-v58. doi:10.1136/thx.2008.101691
5. Dempsey OJ, Kerr KM, Remmen H, Denison AR. How to investigate a patient with suspected interstitial lung disease. *BMJ*. 2010;340:c2843. Published 2010 Jun 9. doi:10.1136/bmj.c2843
6. Castelino FV, Varga J. Interstitial lung disease in connective tissue diseases: evolving concepts of pathogenesis and management. *Arthritis Res Ther*. 2010;12(4):213. doi:10.1186/ar3097
7. https://www.cdc.gov/mmwr/volumes/68/wr/mm6846e2.htm?s_cid=mm6846e2_w.
8. Epler GR, McLoud TC, Gaensler EA, Mikus JP, Carrington CB. Normal chest roentgenograms in chronic diffuse infiltrative lung disease. *N Engl J Med*. 1978;298(17):934-939. doi: 10.1056/NEJM197804272981703
9. Raghu G, Remy-Jardin M, Ryerson CJ, et al. Diagnosis of Hypersensitivity Pneumonitis in Adults. An Official ATS/JRS/ALAT Clinical Practice Guideline [published correction appears in Am J Respir Crit Care Med. 2021 Jan 1;203(1):150-151] [published correction appears in Am J Respir Crit Care Med. 2022 Aug 15;206(4):518]. *Am J Respir Crit Care Med*. 2020;202(3):e36-e69. doi:10.1164/rccm.202005-2032ST
10. Expert Panel on Thoracic Imaging:, Hobbs SB, Chung JH, et al. ACR Appropriateness Criteria® Diffuse Lung Disease. *J Am Coll Radiol*. 2021;18(11S):S320-S329. doi:10.1016/j.jacr.2021.08.008
11. Mathai SC, Danoff SK. Management of interstitial lung disease associated with connective tissue disease. *BMJ*. 2016;352:h6819. Published 2016 Feb 24. doi:10.1136/bmj.h6819
12. Raghu G, Remy-Jardin M, Richeldi L, et al. Idiopathic Pulmonary Fibrosis (an Update) and Progressive Pulmonary Fibrosis in Adults: An Official ATS/ERS/JRS/ALAT Clinical Practice Guideline. *Am J Respir Crit Care Med*. 2022;205(9):e18-e47. doi:10.1164/rccm.202202-0399ST

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

Pneumonia and Coronavirus Disease 2019 (COVID-19) (CH-13)

Pneumonia (CH-13.1)

CH.PN.0013.1.A
v2.0.2024

- Chest x-ray should be performed initially in all individuals with suspected pneumonia, prior to considering advanced imaging.[1, 2]
  - CT Chest without or with contrast (CPT® 71250 or CPT® 71260) if initial or repeat chest x-ray findings reveal:
    - Complication of pneumonia (e.g. abscess, effusion, hypoxemia, respiratory distress, necrotizing pneumonia, pneumothorax).[1,2]
    - Possible lung mass associated with the infiltrate.[2]
- CT Chest without or with contrast (CPT® 71250 or CPT® 71260) for immunocompromised individuals with any of the following:[15]
  - High suspicion for pneumonia despite equivocal or negative CXR
  - Persistent radiographic abnormalities
  - Multiple or diffuse opacities or nodules

Coronavirus Disease 2019 (COVID-19) (CH-13.2)

CH.PN.0013.2.A
v2.0.2024

- CT Chest without contrast (CPT®71250), or with contrast (CPT®71260) in the following clinical situations:
  - Imaging for initial diagnosis:
    - Symptomatic COVID-19 positive individuals with underlying comorbidities (including but not limited to age >65 years, chronic lung disease, current or former smoker, chronic kidney disease, chronic liver disease, dementia, diabetes, Down's syndrome, HIV or other primary, secondary or acquired immunodeficiency, mood disorders, BMI ≥30, pregnancy, solid organ or blood stem cell transplant, cerebrovascular disease, substance use disorder, tuberculosis, cardiovascular disease, malignancy, bronchopulmonary dysplasia, chronic infections, or immunocompromised state). See CDC's list of higher risk for severe COVID for additional information: **https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-with-medical-conditions.html**
    - Moderate to severe symptomatic individuals with evidence of significant pulmonary dysfunction or damage (e.g., hypoxemia, moderate-to-severe dyspnea), suspected of having COVID-19, regardless of COVID-19 test results or when viral testing is not available.
    - Thromboembolic complications including pulmonary embolism, stroke and mesenteric ischemia are recognized complications of COVID-19. See **Pulmonary Embolism (CH-25.1)**, **Mesenteric Ischemia (AB-6.1)** in the Abdomen Imaging Guidelines, and **Stroke/TIA (HD-21.1)** in the Head Imaging Guidelines for appropriate imaging guidance.
    - Other systemic complications are being recognized as medical knowledge about this condition evolves. Imaging for possible COVID-19 complications should be managed by the appropriate condition based guidelines.
  - Imaging after initial diagnosis:
    - Imaging in the following clinical circumstances:
      - If there is significant worsening of symptoms in a COVID-19 positive individual and imaging will be used to modify individual management.
      - A recovered COVID-19 positive individual with significant residual functional impairment and/or persistence hypoxemia.
        - Symptomatic post-COVID individuals with concern for interstitial lung disease including organizing pneumonia imaging can be considered pre and post treatment.[11]

Background and Supporting Information

- The role of advanced imaging in the diagnosis and management of COVID-19 is very dynamic in this rapidly evolving condition.
- Findings on both Chest X-ray and CT Chest are non-specific. Chest X-rays may show patchy opacities with lower lung predominance. CT may show peripheral multifocal ground glass opacities with lower lung predominance. However, a significant portion of cases have opacities without a clear or specific distribution.[3,4,6] A reverse halo sign or other findings of organizing pneumonia may be seen later during the course of illness. Atypical findings include isolated lobar or segmental consolidation without ground glass opacities, discrete small centrilobular ("tree-in-bud") nodules, pleural effusion.[8]
  - Pediatric individuals may have less pronounced imaging findings than adults.
- CT Chest abnormalities are common 3 months after discharge in adults who have been hospitalized for COVID-19 and are associated with more severe acute disease. Fibrosis was seen in a minority of people.[13,14] Most people re-imaged at one year showed radiologic improvement.[13]
- Major professional society guidelines to date:
  - The American College of Radiology (ACR) recommends that CT Chest should not be used for screening or as a first-line test to diagnose COVID-19.[3]
  - The Centers for Disease Control and Prevention (CDC) recommends viral testing as the only specific method of diagnosis.[4]
  - The CDC has stated that symptoms may appear 2-14 days after exposure to the virus. These symptoms may include:[5]
    - Fever or chills
    - Cough
    - Shortness of breath or difficulty breathing
    - Fatigue
    - Muscle or body aches
    - Headache
    - New loss of taste or smell
    - Sore throat
    - Congestion or runny nose
    - Nausea or vomiting
    - Diarrhea
  - The Fleischner Society consensus statement published on April 7, 2020, recommends against the use of imaging in individuals with suspected COVID-19 who are either asymptomatic or have only mild symptoms without evidence of significant pulmonary dysfunction or damage (e.g., absence of hypoxemia, no or mild dyspnea).[6]
  - According to The American Society of Transplantation, screening donors is based on methods below. Screening donors encompasses three different methods.[7]

- Epidemiologic screening for travel and potential exposures
- Screening for symptoms suggestive of COVID-19
- Viral testing (Nucleic acid testing of specimens)
- There is no current indication for screening asymptomatic donors with advanced imaging

References (CH-13)

v2.0.2024

1. Mandell LA, Wunderink RG, Anzueto A, et al. Infectious Diseases Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in adults. *Clin Infect Dis*. 2007;44 Suppl 2(Suppl 2):S27-S72. doi:10.1086/511159
2. Expert Panel on Thoracic Imaging:, Jokerst C, Chung JH, et al. ACR Appropriateness Criteria® Acute Respiratory Illness in Immunocompetent Patients. *J Am Coll Radiol*. 2018;15(11S):S240-S251. doi:10.1016/j.jacr.2018.09.012
3. American College of Radiology. ACR Recommendations for the use of Chest Radiography and Computed Tomography (CT) for Suspected COVID-19 Infection. acr.org. Available at https://www.acr.org/Advocacy-and-Economics/ACR-Position-Statements/Recommendations-for-Chest-Radiography-and-CT-for-Suspected-COVID19-Infection. 3/22/2020
4. Evaluating and Testing Persons for Coronavirus Disease 2019 (COVID-19). Centers for Disease Control and Prevention. National Center for Immunization and Respiratory Diseases (NCIRD), Division of Viral Diseases. https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/testing.html
5. Symptoms of Coronavirus. Centers for Disease Control and Prevention. National Center for Immunization and Respiratory Diseases (NCIRD), Division of Viral Diseases. Page last reviewed: May 13, 2020. https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html
6. Foust AM, Phillips GS, Chu WC, et al. International Expert Consensus Statement on Chest Imaging in Pediatric COVID-19 Patient Management: Imaging Findings, Imaging Study Reporting and Imaging Study Recommendations. *Radiol Cardiothorac Imaging*. 2020;2(2):e200214. Published 2020 Apr 23. doi:10.1148/ryct.2020200214
7. Rubin GD, Ryerson CJ, Haramati LB, et al. The Role of Chest Imaging in Patient Management During the COVID-19 Pandemic: A Multinational Consensus Statement from the Fleischner Society. *Radiology*. 2020;296(1):172-180. doi:10.1148/radiol.2020201365
8. Scott Simpson, Fernando U. Kay, Suhny Abbara, Sanjeev Bhalla, Jonathan H. Chung, Michael Chung, Travis S. Henry, Jeffrey P. Kanne, Seth Kligerman, Jane P. Ko, and Harold Litt . Radiological Society of North America Expert Consensus Statement on Reporting Chest CT Findings Related to COVID-19. Endorsed by the Society of Thoracic Radiology, the American College of Radiology, and RSNA. Published online: March 25 2020 https://pubs.rsna.org/doi/10.1148/ryct.2020200152
9. American Society of Transplantation: *SARS-CoV-2: Recommendations and Guidance for Organ Donor Testing and Evaluation*. Updated: January 18, 2023. https://www.myast.org/sites/default/files/Donor%20Testing%20Document1.18.23.pdf
10. Grillet F, Behr J, Calame P, Aubry S, Delabrousse E. Acute Pulmonary Embolism Associated with COVID-19 Pneumonia Detected by Pulmonary CT Angiography. *Radiology*. 2020;296(3):E186-E188. doi:10.1148/radiol.2020201544
11. Myall KJ, Mukherjee B, Castanheira AM, et al. Persistent Post-COVID-19 Interstitial Lung Disease. An Observational Study of Corticosteroid Treatment. *Ann Am Thorac Soc*. 2021;18(5):799-806. doi:10.1513/AnnalsATS.202008-1002OC
12. Ambardar SR, Hightower SL, Huprikar NA, Chung KK, Singhal A, Collen JF. Post-COVID-19 Pulmonary Fibrosis: Novel Sequelae of the Current Pandemic. *J Clin Med*. 2021;10(11):2452. Published 2021 Jun 1. doi:10.3390/jcm10112452
13. Vijayakumar B, Tonkin J, Devaraj A, et al. CT Lung Abnormalities after COVID-19 at 3 Months and 1 Year after Hospital Discharge. *Radiology*. 2022;303(2):444-454. doi:10.1148/radiol.2021211746
14. van den Borst B, Peters JB, Brink M, et al. Comprehensive Health Assessment 3 Months After Recovery From Acute Coronavirus Disease 2019 (COVID-19). *Clin Infect Dis*. 2021;73(5):e1089-1098. doi:10.1093/cid/ciaa1750
15. Expert Panel on Thoracic Imaging, Lee C, Colletti PM, et al. ACR Appropriateness Criteria® Acute Respiratory Illness in Immunocompromised Patients. *J Am Coll Radiol*. 2019;16(11S):S331-S339. doi:10.1016/j.jacr.2019.05.019

Other Chest Infections (CH-14)

PPD or TB (Mycobacterium tuberculosis and Nontuberculous Mycobacterial Pulmonary Disease (NTM-PD)) (CH-14.1)

CH.CI.0014.1.A

v2.0.2024

- CT Chest with contrast (CPT® 71260) or CT Chest without contrast (CPT® 71250) with ANY of the following:
  - Normal or equivocal chest x-ray with ONE of the following:[1]
    - Positive PPD skin test or other positive tuberculin skin tests OR
    - Positive QuantiFERON-TB Gold OR
    - Suspected active (or reactivated) tuberculosis
  - Suspected complications or progression of tuberculosis (e.g. pleural tuberculosis, empyema, and mediastinitis)[2]
  - Suspected NTM-PD
  - If CT Chest is unremarkable, there is insufficient data to support performing subsequent CT Chest unless symptoms develop or chest x-ray shows a new abnormality.
  - Follow-up CT Chest with contrast (CPT® 71260) or without contrast (CPT® 71250) with frequency at the discretion of or in consultation with the pulmonary or infectious disease specialist (not to exceed 3 studies in 3 months).
  - Re-evaluate individuals undergoing active treatment who had abnormalities seen only on CT Chest.

Fungal Infections (Suspected or Known) (CH-14.2)

CH.CI.0014.2.A
v2.0.2024

- CT Chest with contrast (CPT® 71260) or High resolution CT Chest (HRCT) without contrast (CPT® 71250):[3,4]
  - Initial diagnosis of any fungal pneumonia or chest infection[3,4]
  - Suspected complications or progression of the fungal chest infection (e.g. worsening pneumonitis; pleural effusion, empyema, mediastinitis)
  - Suspected Allergic Bronchopulmonary Aspergillosis (ABPA) in asthmatics with atypical presentation or poor response to conventional therapy.[7,8,9]
- Follow-up CT Chest with contrast (CPT® 71260) or High resolution CT Chest (HRCT) without contrast (CPT® 71250) with frequency at the discretion of or in consultation with the pulmonary or infectious disease specialist.

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924

Wegener's Granulomatosis/Granulomatosis with Polyangiitis (CH-14.3)

CH.CI.0014.3.A

v2.0.2024

- CT Chest without contrast (CPT® 71250)* should be done in all individuals who have pulmonary symptoms and are newly diagnosed or suspected of having Antineutrophil cytoplasmic autoantibody (ANCA)-associated vasculitides (AAV) for a baseline prior to initiating immunosuppressive therapy.[5,6]
- Selective use of additional imaging is useful in evaluating individuals who are suspected or known to have AAV, including CT Head (sinuses, orbits, mastoids) in individuals with visual or upper respiratory track symptoms or signs, and CT Neck (subglottic region) in individuals with symptoms or signs of subglottic stenosis.[6]

*In most situations, CT scans in individuals with AAV should be performed without an iodinated contrast agent administered.[6]

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924

Suspected Sternal Dehiscence (CH-14.4)

CH.CI.0014.4.A
v2.0.2024

- Sternal wound dehiscence is primarily a clinical determination.
- Chest x-ray is performed prior to advanced imaging to identify abnormalities in the sternal wire integrity and/or a midsternal stripe. Other findings include rotated, shifted or ruptured wires.
- CT Chest without contrast (CPT® 71250) or CT Chest with contrast (CPT® 71260) for:
  - Differentiating sternal wire migration from sternal dehiscence[10]
  - Planned debridement and/or repair.

See **Infection – General (MS-9.1)** for concerns for osteomyelitis or soft tissue infection

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

References (CH-14)

v2.0.2024

1. Expert Panel on Thoracic Imaging:, Ravenel JG, Chung JH, et al. ACR Appropriateness Criteria® Imaging of Possible Tuberculosis. *J Am Coll Radiol*. 2017;14(5S):S160-S165. doi:10.1016/j.jacr.2017.02.022
2. Expert Panel on Thoracic Imaging, Lee C, Colletti PM, et al. ACR Appropriateness Criteria® Acute Respiratory Illness in Immunocompromised Patients. *J Am Coll Radiol*. 2019;16(11S):S331-S339. doi:10.1016/j.jacr.2019.05.019
3. Walker CM, Abbott GF, Greene RE, Shepard JA, Vummidi D, Digumarthy SR. Imaging pulmonary infection: classic signs and patterns [published correction appears in AJR Am J Roentgenol. 2014 Jun;202(6):1396]. *AJR Am J Roentgenol*. 2014;202(3):479-492. doi:10.2214/AJR.13.11463
4. Cordier JF, Valeyre D, Guillevin L, Loire R, Brechot JM. Pulmonary Wegener's granulomatosis. A clinical and imaging study of 77 cases. *Chest*. 1990;97(4):906-912. doi:10.1378/chest.97.4.906
5. Peivandi AA, Vogel N, Opfermann UT, et al. Early detection of sternal dehiscence by conventional chest X-ray. *Thorac Cardiovasc Surg*. 2006;54(2):108-111. doi:10.1055/s-2005-872864
6. Kumar K, Loebinger MR. Nontuberculous Mycobacterial Pulmonary Disease: Clinical Epidemiologic Features, Risk Factors, and Diagnosis: The Nontuberculous Mycobacterial Series. *Chest*. 2022;161(3):637-646. doi:10.1016/j.chest.2021.10.003
7. Ash SY, Diaz AA. The role of imaging in the assessment of severe asthma. *Curr Opin Pulm Med*. 2017;23(1):97-102. doi:10.1097/MCP.0000000000000341
8. Ward S, Heyneman L, Lee MJ, Leung AN, Hansell DM, Müller NL. Accuracy of CT in the diagnosis of allergic bronchopulmonary aspergillosis in asthmatic patients. *AJR Am J Roentgenol*. 1999;173(4):937-942. doi:10.2214/ajr.173.4.10511153
9. Richards JC, Lynch D, Koelsch T, Dyer D. Imaging of Asthma. *Immunol Allergy Clin North Am*. 2016;36(3):529-545. doi:10.1016/j.iac.2016.03.005
10. Hota P, Dass C, Erkmen C, Donuru A, Kumaran M. Poststernotomy Complications: A Multimodal Review of Normal and Abnormal Postoperative Imaging Findings. *AJR Am J Roentgenol*. 2018;211(6):1194-1205. doi:10.2214/AJR.18.19782

Sarcoid (CH-15)

Sarcoid (CH-15.1)

CH.SA.0015.1.A
v2.0.2024

- CT Chest with contrast (CPT® 71260) or without contrast (CPT® 71250) for:
  - Establish or rule out the diagnosis when suspected
- Subsequent CT Chest with contrast (CPT® 71260) or without contrast (CPT® 71250), in known sarcoid, for ANY of the following:[1]
  - Development of worsening symptoms
  - New symptoms appear after a period of being asymptomatic
  - Treatment change is being considered
- If CT is equivocal, definitive diagnosis can only be made by biopsy.[2,3,4]
- PET/CT should not be used in the standard work-up of all sarcoid individuals. There is currently no evidence to support the use of PET/CT for screening.
- PET/CT (CPT® 78815) can be considered under the following conditions:[5,6,7]
  - Help guide biopsy location if:
    - Known lesion on CT Chest is difficult to access, to help identify alternative biopsy location
    - No apparent lung involvement and to identify an extrapulmonary biopsy site
  - Differentiation of reversible granulomatous disease from irreversible pulmonary fibrosis and will affect treatment options
  - Help identify treatment failure where either current treatment will be modified or new treatment will be introduced

References (CH-15)

v2.0.2024

1. Hantous-Zannad S, Charrada L, Zidi A, Mestiri I, Ben Miled-M'rad K. Apport de la TDM dans l'exploration de la sarcoïdose thoracique [Value of CT scanning in the investigation of thoracic sarcoidosis]. *Rev Mal Respir.* 2003;20(2 Pt 1):207-213.
2. Okumura W, Iwasaki T, Toyama T, et al. Usefulness of fasting 18F-FDG PET in identification of cardiac sarcoidosis. *J Nucl Med*. 2004;45(12):1989-1998.
3. Sarcoidosis. foundation.chestnet.org. https://foundation.chestnet.org/lung-health-a-z/sarcoidosis/
4. Baughman RP, Culver DA, Judson MA. A concise review of pulmonary sarcoidosis. *Am J Respir Crit Care Med*. 2011;183(5):573-581. doi:10.1164/rccm.201006-0865CI
5. Akaike G, Itani M, Shah H, et al. PET/CT in the Diagnosis and Workup of Sarcoidosis: Focus on Atypical Manifestations. *Radiographics*. 2018;38(5):1536-1549. doi:10.1148/rg.2018180053
6. Keijsers RG, van den Heuvel DA, Grutters JC. Imaging the inflammatory activity of sarcoidosis. *Eur Respir J*. 2013;41(3):743-751. doi:10.1183/09031936.00088612
7. Teirstein AS, Machac J, Almeida O, Lu P, Padilla ML, Iannuzzi MC. Results of 188 whole-body fluorodeoxyglucose positron emission tomography scans in 137 patients with sarcoidosis. *Chest*. 2007;132(6):1949-1953. doi:10.1378/chest.07-1178.

Solitary Pulmonary Nodule (SPN) (CH-16)

Solitary Pulmonary Nodule (CH-16.0)

CH.SN.0016.0.A

v2.0.2024

- For Lung Cancer Screening (LDCT) including incidental findings from LDCT, See **Lung Cancer Screening (CH-33)**

Solitary Pulmonary Nodule – Imaging (CH-16.1)

CH.SN.0016.1.A
v2.0.2024

- For these guidelines, manual nodule measurements should be based on the average of long- and short-axis diameters. The size threshold (<6 mm) corresponds to a rounded measurement of 5 mm or less in these guidelines. Measurements should be rounded to the nearest millimeter. Prediction models used to estimate malignancy yield better results with the average diameter than with the maximum transverse diameter. The dimension of small pulmonary nodules (<10mm) should be expressed as the average of the maximal long-axis and perpendicular maximal short-axis measurements in the same plane. For larger nodules and for masses larger than 10 mm, it is generally appropriate to record both long- and short-axis dimensions, with the long-axis dimension being used to determine the T factor in lung cancer staging and being a criterion for tumor response to treatment.[1,13]
- A pulmonary nodule can be determined to have changed in size when its average diameter has increased or decreased by at least 2mm (rounded to the nearest millimeter). Smaller changes do not reliably indicate change.[13]
- Maximum intensity projection (MIP), and Minimum intensity projection (MinIP) are 2D projections of the volumetric (3D) acquisition data.[11,12] These projections may be of use in evaluation pulmonary nodules, but these projections are included in the cross sectional imaging base codes, and is not separately reimbursable.
- CT Chest with contrast (CPT® 71260) or CT Chest without contrast (CPT® 71250) initially for discrete nodule(s) in the following scenarios:[1,2,3]
  - Lung nodule(s) seen on an imaging study other than a “dedicated” CT or MRI Chest. Examples of other studies:
    - Chest x-ray
    - CT Abdomen
    - MRI Spine
    - Coronary CTA[1]
  - But NOT in the following which are considered initial dedicated advanced chest imaging:
    - CT Chest without and with contrast (CPT® 71270)
    - CTA Chest (CPT® 71275)
    - MRI Chest without contrast (CPT® 71550)
    - MRI Chest without and with contrast (CPT® 71552)
    - MRA Chest without and with contrast (CPT® 71555)
- Comparisons should include the earliest available study and the more recent previous CT Chest scans to determine if nodule was present and stable.[1]
  - Similar-sized pleural nodule(s) is treated as a pulmonary nodule(s)

- The size of the lung or pleural nodule(s) is crucial information for decisions making regarding follow-up. The largest of multiple lung and/or pleural nodules will guide the surveillance interval. (See **Incidental Pulmonary Nodules Detected on CT Images (CH-16.2)**, and **Pleural-Based Nodules and Other Abnormalities (CH-17.1)**)

Background and Supporting Information

Abnormality examples include: mass, opacity, lesion, density, nodule, and calcification.

Incidental Pulmonary Nodules Detected on CT Images (CH-16.2)

CH.SN.0016.2.A
v2.0.2024

Incidentally Detected Solid Pulmonary Nodules Follow-up Recommendations*				
Nodule Type	**<6 mm (<100 mm^3)**	**6–8 mm**	**>8 mm**	**Comments**
Single Nodule	Follow-up (optional) CT at 12 months. No routine follow-up if stable at 12 months	CT at 6–12 months, then CT at 18–24 months if stable	CT at 3 months, then CT at 6-12 and then at 18-24 months if stable. Consider PET/CT** or biopsy	Certain individuals at high-risk with suspicious nodule morphology, upper lobe location, or both may warrant 12-month follow-up
Multiple Nodules	Follow-up (optional) CT at 12 months. *No routine follow-up if stable at 12 months	CT at 3–6 months, then at 18–24 months if stable	CT at 3–6 months, then at 18–24 months if stable. Consider PET/CT** or biopsy	Use most suspicious nodule as a guide to management. Follow-up intervals may vary according to size and risk.

Incidentally Detected Sub-Solid Pulmonary Nodules Follow-up Recommendations			
Nodule Type	**<6mm (<100 mm^3)**	**≥6mm (≥100 mm^3)**	**Comments**
Single Ground glass opacity (GGO)	Consider follow-up at 2 and 4 years. If solid component(s) or growth develops, consider resection.	CT at 6–12 months to confirm persistence, then follow-up with CT every 2 years until 5 years	In certain suspicious nodules, <6 mm, consider follow-up at 2 and 4 years. If solid component(s) or growth develops, consider resection.

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924

Incidentally Detected Sub-Solid Pulmonary Nodules Follow-up Recommendations			
Single Part-solid	Consider follow-up at 2 and 4 years. If growth develops, consider resection.	CT at 3–6 months to confirm persistence. If unchanged and solid component remains <6 mm, then annual CT should be performed for 5 years. If the solid component has suspicious morphology (i.e., lobulated margins or cystic components), is >8 mm or is growing: Consider PET/CT** or biopsy	In practice, part-solid nodules cannot be defined as such until ≥6 mm. Persistent part-solid nodules with solid components ≥6 mm should be considered highly suspicious.
Multiple Part-Solid	CT at 3–6 months. If stable, consider CT at 2 and 4 years.	CT at 3–6 months. Subsequent management based on the most suspicious nodule(s).	Multiple <6 mm pure ground-glass nodules are usually benign.

(*Following the Fleischner Society Guidelines for high-risk which include American College of Chest Physicians intermediate and high-risk categories.[1,2])

Pulmonary Cyst(s)[10]

- May represent a rare form of adenocarcinoma, squamous cell carcinoma, or small cell carcinoma.
- Short-term initial imaging to exclude rapid growth can be considered at 3-6 months.
- Further imaging can be managed according to the part-solid pathway above.

**PET/CT consider for ≥8 mm solid lung nodule or solid component of a sub-solid nodule, not for groundglass opacity.

If a PET/CT was found to be negative, follow-up with CT at 3 months, 9 months, and 21–24 months, if stable.

If a PET/CT was found to be positive, a biopsy was negative or non-diagnostic, follow-up with CT at 3 months, 12 months, and 24 months, if stable.

Interval Imaging Outcomes (CH-16.3)

CH.SN.0016.3.C
v2.0.2024

- No further advanced imaging is necessary if nodule(s) ANY of the following:
  - Has remained stable as described in **CH-16.2: Incidental Pulmonary Nodules Detected on CT Images**
  - Has remained stable on chest x-ray for 5 years
  - Has classically benign characteristics by chest x-ray or previous CT (e.g. benign calcification pattern typical for a granuloma or hamartoma)
  - Is decreasing in size or disappearing.[3]
- Lung nodule(s) which increase in size or number should no longer be considered for CT screening or surveillance.[1,2,3,7]
  - With an increase in nodule(s) size or number, tissue sampling or other further diagnostic investigations should be considered.
  - PET, for solid nodules ≥8mm, should be considered (See **PET (CH-16.4)**)

PET (CH-16.4)

CH.SN.0016.4.C
v2.0.2024

- PET/CT (CPT® 78815) for a solid lung nodule ≥8 mm on dedicated advanced chest imaging, as described in **Solitary Pulmonary Nodule - Imaging (CH-16.1)**. See **Non-Small Cell Lung Cancer – Suspected/Diagnosis (ONC-8.2)** in the Oncology Imaging Guidelines for lung mass ≥3.1 cm
  - If there is a history of malignancy, refer to the appropriate Oncology restaging/recurrence guideline for indications for PET imaging
  - Pleural nodule, See **Pleural-Based Nodules and Other Abnormalities (CH-17.1)**
  - Serial PET studies are not considered indicated
  - Not appropriate for infiltrate, ground glass opacity, or hilar enlargement
  - Mediastinal lymphadenopathy - See **Mediastinal Lymphadenopathy (CH-2.3)** or Sarcoid concerns – See **Sarcoid (CH-15.1)**

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.[3]
- **Malignant** nodule features can include spiculation, abnormal calcification, size greater than 7-10 mm, interval growth, history of a cancer that tends to metastasize to the lung or mediastinum, and/or smoking history.[1,3]
  - A nodule that grows at a rate consistent with cancer (doubling time 100 to 400 days) may be sampled for biopsy or resected.[1]
  - Less than 1% of <6 mm lung nodules are malignant.[1]
  - Three percent of all 8 mm lung nodules are malignant.[1]
  - The larger the solid component of a sub-solid nodule, the greater the risk of invasiveness and metastases.[1]
  - The risk of primary cancer increases with the total nodule count from 1 to 4.[1]
  - There is decreased risk of primary cancer in individuals with 5 or more nodules, most of which likely resulted from prior granulomatous infection.[1]
  - A nodule that does not grow in 6 months has a <10% risk of malignancy.
- **Benign** features in solid nodules can include benign calcification (80% granuloma, 10% hamartoma), multiple areas of calcification, small size, multiple nodules, negative PET, and stability of size over 2 years.[3]
- **Ground glass** or subsolid opacities, which can harbor indolent adenocarcinoma with average doubling times of 3–5 years.[1]

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

- **Repeat PET** is discouraged. If the original PET is positive, biopsy may be performed. If the original PET is negative, but subsequent CT Chest shows an increase in nodule size, biopsy may be performed.
- **Positive PET** is defined as a standardized uptake value (SUV) in the lung nodule greater than the baseline mediastinal blood pool. A positive PET can occur with infection or inflammation, including absence of lung cancer with localized infection, presence of lung cancer with associated (post-obstructive) infection and/or related inflammation.
- **False negative PET** can be seen in individuals with adenocarcinoma in situ (formally known as bronchoalveolar carcinoma), carcinoid tumors, a small size nodule, non-solid or ground glass opacity.[9] High pre-test likelihood of malignancy with negative findings on PET only reduces the likelihood of malignancy to 14%; while in an individual with a low pre-test likelihood (20%) of malignancy, a negative PET reduces the likelihood of malignancy to 1%.[6]
- Individuals aged 35 years or younger[1]
  - Considered to have an overall low risk for pulmonary malignancy
  - In this age group, nodules are most likely to be infectious rather than cancer
  - Management of incidentally-found pulmonary nodules in this group should be individualized

References (CH-16)

v2.0.2024

1. MacMahon H, Naidich DP, Goo JM, et al. Guidelines for Management of Incidental Pulmonary Nodules Detected on CT Images: From the Fleischner Society 2017. *Radiology*. 2017;284(1):228-243. doi:10.1148/radiol.2017161659
2. Gould MK, Donington J, Lynch WR, et al. Evaluation of individuals with pulmonary nodules: when is it lung cancer? Diagnosis and management of lung cancer, 3rd ed: American College of Chest Physicians evidence-based clinical practice guidelines. *Chest* 2013;143(5 Suppl):e93S-e120S. doi:10.1378/chest.12-2351
3. 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
4. Tan BB, Flaherty KR, Kazerooni EA, Iannettoni MD; American College of Chest Physicians. The solitary pulmonary nodule. *Chest. 2003;*123(1 Suppl):89S-96S. doi:10.1378/chest.123.1_suppl.89s
5. Khandani, AH, Fielding JR. PET in management of small pulmonary nodules. *Radiology*. 2007;242(3):948-949. doi:10.1148/radiol.2423060308
6. Truong MT, Ko JP, Rossi SE, et al. Update in the evaluation of the solitary pulmonary nodule. *Radiographics*. 2014;34(6):1658-1679. doi:10.1148/rg.346130092
7. Lung CT Screening Reporting and Data System (Lung-RADS™), American College of Radiology, Quality & Safety. https://www.acr.org/Quality-Safety/Resources/LungRADS.
8. National Comprehensive Cancer Network® (NCCN®) Guidelines® Version 1.2024 – July 19, 2023. Lung Cancer Screening. https://www.nccn.org/professionals/physician_gls/pdf/lung_screening.pdf. Referenced with permission from the NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Lung Cancer Screening Version 1.2024. © 2023 National Comprehensive Cancer Network® (NCCN®). All rights reserved. NCCN Guidelines® and illustrations herein may not be reproduced in any form for any purpose without the express written permission of the NCCN. To view the most recent and complete version of the NCCN Guidelines®, go online to NCCN.org.
9. National Comprehensive Cancer Network® (NCCN®) Guidelines® Version 3.2023 – April 13, 2023. Non-Small Cell Lung Cancer. https://www.nccn.org/professionals/physician_gls/pdf/nscl.pdf. Referenced with permission from the NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Non-Small Cell Lung Cancer Version 3.2023. © 2023 National Comprehensive Cancer Network® (NCCN®). All rights reserved. NCCN Guidelines® and illustrations herein may not be reproduced in any form for any purpose without the express written permission of the NCCN. To view the most recent and complete version of the NCCN Guidelines® , go online to NCCN.org.
10. Mets OM, Schaefer-Prokop CM, de Jong PA. Cyst-related primary lung malignancies: an important and relatively unknown imaging appearance of (early) lung cancer. *Eur Respir Rev*. 2018;27(150):180079. Published 2018 Dec 19. doi:10.1183/16000617.0079-2018
11. Fishman EK, Ney DR, Heath DG, Corl FM, Horton KM, Johnson PT. Volume rendering versus maximum intensity projection in CT angiography: what works best, when, and why. *Radiographics*. 2006;26(3):905-922. doi:10.1148/rg.263055186
12. Naeem MQ, Darira J, Ahmed MS, Hamid K, Ali M, Shazlee MK. Comparison of Maximum Intensity Projection and Volume Rendering in Detecting Pulmonary Nodules on Multidetector Computed Tomography. *Cureus*. 2021;13(3):e14025. Published 2021 Mar 21. doi:10.7759/cureus.14025
13. Bankier AA, MacMahon H, Goo JM, Rubin GD, Schaefer-Prokop CM, Naidich DP. Recommendations for Measuring Pulmonary Nodules at CT: A Statement from the Fleischner Society. *Radiology*. 2017;285(2):584-600. doi:10.1148/radiol.2017162894

Pleural-Based Nodules and Other Abnormalities (CH-17)

Pleural-Based Nodules and Other Abnormalities (CH-17.1)

CH.PB.0017.1.A
v2.0.2024

- CT Chest with contrast (CPT® 71260) or CT Chest without contrast (CPT® 71250) (with contrast is preferred for initial evaluation) for pleural nodule(s).[1]
  - Pleural nodule(s) seen on an imaging study other than a "dedicated" CT or MRI Chest.[1]
  - Pleural nodule(s) identified incidentally on any of the following dedicated chest studies can replace CT Chest as the initial dedicated study.[1]
    - CT Chest without and with contrast (CPT® 71270).
    - CTA Chest (CPT® 71275).
    - MRI Chest without contrast (CPT® 71550).
    - MRI Chest without and with contrast (CPT® 71552).
    - MRA Chest without and with contrast (CPT® 71555).
  - After preliminary comparison with any available previous chest films to determine presence and stability.
  - Using largest measurement of multiple nodule(s). (See **Solitary Pulmonary Nodule – Imaging (CH-16.1)**).
  - Following the Fleischner Society Guidelines for high-risk. (See **Incidental Pulmonary Nodules Detected on CT Images (CH-16.2)**)[1]
- PET/CT (CPT® 78815) can be considered if dedicated CT or MRI Chest identifies a pleural nodule/mass or defined area of pleural thickening that is ≥8 mm when there is a likelihood of malignancy including current or previous malignancy, pleural effusion, bone erosion, chest pain.[1]

Background and Supporting Information

- Pleural nodule/mass or thickening without suggestion of malignancy would undergo surveillance or biopsy.
- A study looking at over 8,700 LDCT chest scans identified 943 noncalcified nodules attached to the costal pleura, of these 897 were < 10 mm in size. There were 603 that were either lentiform, oval, semicircular or triangular in shape and had smooth margins. All of these nodules, that met these qualifications of shape, size and smooth margins, were benign. Follow-up with annual screening, rather than more immediate work-up, was recommended.[2]

Reference (CH-17)

v2.0.2024

1. Rivera MP, Mehta AC, Wahidi MM. Establishing the diagnosis of lung cancer: Diagnosis and management of lung cancer, 3rd ed: American College of Chest Physicians evidence-based clinical practice guidelines. *Chest*. 2013;143(5 Suppl):e142S-e165S. doi:10.1378/chest.12-2353
2. Zhu Y, Yip R, You N, Henschke CI, Yankelevitz DF. Management of Nodules Attached to the Costal Pleura at Low-Dose CT Screening for Lung Cancer. *Radiology*. 2020;297(3):710-718. doi:10.1148/radiol.2020202388

Pleural Effusion (CH-18)

Pleural Effusion (CH-18.1)

CH.EF.0018.1.A
v2.0.2024

- CT Chest with contrast (CPT® 71260) after:[1,2]
  - Chest x-ray including lateral decubitus films; **and**
  - Thoracentesis to determine if fluid is exudative or transudative and remove as much as possible (this fluid can obscure the underlying lung parenchyma and possibly a mass) **or**
  - Concern for loculated effusion, empyema, paramediastinal location, subpleural lung abscess or cavitation[3]
- Chest ultrasound (CPT® 76604) can be used as an alternative to chest x-ray to evaluate for the presence of fluid within the pleural spaces and guide thoracentesis.

Background and Supporting Information

- Bilateral effusions are more often systemic related transudates (congestive heart failure, renal failure, liver insufficiency, etc.), and advanced imaging is rarely needed. Large unilateral effusions can be malignant. Analysis of fluid may include: cytology, culture, cell count, and biochemical studies.

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

References (CH-18)

v2.0.2024

1. Light RW, Macgregor MI, Luchsinger PC, Ball WC Jr. Pleural effusions: the diagnostic separation of transudates and exudates. *Ann Intern Med* 1972;77(4):507-513. doi:10.7326/0003-4819-77-4-507
2. MacDuff A, Arnold A, Harvey J; BTS Pleural Disease Guideline Group. Management of spontaneous pneumothorax: British Thoracic Society Pleural Disease Guideline 2010. *Thorax*. 2010;65 Suppl 2:ii18-ii31. doi:10.1136/thx.2010.136986
3. Heffner JE, Klein JS, Hampson C. Diagnostic utility and clinical application of imaging for pleural space infections. *Chest*. 2010;137(2):467-479. doi:10.1378/chest.08-3002

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924

Pneumothorax/Hemothorax (CH-19)

Pneumothorax/Hemothorax (CH-19.1)

CH.PT.0019.1.A
v2.0.2024

Chest x-ray and CT Chest are the first line tests for detecting pneumothorax/hemothorax and ruling out other lung diseases.[8]

- Chest x-ray initially.
  - CT Chest with contrast (CPT® 71260) or without contrast (CPT® 71250) if:
    - Diagnosis of a small pneumothorax is in doubt, and the presence of a pneumothorax will affect individual treatment decisions.[1]
    - Preoperative study for treatment of pneumothorax.[1]
    - Pneumothorax associated with hemothorax.[2]
    - Suspected complications from hemothorax (e.g. empyema).[2]
    - Suspected Alpha-1-Antitrypsin Deficiency (even without pneumothorax).[3]
    - Suspected Cystic Lung Disease, including Lymphangioleiomyomatosis (LAM), tuberous sclerosis (TS), or Birt-Hogg-Dube (BHD) syndrome.[6,7]
    - To determine the etiology of persistent pneumothorax/air leak, such as chest tube malposition, bronchopleural fistula, loculated pneumothorax, lung parenchymal disease.[11]
    - Suspected catamenial pneumothorax/thoracic endometriosis[8]
- MRI Chest without and with contrast (CPT® 71552) or MRI Chest without contrast (CPT® 71550) for:
  - Detecting diaphragmatic endometriosis
  - Pre-surgical planning for thoracic endometriosis[8,9,10]

Pneumomediastinum; Subcutaneous Emphysema (CH-19.2)

CH.PT.0019.2.A
v2.0.2024

- Chest x-ray initially.
  - CT Chest with contrast (CPT® 71260) or without contrast (CPT® 71250) if:
    - Recent vomiting and/or suspected esophageal perforation.[4,5]
    - Associated pneumopericardium.[4,5]
    - Associated pneumothorax.[4,5]
    - Preoperative study for treatment.[4,5]

Background and Supporting Information

- An expiration chest x-ray can enhance the evaluation of equivocal plain x-ray. There is no data supporting the use of serial CT Chest to follow individuals with a known pneumothorax, pneumomediastinum, or hemothorax who are asymptomatic or have stable symptoms. With the exception of the indications above, advanced imaging of the chest is rarely indicated in the diagnosis or management of pneumothorax, or pneumomediastinum. Inspiratory/expiratory chest x-rays are helpful in defining whether a pneumothorax is present.

References (CH-19)

v2.0.2024

1. Manes N, Hernandez-Rodriguez H, Lopez-Martin S, Sanchez-Gascon F. Pneumothorax--guidelines of action. *Chest. 2002;121(2):669. doi:10.1378/chest.121.2.669*
2. Mowery NT, Gunter OL, Collier BR, et al. Practice management guidelines for management of hemothorax and occult pneumothorax. *J Trauma*. 2011;70(2):510-518. doi:10.1097/TA.0b013e31820b5c31
3. Sandhaus RA, Turino G, Brantly ML, et al. The Diagnosis and Management of Alpha-1 Antitrypsin Deficiency in the Adult. *Chronic Obst Pulm Dis.* 2016;3(3):668-682. Published 2016 Jun 6. doi:10.15326/jcopdf.3.3.2015.0182
4. Daccord C, Good JM, Morren MA, Bonny O, Hohl D, Lazor R. Birt-Hogg-Dubé syndrome. *Eur Respir Rev*. 2020;29(157):200042. Published 2020 Sep 17. doi:10.1183/16000617.0042-2020
5. Iyer VN, Joshi AY, Ryu JH. Spontaneous pneumomediastinum: analysis of 62 consecutive adult patients. *Mayo Clin Proc*. 2009;84(5):417-421. doi:10.1016/S0025-6196(11)60560-0
6. Ryu JH, Moss J, Beck GJ, et al. The NHLBI lymphangioleiomyomatosis registry: characteristics of 230 patients at enrollment. *Am J Respir Crit Care Med*. 2006;173(1):105-111. doi:10.1164/rccm.200409-1298OC
7. Raoof S, Bondalapati P, Vydyula R, et al. Cystic Lung Diseases: Algorithmic Approach. *Chest*. 2016;150(4):945-965. doi:10.1016/j.chest.2016.04.026
8. Rousset P, Rousset-Jablonski C, Alifano M, Mansuet-Lupo A, Buy JN, Revel MP. Thoracic endometriosis syndrome: CT and MRI features. *Clin Radiol*. 2014;69(3):323-330. doi:10.1016/j.crad.2013.10.014
9. Nezhat C, Lindheim SR, Backhus L, et al. Thoracic Endometriosis Syndrome: A Review of Diagnosis and Management. *JSLS*. 2019;23(3):e2019.00029. doi:10.4293/JSLS.2019.00029
10. McKee DC, Mansour T, Wasson MN. Thoracic and diaphragmatic endometriosis: an overview of diagnosis and surgical treatment. *Curr Opin Obstet Gynecol*. 2022;34(4):204-209. doi:10.1097/GCO.0000000000000792
11. Chaturvedi A, Lee S, Klionsky N, Chaturvedi A. Demystifying the persistent pneumothorax: role of imaging. *Insights Imaging*. 2016;7(3):411-429. doi:10.1007/s13244-016-0486-5

Mediastinal Mass (CH-20)

Mediastinal Mass (CH-20.1)

CH.MM.0020.1.A

v2.0.2024

- CT Chest with contrast (CPT® 71260) or CT Chest without contrast (CPT® 71250) or MRI Chest without and with contrast (CPT® 71552) or MRI Chest without contrast (CPT® 71550), to evaluate mediastinal abnormalities, may include, but not limited to mediastinal cyst including bronchogenic, thymic, pericardial or esophageal, seen on chest x-ray or other non-dedicated chest imaging.
- MRI Chest without and with contrast (CPT® 71552) or MRI Chest without contrast (CPT® 71550) can be considered for indeterminate mediastinal mass on CT Chest.
  - Lesions that remain indeterminate on MRI, if biopsy is not performed, surveillance imaging could be performed at 3-12 month intervals over 2 years or more with MRI Chest, depending upon level of clinical concern.
- FDG PET/CT offers limited additional value beyond that of conventional CT in the initial assessment of mediastinal mass(es), with the exception of primary mediastinal lymphoma. See **Non-Hodgkin Lymphomas (ONC-27)** or **Hodgkin Lymphoma (ONC-28)** in the Oncology Imaging Guidelines. A positive FDG PET/CT has little value for discrimination between benign and malignant lesions.
  - MRI Chest without and with contrast (CPT® 71552) or MRI Chest without contrast (CPT® 71550) can be considered for indeterminate mediastinal mass on FDG PET/CT
- CT Chest with contrast (CPT® 71260), or CT Chest without contrast (CPT® 71250) or MRI Chest without and with contrast (CPT® 71552), or MRI Chest without contrast (CPT® 71550) for subsequent evaluations if:
  - New signs or symptoms, or
  - Preoperative assessment
- For Adenopathy; See **Lymphadenopathy (CH-2)**.
- For Goiter; See **Thyroid Nodule (NECK-8.1)** in the Neck Imaging Guidelines.
- For Myasthenia Gravis; See **Neuromuscular Junction Disorders (PN-6.1)** in the Peripheral Nerve Disorders Imaging Guidelines.

References (CH-20)

v2.0.2024

1. Kuhlman JE, Bouchardy L, Fishman EK, Zerhouni EA. CT and MR imaging evaluation of chest wall disorders. *Radiographics.* 1994;14(3):571-595. doi:10.1148/radiographics.14.3.8066273
2. Juanpere S, Cañete N, Ortuño P, Martínez S, Sanchez G, Bernado L. A diagnostic approach to the mediastinal masses. *Insights Imaging*. 2013;4(1):29-52. doi:10.1007/s13244-012-0201-0
3. Komanapalli C, Schipper P, Sukumar M. Pericardial Cyst. October 2022. doi:10.25373/ctsnet.21280404
4. Expert Panel on Thoracic Imaging, Ackman JB, Chung JH, et al. ACR Appropriateness Criteria® Imaging of Mediastinal Masses. *J Am Coll Radiol*. 2021;18(5S):S37-S51. doi:10.1016/j.jacr.2021.01.007

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

Chest Trauma (CH-21)

Chest Trauma (CH-21.1)

CH.CT.0021.1.A
v2.0.2024

- Chest X-ray initially.
  - CT Chest without contrast (CPT® 71250) or with contrast (CPT® 71260) for the following situations:[1]
    - Rib[1] or Sternal[2] Fracture:
      - With associated complications identified clinically or by other imaging, including pneumothorax, hemothorax, pulmonary contusion, atelectasis, flail chest, cardiovascular injury and/or injuries to solid or hollow abdominal organs.[1]
      - Uncomplicated, single fractures, multiple fractures, non-acute fractures, or occult rib fractures are NOT an indication for CT Chest unless malignancy is suspected as the etiology.[1]
    - Routine follow-up advanced imaging of rib or sternal fractures is not indicated.[1]
- CT Chest without contrast (CPT® 71250) or Tc-99m bone scan whole body (CPT® 78306) for suspected pathological rib fractures, with or without a history of trauma.[1]
- Clavicle Fractures:
  - CT Chest with contrast (CPT® 71260) or CT Chest without contrast (CPT® 71250) or MRI Chest without and with contrast (CPT® 71552) or MRI Chest without contrast (CPT® 71550) for proximal (medial) 1/3 fractures or sternoclavicular dislocations.[3]
  - X-ray is adequate for evaluation of middle and distal 1/3 fractures.[3]
- No advanced imaging of the abdomen or pelvis is indicated when there is chest trauma and no physical examination or laboratory evidence of abdominal and/or pelvic injury.

References (CH-21)

v2.0.2024

1. Expert Panel on Thoracic Imaging:, Henry TS, Donnelly EF, et al. ACR Appropriateness Criteria® Rib Fractures. *J Am Coll Radiol*. 2019;16(5S):S227-S234. doi:10.1016/j.jacr.2019.02.019
2. Clancy K, Velopulos C, Bilaniuk JW, et al. Screening for blunt cardiac injury: an Eastern Association for the Surgery of Trauma practice management guideline. *J Trauma Acute Care Surg.* 2012;73(5 Suppl 4):S301-S306. doi:10.1097/TA.0b013e318270193a
3. Throckmorton T, Kuhn JE. Fractures of the medial end of the clavicle. *J Shoulder Elbow Surg.* 2007;16(1):49-54. doi:10.1016/j.jse.2006.05.010

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

Chest Wall Mass (CH-22)

Chest Wall Mass (CH-22.1)

CH.CM.0022.1.A
v2.0.2024

- Chest x-ray is useful in the workup of a soft-tissue mass and is almost always indicated as the initial imaging study.[1]
  - Chest ultrasound (CPT® 76604) may be useful as an initial imaging study in the setting of a suspected superficial or subcutaneous lipoma. This modality may also be valuable in differentiating cystic from solid lesions and has also been used to assess the vascularity of lesions.[1]
  - Following a non-diagnostic Chest x-ray that does not show an obvious lipoma(s) or clearly benign entity (see **Soft Tissue Mass or Lesion of Bone (MS-10)** in the Musculoskeletal Imaging Guidelines), the following may be appropriate:[1,2]
    - MRI Chest without and with contrast (CPT® 71552) or
    - MRI Chest without contrast (CPT® 71550) or when MRI is contraindicated,
    - CT Chest with contrast (CPT® 71260)

Background and Supporting Information

- Chest x-rays of chest wall masses can detect calcification, ossification, or bone destruction as well as location and size.[1,2]
- CT Chest without contrast is usually not beneficial in the evaluation of a soft tissue mass. With modern CT technology, calcification can usually be distinguished from vascular enhancement on contrast enhanced scan. In the evaluation of suspected tumors, contrast imaging is especially useful in distinguishing vascularized from potentially necrotic regions of the tumor.[1]

References (CH-22)

v2.0.2024

1. Expert Panel on Musculoskeletal Imaging, Garner HW, Wessell DE, et al. ACR Appropriateness Criteria® Soft Tissue Masses: 2022 Update. *J Am Coll Radiol*. 2023;20(5S):S234-S245. doi:10.1016/j.jacr.2023.02.009
2. Expert Panel on Musculoskeletal Imaging, Bestic JM, Wessell DE, et al. ACR Appropriateness Criteria® Primary Bone Tumors. *J Am Coll Radiol*. 2020;17(5S):S226-S238. doi:10.1016/j.jacr.2020.01.038

Pectus Excavatum and Pectus Carinatum (CH-23)

Pectus Excavatum and Carinatum (CH-23.1)

CH.EC.0023.1.C
v2.0.2024

- CT Chest without contrast (CPT® 71250) or MRI Chest without and with contrast (CPT® 71552) and 3-D reconstruction (CPT® 76377) if:
  - Candidate for surgical correction.[1,2]
  - Cardiac or pulmonary dysfunction has been identified[1,2]
    - ECG and echocardiography if cardiac symptoms or evidence of cardiac function abnormalities.
    - Chest x-ray and PFT's if increasing shortness of breath.[1]

Background and Supporting Information

- Chest measurements derived from CT Chest, such as the Haller Index or the correction index, are helpful to the thoracic surgeon in pre-operative assessment of chest wall deformities to assess for the appropriateness of operative repair prior to the development of symptomatic pectus deformities.
- The Haller index is calculated using the width of the chest divided by the distance between the posterior surface of the sternum and the anterior surface of the spine. A Haller index score is normal at 2.5 to 2.7 and severe at 3.25 or greater. The correction index uses an equation of (b−a)/b×100, in which a is the minimum distance between the anterior spine and the posterior surface of the sternum, and b is the maximum distance between the anterior spine and most anterior internal rib. It yields a percentage that the chest would need to be corrected to achieve normal dimensions, with a normal level being 10% or less.[3]
- Some have suggested that a CXR can replace the CT Chest for Haller Index calculation with a strong correlation and high diagnostic accuracy.[4]
- Expert consensus from The Society of Thoracic Surgeons 2023, recommended that a comprehensive evaluation with spirometry, ECG, and echocardiography be done with any cardio-pulmonary complaint. The Haller index, correction index, pulmonary compression or failed previous repair, in and of itself, was not an indication for surgery. Corrective surgery indications for those with severe pectus excavatum included; progression of deformity, presence of cardio-pulmonary symptoms, mitral valve prolapse, arrhythmia, significant body image disturbances, abnormal PFTs, abnormal cardiac function test or the presence of cardiac compression on imaging, (echo or CT).[5]

References (CH-23)

v2.0.2024

1. 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
2. Goretsky MJ, Kelly RE Jr, Croitoru D, Nuss D. Chest wall anomalies: pectus excavatum and pectus carinatum. *Adolesc Med Clin*. 2004;15(3):455-471. doi:10.1016/j.admecli.2004.06.002
3. Abid I, Ewais MM, Marranca J, Jaroszewski DE. Pectus Excavatum: A Review of Diagnosis and Current Treatment Options. *J Am Osteopath Assoc*. 2017;117(2):106-113. doi:10.7556/jaoa.2017.021
4. Scalise PN, Demehri FR. The management of pectus excavatum in pediatric patients: a narrative review. *Transl Pediatr*. 2023;12(2):208-220. doi:10.21037/tp-22-361
5. Janssen N, Daemen JHT, van Polen EJ, et al. Pectus Excavatum: Consensus and Controversies in Clinical Practice. *Ann Thorac Surg*. 2023;116(1):191-199. doi:10.1016/j.athoracsur.2023.02.059

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924

Pulmonary Arteriovenous Fistula (AVM) (CH-24)

Pulmonary AVM (CH-24.1)

CH.AV.0024.1.A
v2.0.2024

- CT Chest with contrast (CPT® 71260), CT Chest without contrast (CPT® 71250), CTA Chest (preferred modality for pre-intervention planning) (CPT® 71275), or MRA Chest (CPT® 71555) for evaluation of:[1,2,3,5,6,7]
  - Suspected pulmonary AVM, including individuals with HHT (Hereditary Hemorrhagic Telangiectasia) or who have a first degree relative with HHT[4,5]
  - First degree relatives of an individual with a primary pulmonary AVM
  - Evaluation of individuals with paradoxical embolus/stroke and no evidence of patent foramen ovale on echocardiogram
  - Follow-up of treated AVM's at 6 months post embolization and then every 3-5 years[4]
  - Follow-up of untreated AVM's to be determined by treating physician but no more than annually. Usually the interval is 3-5 years due to the slow-growth nature of PAVM's[4]
  - Treated or untreated PAVM's with recurrent symptoms[4]

Background and Supporting Information

- Pulmonary AVMs are abnormal connections between pulmonary arteries and veins, usually found in the lower lobes, that can be either primary (such as in individuals with HHT) or acquired (such as trauma, bronchiectasis). They can be identified in up to 98% of chest x-rays by a peripheral, circumscribed, non-calcified lesion connected by blood vessels to the hilum of the lung. Treatment is often by surgery or embolization of the feeding artery using platinum coils or detachable balloons.

References (CH-24)

v2.0.2024

1. De Cillis E, Burdi N, Bortone AS, et al. Endovascular treatment of pulmonary and cerebral arteriovenous malformations in patients affected by hereditary haemorrhagic teleangiectasia. *Curr Pharm Des*. 2006;12(10):1243-1248. doi:10.2174/138161206776361237
2. Gossage JR, Kanj G. Pulmonary arteriovenous malformations. A state of the art review. *Am J Respir Crit Care Med*. 1998;158(2):643-661. doi:10.1164/ajrccm.158.2.9711041
3. Lee EY, Boiselle PM, Cleveland RH. Multidetector CT evaluation of congenital lung anomalies. *Radiology*. 2008;247(3):632-648. doi:10.1148/radiol.2473062124
4. Faughnan ME, Palda VA, Garcia-Tsao G, et al. International guidelines for the diagnosis and management of hereditary haemorrhagic telangiectasia. *J Med Genet*. 2011;48(2):73-87. doi:10.1136/jmg.2009.069013
5. Faughnan ME, Mager JJ, Hetts SW, et al. Second International Guidelines for the Diagnosis and Management of Hereditary Hemorrhagic Telangiectasia. *Ann Intern Med*. 2020;173(12):989-1001. doi:10.7326/M20-1443
6. Shovlin CL, Condliffe R, Donaldson JW, Kiely DG, Wort SJ; British Thoracic Society Clinical Statement on Pulmonary Arteriovenous Malformations. *Thorax*. 2017;72(12):1154-1163. doi:10.1136/thoraxjnl-2017-210764
7. 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. doi:10.1016/j.jacr.2016.03.020

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

Pulmonary Embolism (PE) (CH-25)

Pulmonary Embolism (CH-25.1)

CH.PE.0025.1.A
v2.0.2024

- CT Chest with contrast with PE protocol (CPT® 71260) or CTA Chest (CPT® 71275) if at least one symptom, clinical/laboratory finding or risk factor from each of the lists below are present.
  - With any ONE of the 3:[6,7,8]
    - Dyspnea, new onset and otherwise unexplained;
    - Chest Pain, pleuritic;
    - Tachypnea
  - AND, with any ONE of the 3:[6,7,8]
    - Abnormal **D-dimer** test;
    - Wells Criteria score* higher than 4 points;
    - One Risk Factor** or Symptom** of new onset demonstrating high clinical probability of PE

RISK FACTORS** [6,7,8]	SYMPTOMS ATTRIBUTED TO PE** [6,7,8]
Immobilization at least 3 days or surgery in last 4 weeks or recent trauma	Signs or symptoms of DVT
Previous history of DVT or PE	Hemoptysis
Cancer actively treated in last 6 months or receiving palliative treatment	Right heart strain or failure
Recent history of a long airplane flight	Systolic BP <90
Use of estrogen-based contraceptives (birth control pills, the patch, and vaginal ring)/Oral estrogen[1]	Syncope
Advanced age (≥70)	Cough
Congestive heart failure	Heart Rate >100
Obesity (BMI ≥35)	Palpitations
Suspicion or diagnosis of COVID-19	

Well's Criteria for Clinical Probability of PE* [6]	
Clinical signs/symptoms of DVT (at minimum: leg swelling and pain with palpation of the deep veins)	3
PE is likely or equally likely diagnosis	3
Heart rate >100	1.5

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924

Well's Criteria for Clinical Probability of PE* [6]	
Immobilization at least 3 days or surgery in last 4 weeks	1.5
Previous history of DVT or PE	1.5
Hemoptysis	1
Cancer actively treated in last 6 months or receiving palliative treatment	1
Calculate Probability: Low <2 Moderate 2 to 6 High >6	
Using the above criteria, only 3% of individuals with a low pretest probability had PE versus 63% of those with a high pretest probability.	

- Non-urgent cases which do not meet above 2-step criteria, should undergo prior to advanced imaging:[9]
  - Chest x-ray (to rule out other causes of acute chest pain).
  - Primary cardiac and pulmonary etiologies should be eliminated.
- Pregnancy is a risk factor for thrombo-embolic events in and of itself. Additional risk factors are not required. Pregnant individuals with suspected PE are suggested to proceed with:[11,12,13]
  - If signs/symptoms of DVT are present, Doppler studies of the lower extremities (CPT® 93925 bilateral study or CPT® 93926 unilateral study)
  - If no signs/symptoms of DVT, then chest x-ray should be done first
  - If chest x-ray is normal, then V/Q scan is preferred test
  - If chest x-ray is abnormal or after non-diagnostic V/Q scan or if V/Q scanning is not readily available, then CTA Chest (CPT® 71275) or CT Chest with contrast with PE protocol (CPT® 71260).
- Ventilation-perfusion scans, also called V/Q, scans (CPT® 78580-Pulmonary Perfusion Imaging; CPT® 78582-Pulmonary Ventilation (e.g., Aerosol or Gas) and Perfusion Imaging) or SPECT/CT (CPT® 78830):[15]
  - Is not a replacement for CTA Chest[9]
  - Can be considered in any of the following:
    - Suspected pulmonary embolism if there is a contraindication to CT or CTA Chest (ventilation-perfusion scans CPT® 78582)
    - Suspected pulmonary embolism when a chest x-ray is negative and CTA Chest is not diagnostic (CPT® 78580 or CPT® 78582)
    - Follow-up of an equivocal or positive recent ventilation-perfusion lung scan to evaluate for interval change (CPT® 78580)

    - Suspected Chronic thromboembolic disease or Chronic thromboembolic pulmonary hypertension*, usually after 3 months of effective anticoagulation[14]
- Follow-up Imaging in Stable or Asymptomatic Individuals with Known PE is not warranted[2,3,4,10]
- Follow-up imaging with CT Chest with contrast with PE protocol (CPT® 71260) or CTA Chest (CPT® 71275) for ANY of the following indications:
    - Recurrent or persistent signs or symptoms such as dyspnea, particularly if present after 3 months of anticoagulation, or
    - Elevated d-dimer which is persistent or recurrently elevated, or
    - Right heart strain or failure identified by EKG, ECHO or Heart catheterization.
- *Pulmonary Artery Hypertension (PAH) - See **Pulmonary Artery Hypertension (PAH) – Indications (CD-8.1)** in the Cardiac Imaging Guidelines

Background and Supporting Information

- Pulmonary embolism is found in approximately 10% of all those that present with suspicion of PE. Dyspnea, pleuritic chest pain and tachypnea occur with about 50% incidence with leg swelling or pain just over 50%.
- D-dimer level has a high sensitivity and low specificity for diagnosing PE.
    - A negative D-dimer in combination with low or moderate PE risk classification has a negative predictive value approaching 100%.
    - D-dimer can be falsely elevated with recent surgery, injury, malignancy, sepsis, diabetes, pregnancy, or other conditions where fibrin products are likely to be present.
- CT imaging has supplanted V/Q scanning since the latter is difficult to obtain quickly, does not provide a substantial cost savings, and does not diagnose other pulmonary pathology.
- The decision to terminate anticoagulation treatment after previous pulmonary embolism (PE) with absent or stable symptoms is based on clinical evaluation and risk factors.
- Repeat studies do not allow one the ability to distinguish new from residual clot, with luminal diameter and clot character poorly correlated to symptoms and ECHO findings.
- Two thirds of individuals with primary thromboembolism have residual pulmonary artery clot at 6 months and 50% remain at one year.
- Subsequent persistence or elevation of D-dimer is associated with increased risk of recurrent PE. ECHO and Right Heart Catheterization (RHC) can identify those with pulmonary hypertension. Yet, 1/2 of all have persistent or new pulmonary hypertension after primary thromboembolism and only half of this latter group has dyspnea at rest or exercise intolerance.
- Of note, pregnancy is accompanied by a progressive increase in D-dimer levels and as such, D-Dimer levels may not be helpful to rule-in or rule-out DVT/PE in pregnancy.[11,12]

Modality	Fetal radiation exposure in mGy
CXR	0.002-0.1
V/Q	0.32 – 0.74
CTPA	0.03 – 0.66

- Compared with V/Q scan, computed tomography pulmonary angiography (CTPA), is associated with a higher radiation dose to the mother: the calculated doses to breast and lung tissue have been estimated to range from 10 to 60 mGy and 39.5 mGy, respectively with CTPA as compared with 0.98 to 1.07 mGy and 5.7 to 13.5 mGy, respectively with V/Q scan.[12]

References (CH-25)

v2.0.2024

1. Canonico M, Plu-Bureau G, Lowe GD, Scarabin PY. Hormone replacement therapy and risk of venous thromboembolism in postmenopausal women: systematic review and meta-analysis. *BMJ*. 2008;336(7655):1227-1231. doi:10.1136/bmj.39555.441944.BE
2. Fedullo PF, Auger WR, Kerr KM, Rubin LJ. Chronic thromboembolic pulmonary hypertension. *N Engl J Med*. 2001;345(20):1465-1472. doi:10.1056/NEJMra010902
3. Kline JA, Steuerwald MT, Marchick MR, Hernandez-Nino J, Rose GA. Prospective evaluation of right ventricular function and functional status 6 months after acute submassive pulmonary embolism: frequency of persistent or subsequent elevation in estimated pulmonary artery pressure. *Chest*. 2009;136(5):1202-1210. doi:10.1378/chest.08-2988
4. Nijkeuter M, Hovens MM, Davidson BL, Huisman MV. Resolution of thromboemboli in patients with acute pulmonary embolism: a systematic review. *Chest.* 2006;129(1):192-197. doi:10.1378/chest.129.1.192
5. Palareti G, Cosmi B, Legnani C, et al. D-dimer testing to determine the duration of anticoagulation therapy [published correction appears in N Engl J Med. 2006 Dec 28;355(26):2797]. *N Engl J Med.* 2006;355(17):1780-1789. doi:10.1056/NEJMoa054444
6. Wells PS, Anderson DR, Rodger M, et al. Excluding pulmonary embolism at the bedside without diagnostic imaging: management of patients with suspected pulmonary embolism presenting to the emergency department by using a simple clinical model and d-dimer. *Ann Intern Med*. 2001;135(2):98-107. doi:10.7326/0003-4819-135-2-200107170-00010
7. Wolf SJ, McCubbin TR, Feldhaus KM, Faragher JP, Adcock DM. Prospective validation of Wells Criteria in the evaluation of patients with suspected pulmonary embolism. *Ann Emerg Med*. 2004;44(5):503-510. doi:10.1016/j.annemergmed.2004.04.002
8. van Belle A, Büller HR, Huisman MV, et al. Effectiveness of managing suspected pulmonary embolism using an algorithm combining clinical probability, D-dimer testing, and computed tomography. *JAMA*. 2006;295(2):172-179. doi:10.1001/jama.295.2.172
9. Expert Panels on Cardiac and Thoracic Imaging:, Kirsch J, Brown RKJ, et al. ACR Appropriateness Criteria® Acute Chest Pain-Suspected Pulmonary Embolism. *J Am Coll Radiol*. 2017;14(5S):S2-S12. doi:10.1016/j.jacr.2017.02.027
10. Kearon C, Akl EA, Ornelas J, et al. Antithrombotic Therapy for VTE Disease: CHEST Guideline and Expert Panel Report [published correction appears in Chest. 2016 Oct;150(4):988]. *Chest*. 2016;149(2):315-352. doi:10.1016/j.chest.2015.11.026
11. American College of Obstetricians and Gynecologists' Committee on Practice Bulletins—Obstetrics. ACOG Practice Bulletin No. 196: Thromboembolism in Pregnancy [published correction appears in Obstet Gynecol. 2018 Oct;132(4):1068]. *Obstet Gynecol*. 2018;132(1):e1-e17. doi:10.1097/AOG.0000000000002706
12. Leung AN, Bull TM, Jaeschke R, et al. An official American Thoracic Society/Society of Thoracic Radiology clinical practice guideline: evaluation of suspected pulmonary embolism in pregnancy. *Am J Respir Crit Care Med*. 2011;184(10):1200-1208. doi:10.1164/rccm.201108-1575ST
13. Lim W, Le Gal G, Bates SM, et al. American Society of Hematology 2018 guidelines for management of venous thromboembolism: diagnosis of venous thromboembolism. *Blood Adv*. 2018;2(22):3226-3256. doi:10.1182/bloodadvances.2018024828
14. Rivera-Lebron B, McDaniel M, Ahrar K, et al. Diagnosis, Treatment and Follow Up of Acute Pulmonary Embolism: Consensus Practice from the PERT Consortium. *Clin Appl Thromb Hemost*. 2019;25:1076029619853037. doi:10.1177/1076029619853037
15. Derenoncourt PR, Felder GJ, Royal HD, et al. Ventilation-Perfusion Scan: A Primer for Practicing Radiologists. *Radiographics*. 2021;41(7):2047-2070. doi:10.1148/rg.2021210060

Pulmonary Hypertension (CH-26)

Pulmonary Hypertension (CH-26.1)

CH.PH.0026.1.A
v2.0.2024

- See the **Pulmonary Artery Hypertension (PAH) – Indications (CD-8.1)**

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

Subclavian Steal Syndrome (CH-27)

Subclavian Steal Syndrome – General (CH-27.0)

CH.SS.0027.0.A
v2.0.2024

- Occurs from blood flowing up the contralateral vertebral artery to the basilar artery and retrograde down the ipsilateral vertebral artery (reversal of flow) to supply collateral circulation to the arm on the side and past the stenotic or occluded proximal subclavian or innominate artery to perfuse that arm.

Subclavian Steal Syndrome (CH-27.1)

CH.SS.0027.1.C
v2.0.2024

- Initial evaluation should include clinical findings satisfying the symptom complex (See **Background and Supporting Information**) and initial imaging with Carotid duplex study (CPT® 93882).
  - Carotid duplex study (CPT® 93882) is the initial and definitive imaging study
    - Reversal of flow in the ipsilateral vertebral artery.
    - If the carotid duplex is not diagnostic for reversal of flow in the ipsilateral vertebral artery, then neurological symptoms should be evaluated according to the Head guidelines.
- MRA Neck and Chest (CPT® 70548 and CPT® 71555) or CTA Neck and Chest (CPT® 70498 and CPT® 71275) can be performed for diagnosis in individuals with symptoms of vertebrobasilar ischemia with either of the following:
  - Clinical exam and duplex study are positive or indeterminate
  - Preoperative studies if they will substitute for invasive angiography.
- MRA Upper extremity (CPT® 73225) or CTA Upper extremity (CPT® 73206) can be performed in symptomatic individuals if needed to exclude pathology distal to the subclavian artery and if they will substitute for invasive angiography.
- See **Stroke/TIA (HD-21.1)** (for vertebrobasilar stroke) in the Head Imaging Guidelines.
- Treatment options include ligation of the ipsilateral vertebral artery, aorta-subclavian artery bypass graft, or subclavian endarterectomy.

Background and Supporting Information

- While MRA does not expose the individual to radiation, CTA should be considered the test of choice for subclavian steal syndrome given its superior spatial and temporal resolution.
- Satisfying the symptom complex.
  - Physical examination findings suggestive of subclavian stenosis include a discrepancy of >15 mmHg in blood pressure readings taken in both upper extremities, delayed or decreased amplified pulses in the affected side, and a bruit in the supraclavicular area on the affected side.
  - Symptoms include vertebral basilar artery insufficiency, vertigo, limb paresis, and paresthesias. Bilateral cortical visual disturbances, ataxia, syncope, and dysarthria occur less frequently.
  - Symptoms of cerebral ischemia may be produced by exercise of the affected arm

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

References (CH-27)

v2.0.2024

1. Van Grimberge F, Dymarkowski S, Budts W, Bogaert J. Role of magnetic resonance in the diagnosis of subclavian steal syndrome. *J Magn Reson Imaging*. 2000;12(2):339-342. doi:10.1002/1522-2586(200008)12:2<339::aid-jmri17>3.0.co;2-8
2. Potter BJ, Pinto DS. Subclavian steal syndrome. *Circulation*. 2014;129(22):2320-2323. doi:10.1161/CIRCULATIONAHA.113.006653

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

Superior Vena Cava (SVC) Syndrome (CH-28)

SVC Syndrome (CH-28.1)

CH.SV.0028.1.A
v2.0.2024

- CT Chest with contrast (CPT® 71260) for the evaluation of suspected SVC syndrome based on the facial cyanosis and upper extremity swelling without anasarca.[1,2]
- MRV (CPT® 71555) or CTV (CPT® 71275) Chest when stenting of the SVC is being considered.[1,2]

Background and Supporting Information

- SVC syndrome is caused by acute or subacute, intrinsic or extrinsic obstruction of the SVC, most commonly from lung cancer (80-85%) and less often benign (fibrosis, mediastinitis, indwelling devices). Other symptoms include dyspnea, headache and dizziness.

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924

References (CH-28)

v2.0.2024

1. Wilson LD, Detterbeck FC, Yahalom J. Clinical practice. Superior vena cava syndrome with malignant causes [published correction appears in N Engl J Med. 2008 Mar 6;358(10):1083]. *N Engl J Med*. 2007;356(18):1862-1869. doi:10.1056/NEJMcp067190
2. Lepper PM, Ott SR, Hoppe H, et al. Superior vena cava syndrome in thoracic malignancies. *Respir Care*. 2011;56(5):653-666. doi:10.4187/respcare.00947

Elevated Hemidiaphragm (CH-30)

Elevated Hemidiaphragm (CH-30.1)

CH.EH.0030.1.A
v2.0.2024

- CT Chest with contrast (CPT® 71260) and/or CT Neck with contrast (CPT® 70491) with new diaphragmatic paralysis after:[1,2]
  - Previous chest x-rays are available and reviewed to determine if the diaphragmatic elevation is a new finding, and/or
  - Fluoroscopic examination ("sniff test") to differentiate true paralysis from weakness.
- CT Abdomen with contrast (CPT® 74160) to rule out liver or abdominal process if CT Chest is negative.[1,2]
- Repeat advanced imaging studies in the absence of new signs or symptoms are not indicated.

Background and Supporting Information

- The right hemidiaphragm sits about 2 cm higher than the left.
- "Eventration" is thin membranous replacement of muscle, usually on the right, as the most common cause of elevation.
- Any injury to the phrenic nerve from neck to diaphragm can lead to paralysis.
- Common phrenic causes are traumatic or surgical injury or malignancy involving the mediastinum.
- Any loss of lung volume or increased abdominal pressure can lead to diaphragm elevation.

References (CH-30)

v2.0.2024

1. Ko MA, Darling GE. Acquired paralysis of the diaphragm. *Thorac Surg Clin*. 2009;19(4):501-510. doi:10.1016/j.thorsurg.2009.08.011
2. Qureshi A. Diaphragm paralysis. *Semin Respir Crit Care Med*. 2009;30(3):315-320. doi:10.1055/s-0029-1222445

Thoracic Outlet Syndrome (TOS) (CH-31)

Thoracic Outlet Syndrome (CH-31.1)

CH.TO.0031.1.A
v2.0.2024

- Chest x-ray should be performed initially in all cases, after the onset of symptoms or if there has been a change in symptoms, since it can identify bony abnormalities or other causes of upper extremity pain.[1,2]
- Preferred imaging modality in individuals with suspected TOS varies depending upon suspected etiology. More than one type of imaging may be required for diagnosis in complex cases.[1,2]
- Neurogenic Thoracic Outlet Syndrome:
  - See **Brachial Plexus (PN-4.1)** in the Peripheral Nerve Disorders Imaging Guidelines
- Venous Thoracic Outlet Syndrome:
  - CT Chest with Contrast (CPT® 71260) (preferred study) or MRI Chest with contrast (CPT® 71551) or CTV Chest (CPT® 71275)
- Arterial Thoracic Outlet Syndrome:
  - CTA Chest (CPT® 71275) (preferred study) or MRA Chest (CPT® 71555) (preferred study) or CT Chest either without or with contrast (CPT® 71250 or CPT® 71260) or MRI Chest with contrast (CPT® 71551)
- CT Chest with contrast (CPT® 71260) or CT Neck with contrast (CPT® 70491) can be used in place of MRI for:
  - Suspected anomalous ribs or fractures, as bone anatomy is more easily definable with CT.
  - Postoperative individuals in whom there is a question regarding a remnant first rib.
  - Dialysis-dependent renal failure, claustrophobia, or implanted device incompatibility.
- See **Brachial Plexus (PN-4.1)** in the Peripheral Nerve Disorders Imaging Guidelines.

Background and Supporting Information

- TOS refers to compression of the subclavian vessels and/or brachial plexus at the thoracic outlet of the chest (the area bounded by the two scalene muscles and the first rib).
- There are 3 types, with neurogenic causes seen in 80%, venous causes (also called effort thrombosis) found in 15% and the remaining 5% being arterial in etiology.
- Since this is such a rare entity and diagnosis is difficult, specialist evaluation by a vascular surgeon or thoracic surgeon is helpful in determining the appropriate imaging pathway.

References (CH-31)

v2.0.2024

1. Raptis CA, Sridhar S, Thompson RW, Fowler KJ, Bhalla S. Imaging of the Patient with Thoracic Outlet Syndrome. *Radiographics*. 2016;36(4):984-1000. doi:10.1148/rg.2016150221
2. Expert Panels on Vascular Imaging, Thoracic Imaging, and Neurological Imaging, Zurkiya O, Ganguli S, et al. ACR Appropriateness Criteria® Thoracic Outlet Syndrome. *J Am Coll Radiol*. 2020;17(5S):S323-S334. doi:10.1016/j.jacr.2020.01.029

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924

Lung Transplantation (CH-32)

Pre-Transplant Imaging Studies (CH-32.1)

CH.LT.0032.1.A
v2.0.2024

- Individuals on the waiting list or being considered for the lung transplant can undergo advanced imaging per that institution's protocol as long as the studies do not exceed the following:
  - CT Chest with and without contrast (CPT® 71270), CT Chest with contrast (CPT® 71260), or CT Chest without contrast (CPT® 71250)
  - ECHO
  - Imaging Stress Test (MPI, SE, MRI) or Heart Catheterization (Right and Left); Heart catheterization can also be done after a positive stress test.
  - CTA Chest and/or CTA Abdomen and Pelvis and/or CTA Aorta with bilateral lower extremity run-off is indicated without initial ABI's and/or arterial duplex for the following individuals:
    - Prior abdominal or lower extremity vascular intervention (any timeframe is acceptable)
    - Known peripheral artery disease (PAD) from prior imaging
    - Current symptoms of claudication, rest pain or gangrene
  - CTA Chest and/or CTA Abdomen and Pelvis and/or CTA Aorta with bilateral lower extremity run-off is indicated after initial ABI's and/or arterial duplex for the following individuals:
    - Initial ABI's and/or arterial duplex suggest the presence of PAD per one of the following:
      - ABI of <0.9
      - Presence of plaque
      - Presence of vascular calcification, stenosis or occlusion
      - Small vessel size on the duplex
  - CT Abdomen and Pelvis with or without contrast (CPT® 74177 or CPT® 74176) for determining extracorporeal membrane oxygenation (ECMO) candidacy
- Other studies that will be considered include V/Q scan, Six Minute Walk Test.
- See **Transplant (CD-1.6)** in the Cardiac Imaging Guidelines.

Post-Transplant Imaging Studies (CH-32.2)

CH.LT.0032.2.A
v2.0.2024

- CT Chest with and without contrast (CPT® 71270), CT Chest with contrast (CPT® 71260), or CT Chest without contrast (CPT® 71250) is supported for:[2]
  - Initial post-transplant follow-up.
  - Suspected complication, either surgical, medical or infectious, (See **Background and Supporting Information**)
  - Worsening PFT's
  - New finding on other imaging, including chest x-ray
- See **Transplant (CD-1.6)** in the Cardiac Imaging Guidelines.

Background and Supporting Information

- Complications from lung transplantation are a major cause of morbidity and mortality.
- The three main categories of complications are surgical, medical and infectious.
  - Surgical complications include; anastomotic complications, bronchial dehiscence, bronchial stenosis, pneumothorax, hemothorax, hematoma, wound dehiscence and infection.
  - Medical complications include; primary graft dysfunction, pulmonary embolism and pulmonary infarction, Tracheobronchomalacia, posttransplant lymphoproliferative disease, primary disease recurrence, acute and chronic allograft rejection, including bronchiolitis obliterans and restrictive allograft syndrome.
  - Infectious complications include; hospital and community acquired nonmycobacterial pulmonary infections, mycobacterial infections, fungal infections, and viral infections, (CMV most common).

Reference (CH-32)

v2.0.2024

1. Ng YL, Paul N, Patsios D, et al. Imaging of lung transplantation: review. *AJR Am J Roentgenol*. 2009;192(3 Suppl):S1-S19. doi:10.2214/AJR.07.7061
2. DeFreitas MR, McAdams HP, Azfar Ali H, Iranmanesh AM, Chalian H. Complications of Lung Transplantation: Update on Imaging Manifestations and Management. *Radiol Cardiothorac Imaging*. 2021;3(4):e190252. Published 2021 Aug 26. doi:10.1148/ryct.2021190252
3. Mb D, Bao B, Brechot N, et al. Extracorporeal Life Support Organization (ELSO) Ultrasound Guidance for Extra-Corporeal Membrane Oxygenation Veno-Venous ECMO Specific Guidelines. http://www.elso.org/Portals/0/Files/elso_Ultrasoundguidance_vvecmo_guidelines_MAY2015.pdf.
4. Bonicolini E, Martucci G, Simons J, et al. Limb ischemia in peripheral veno-arterial extracorporeal membrane oxygenation: a narrative review of incidence, prevention, monitoring, and treatment. *Crit Care*. 2019;23(1):266. Published 2019 Jul 30. doi:10.1186/s13054-019-2541-3
5. Hoetzenecker K, Benazzo A, Stork T, et al. Bilateral lung transplantation on intraoperative extracorporeal membrane oxygenator: An observational study. *J Thorac Cardiovasc Surg*. 2020;160(1):320-327.e1. doi:10.1016/j.jtcvs.2019.10.155
6. Faccioli E, Terzi S, Pangoni A, et al. Extracorporeal membrane oxygenation in lung transplantation: Indications, techniques and results. *World J Transplant*. 2021;11(7):290-302. doi:10.5500/wjt.v11.i7.290

Lung Cancer Screening (CH-33)

U.S. Preventive Services Task Force: Lung Cancer Screening (Commercial and Medicaid) (CH-33.1)

CH.CS.0033.1.A
v2.0.2024

- Low-dose CT Chest (CPT® 71271) for lung cancer screening annually if all of the following criteria are met:

Screening Indications – Commercial and Medicaid	Imaging Study

• All criteria below must be met:
  • Individual has not received a low-dose CT lung screening in less than 12 months; and
  • Individual has NO health problems that substantially limit life expectancy or the ability or willingness to have curative lung surgery*; and
  • Individual is between 50 and 80 years of age; and
  • Individual has at least a 20 pack-year history of cigarette smoking; and
  • Currently smokes or quit within the past ≤15 years
	Low-Dose CT Chest without contrast (CPT® 71271)

For incidental nodule(s) detected on previous imaging but do not qualify for LDCT, Lung Cancer Screening See **Solitary Pulmonary Nodule (SPN) (CH-16)**, for CPT® 71250 and CPT® 71260.

*This is based on a range of chest or other organ signs, symptoms or conditions which would question the member's ability to undergo surgical or non-surgical treatment if a lung cancer was discovered. For example, congestive heart failure, advanced cancer from another site or a member with COPD who uses oxygen when ambulating, would be examples of conditions that would "substantially limit life expectancy." Conversely, stable COPD and its symptoms, including cough, shortness of breath would not "substantially limit life expectancy."

National Coverage Determination (NCD) for Lung Cancer Screening with Low Dose Computed Tomography (LDCT) (Medicare) (CH-33.2)

CH.CS.0033.2.A

v2.0.2024

- Medicare criteria for LDCT for Lung Cancer Screening (CPT® 71271) See **NCD 210.14**

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

Incidental Pulmonary Nodules Detected on Low Dose CT Chest (LDCT) Images (CH-33.3)

CH.CS.0033.3.A

v2.0.2024

- Any Lung-RADS less than 1 year interval follow-up is coded as Low-Dose CT Chest (CPT® 71250) (Not CPT® 71271 which is ONLY the annual screen)
- For lung nodules, including incidental findings from studies other than screening LDCT, or if no longer qualify for screening LDCT, See **Incidental Pulmonary Nodules Detected on CT Images (CH-16.2)**

Lung-RADS Primary Category/Category Descriptor*	Management
0: Incomplete	If findings suggestive of an inflammatory or infectious process, follow-up with LDCT (CPT 71250) in 1-3 months
2: Benign appearance or behavior - very low likelihood of becoming a clinically active cancer due to size or lack of growth	Annual LDCT screening (CPT® 71271) in 12 months
3: Probably benign finding(s) - short term follow-up suggested; includes nodules with a low likelihood of becoming a clinically active cancer	6 month LDCT (CPT® 71250) and if unchanged on this CT it is coded as category 2 and returned to annual LDCT screening (CPT® 71271) in 12 months
4A: Suspicious - Findings for which additional diagnostic testing and/or tissue sampling is recommended	PET/CT (CPT® 78815) when there is a ≥8 mm solid nodule or solid-component Follow-up with LDCT (CPT® 71250) in 3 months and if stable or decreased in size on this CT, it is coded as category 3 with follow-up LDCT (71250) at 6 months, if stable or decreased in size on this CT, return to annual LDCT screening (CPT® 71271) in 12 months

Lung-RADS Primary Category/Category Descriptor*	Management
4B or 4X: Suspicious - Findings for which additional diagnostic testing and/or tissue sampling is recommended	CT Chest with or without contrast, PET/CT (CPT® 78815) and/or tissue sampling depending on the probability of malignancy and comorbidities. PET/CT (CPT® 78815) when there is a ≥8 mm solid component. If there is low suspicion of lung cancer, follow-up with LDCT (CPT® 71250) in 3 months with another LDCT (CPT® 71250) in 6 months and if unchanged on this CT return to annual LDCT screening (CPT® 71271) in 12 months

• For those that no longer qualify for annual LDCT for lung cancer screening but have known lung nodules, follow criteria for follow-up under CH-16. For example, a nodule that is new on the last screening LDCT may warrant continued diagnostic CT evaluation per **CH-16.2**.

*Please see note section of the official ACR Lung-RADS V2022 for additional details concerning specific recommendations-https://www.acr.org/-/media/ACR/Files/RADS/Lung-RADS/Lung-RADS-2022.pdf

References (CH-33)

v2.0.2024

1. US Preventive Services Task Force. Screening for Lung Cancer: US Preventive Services Task Force Recommendation Statement. *JAMA*. 2021;325(10):962–970. doi:10.1001/jama.2021.1117
2. CMS Decision Memo for Lung Cancer Screening with Low Dose Computed Tomography (LDCT) (210.14) Effective Date of this Version 2/5/2015.
3. Lung-RADS™ Version 1.1 Assessment Categories Release date: 2019. https://www.acr.org/-/media/ACR/Files/RADS/Lung-RADS/LungRADSAssessmentCategoriesv1-1.pdf

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com