CIGNA MEDICAL COVERAGE POLICIES– RADIOLOGY

Chest Imaging Guidelines

Effective Date: February 02, 2027

Instructions for use

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

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

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

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

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

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

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Abbreviations for Chest Guidelines

CH.GG.Abbreviations.A
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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

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

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General Guidelines (CH-1.0)

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Criteria

- 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 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.
        - 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.
  - When smoking history is referred to or required this is speaking to cigarette smoking history and not other smoking substances, unless other substances are directly mentioned in the relative guideline section.

Health Equity Considerations

Health equity is the highest level of health for all individuals; health inequity is the avoidable difference in health status or distribution of health resources due to the social conditions in which individuals are born, grow, live, work, and age. Social determinants of health are the conditions in the environment that affect a wide range of health, functioning, and quality of life outcomes and risks. Examples include the following: safe housing, transportation, and neighborhoods; racism, discrimination, and violence; education, job opportunities, and income; access to nutritious foods and physical activity opportunities; access to clean air and water; and language and literacy skills.

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

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- Chest x-ray can help identify previously unidentified disease and direct proper advanced imaging for such conditions as:
  - mediastinal lymphadenopathy (See **Mediastinal Lymphadenopathy (CH-2.3)**)
  - cough (See **Cough (CH-3.1)**)
  - non-cardiac chest pain (See **Non-Cardiac Chest Pain - Imaging (CH-4.1)**)
  - dyspnea (See **Dyspnea/Shortness of Breath (CH-5.1)**)
  - suspected post endobronchial valve complication (See **Post Endobronchial Valve (EBV) Placement (CH-5.3)**)
  - hemoptysis (See **Hemoptysis (CH-6.1)**)
  - bronchitis (See **Bronchitis (CH-8.1)**)
  - asbestos exposure (See **Asbestos Exposure (CH-9.1)**)
  - chronic obstructive pulmonary disease (See **COPD (CH-10.1)**)
  - e-cigarette or vaping product use-associated lung injury (See **E-cigarette, or Vaping, Product-Use Associated Lung Injury (EVALI) (CH-11.2)**)
  - pleural effusion (See **Pleural Effusion (CH-18.1)**)
  - pneumothorax or hemothorax (See **Pneumothorax/Hemothorax (CH-19.1)**)
  - pneumomediastinum (See **Pneumomediastinum; Subcutaneous Emphysema (CH-19.2)**)
  - fractured ribs, sternum, or clavicle (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 may include such conditions as:
  - supraclavicular lymphadenopathy (See **Supraclavicular Region (CH-2.1)**)
  - axillary lymphadenopathy (See **Axillary Lymphadenopathy (and Mass) (CH-2.2)**)
  - costochondritis (See **Costochondritis/Other Musculoskeletal Chest Wall Syndrome (CH-4.2)**)
  - pre-operative assessment (See **Pre-Operative Assessment CH-5.2)**)
  - known bronchiectasis (See **Bronchiectasis (CH-7.1)**)
  - cystic fibrosis (See **Adult Cystic Fibrosis (CH-7.2)**)
  - suspected interstitial lung disease (See **Interstitial Lung Disease (ILD)/Diffuse Lung Disease (DLD) (CH-11.1)**)

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- positive PPD or tuberculosis (See **Other Chest Infections (CH-14)**)
- sarcoidosis (See **Sarcoid (CH-15.1)**)
- pulmonary nodules (See **Solitary Pulmonary Nodule (SPN) (CH-16)** and **Pleural-Based Nodules and Other Abnormalities (CH-17.1)**)
- mediastinal mass (See **Mediastinal Mass (CH-20.1)**)
- pectus excavatum and carinatum (See **Pectus Excavatum and Carinatum (CH-23.1)**)
- pulmonary arteriovenous fistula (See **Pulmonary AVM (CH-24.1)**)
- pulmonary embolism (See **Pulmonary Embolism (CH-25.1)**)
- elevated hemidiaphragm (See **Elevated Hemidiaphragm (CH-30.1)**)
- pre- or post-lung transplant (See **Lung Transplantation (CH-32)**)
- lung cancer screening (See **Lung Cancer Screening (CH-33)**)

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General Guidelines – Chest Ultrasound (CH-1.2)

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Criteria

- 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. It may be helpful in identifying pleural effusions (See **Pleural Effusion (CH-18)**).
  - Chest ultrasound:
    - CPT® 76604
  - Breast ultrasound:
    - CPT® 76641: unilateral, complete
    - CPT® 76642: unilateral, limited
    - CPT® 76641 and CPT® 76642 be reported only once per breast, per imaging session
  - Axillary ultrasound:
    - CPT® 76882 (unilateral); if bilateral, can be reported as CPT® 76882 x 2

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General Guidelines – CT Chest (CH-1.3)

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Criteria

- Intrathoracic abnormalities as covered in these guidelines 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)
- For low-dose CT Chest (CPT® 71271 OR CPT® 71250): 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.

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.
- Low-dose CT chest does not have a specific, separate CPT® code associated with it. It should be reported with the standard CT chest CPT code (CPT® 71250).
  - An exception to this is the low-dose CT used specifically for the annual lung cancer screening scans, for which CPT® 71271 is used.

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

CH.GG.0001.4.A
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Criteria

- CTA Chest (CPT® 71275) is medically necessary for:
  - non-cardiac chest pain (See **Non-Cardiac Chest Pain - Imaging (CH-4.1)**)
  - hemoptysis (See **Hemoptysis (CH-6.1)**)
  - pulmonary arteriovenous fistula (See **Pulmonary AVM (CH-24.1)**)
  - pulmonary embolism (See **Pulmonary Embolism (CH-25.1)**)
  - pre-lung transplantation (See **Pre-Transplant Imaging Studies (CH-32.1)**)
  - prior to minimally invasive or robotic surgery (See **Transcatheter Aortic Valve Replacement (TAVR) (CD-4.8)** in the Cardiac Imaging Guidelines)

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

CH.GG.0001.5.A
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Criteria

- Indications for MRI Chest are infrequent and may relate to concerns about CT contrast such as renal insufficiency or contrast allergy. MRI is considered medically necessary for:
  - Clarification of equivocal findings on previous imaging studies (often in the thymic mediastinal region).
    - Certain conditions include:
      - mediastinal lymphadenopathy (See **Mediastinal Lymphadenopathy (CH-2.3)**)
      - chest wall mass (See **Chest Wall Mass (CH-22.1)**)
      - mediastinal mass (See **Mediastinal Mass (CH-20.1)**)
      - chest muscle tendon injuries (See **Muscle/Tendon Unit Injuries/Diseases (MS-11.0)** in the Musculoskeletal Imaging Guidelines)
      - pectoralis tendon rupture (See **Muscle/Tendon Unit Injuries/Diseases (MS-11.0)** in the Musculoskeletal Imaging Guidelines)
      - 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)

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Navigational Bronchoscopy and Biopsy (CH-1.7)

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Criteria

- CPT® 76497 (Unlisted CT procedure) 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) if:
  - Previous diagnostic scan was ≥6 weeks ago and study is needed for navigational bronchoscopy.
- Bronchoscopy with computer-assisted, image-guided navigation, includes three-dimensional reconstruction. Do not report in conjunction with 3-D rendering CPT codes (CPT® 76376) or (CPT® 76377).
- Core needle biopsy (CPT® 32408) for:
  - Biopsy of the lung or mediastinum to diagnose malignancy.
- For robotic-assisted lung resection, see **Pre-Operative Assessment (CH-5.2)**.

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(Cicenia et al., 2020; Gildea et al., 2006; Mehta et al., 2018). 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(Cicenia et al., 2020).
- Names for navigational bronchoscopy systems can include:
  - superDimension or super-D
  - Spin Thoracic Navigation System
  - Archimedes
  - Monarch Platform - robotic
  - Ion - endoluminal robotic bronchoscopy platform
  - Shape-sensing robot assisted bronchoscopy (ssRAB)
- The diagnostic accuracy of navigational bronchoscopy is 70.9-79% (Kops et al., 2023; Lentz et al., 2025). It has an excellent safety profile, with an adverse event rate

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(e.g., pneumothorax) of 3.3-5.6% (Kops et al., 2023; Lentz et al., 2025; Podder et al., 2022).

- Cone-Beam CT, (CBCT) is a newer technique that helps locate the nodule in real time (Piro et al., 2021; Podder et al., 2022). Studies have shown comparable results and diagnostic yields to other guided bronchoscopy strategies. CBCT combined with other navigational techniques often reaches a higher navigational success rate and diagnostic rate (Piro et al., 2021; Podder et al., 2022; Yang et al., 2025). However, a recent study found no statistically significant differences in diagnostic sensitivity, specificity, and accuracy between those who received CBCT and other methods (Yang et al., 2025). Additionally, CBCT can expose the individual and operator to radiation through the repeated acquisition of images. The mean radiation dose was determined to be 48.4 Gy cm^2 per case; this excessive and unnecessary radiation can cause radioactive damage to the individual and the operator. Another study concluded that, "Additional studies are warranted to confirm the safety and efficacy of this technique" (Piro et al., 2021). Efforts are required to improve diagnostic accuracy and standardized practices before CBCT can be considered mainstream. Large-scale randomized controlled trials that compare CBCT with other navigational techniques are necessary to determine the most optimal navigational strategy, clinical criteria for CBCT usage, and the best way to diagnose peripheral pulmonary lesions (Yang et al., 2025).

Chest Imaging Guidelines

References (CH-1)

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Lymphadenopathy (CH-2)

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Supraclavicular Region (CH-2.1)

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Criteria

- Ultrasound (CPT® 76536) is the initial study for palpable or suspected lymphadenopathy.
  - Allows simultaneous ultrasound-guided 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

Evidence Discussion

For suspected or palpable supraclavicular lymphadenopathy, ultrasound (US) demonstrates excellent sensitivity, reported to be as high as 100% for the detection of metastatic disease, while CT of the neck shows a comparatively lower sensitivity of approximately 83% for the same lesions (van Overhagen et al., 2004). Ultrasound also avoids ionizing radiation exposure associated with CT, is widely available, and facilitates ultrasound-guided needle biopsy for diagnostic confirmation, when indicated (English et al., 2015; Ackman et al., 2021).

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Axillary Lymphadenopathy (and Mass) (CH-2.2)

CH.LA.0002.2.A
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Criteria

- There is no evidence-based support for advanced imaging of clinically evidenced axillary lymphadenopathy prior to a biopsy. If axillary node biopsy reveals benign findings, advanced imaging is considered not medically necessary. 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). Follow-up imaging with ultrasound is considered medically necessary if there is a significant risk of metastatic adenopathy (e.g., breast, head and neck, upper extremity/trunk melanoma or lymphoma)
    - If axillary adenopathy is unchanged, then consider additional follow up 6 months after initial presentation.
  - Ultrasound directed core needle biopsy or surgical excisional biopsy of the most abnormal lymph node if:
    - Condition persists.
    - Malignancy is suspected.
  - Surgical excisional biopsy if core needle biopsy results are non-diagnostic.
  - Advanced imaging is considered not medically necessary.
- 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
  - Advanced imaging is considered not medically necessary.

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  - 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.
- For unexplained axillary lymphadenopathy in individuals with silicone breast implants, see **Breast Implant Evaluation (BR-5.2)**

Evidence Discussion

Initial evaluation of an axillary mass or axillary lymphadenopathy (LAN) should be ultrasound (US). US allows for real-time evaluation and immediate image-directed biopsy (Sun et al., 2020). CT Chest is usually not appropriate in the evaluation of axillary LAN, especially in the female population with concern for breast cancer (Le-Petross et al., 2022).

Ultrasound is a very important initial imaging modality which is easy to obtain, universally available and portable, exposes individuals to no radiation, and is cost effective (Le-Petross et al., 2022). It is also excellent in helping to determine next best advanced imaging study including appropriate protocol and contrast level. US not only provides excellent soft tissue resolution, but also provides characterization of cystic lesions (Bosniak classification) whether complex or simple to help guide follow up imaging interval or biopsy (Sun et al., 2020).

Background and Supporting Information

- 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. 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. However, the SBI no longer recommends delaying screening mammograms around COVID-19 vaccinations (Grimm et al., 2021).

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Mediastinal And Hilar Lymphadenopathy (CH-2.3)

CH.LA.0002.3.A
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Criteria

- CT Chest with contrast (CPT® 71260) if mediastinal and/or hilar abnormalities are detected on a chest x-ray (over read by a radiologist), other non-dedicated advanced chest imaging, or clarification of mediastinal and/or hilar abnormalities on a non-contrast CT Chest.
  - If contrast cannot be tolerated due to allergy or renal dysfunction, MRI chest without and with contrast (CPT® 71552) OR MRI chest without contrast (CPT® 71550) is considered medically necessary.
  - Follow-up CT Chest (CPT® 71260) is considered medically necessary at least 3 months after the initial CT when: :
    - If enlarged lymph nodes, ≥15 mm (in the short axis)*, are present in the mediastinum or hilar regions with no known condition that fully accounts for the lymphadenopathy. . .
    - If mediastinal lymph nodes are stable or decreasing in size on follow-up CT, further advanced imaging is considered not medically necessary.
  - Further evaluations:
    - Lymph node biopsy (see methods below) is considered medically necessary 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) is considered medically necessary for enlarged lymph nodes, ≥15 mm (in the short axis)*with no known condition that fully accounts for the lymphadenopathy or increasing lymph node size on follow-up CT Chest.

* If a single measurement is reported without specification of axis, it shall be interpreted as the short-axis measurement for the purposes of these guidelines.

Evidence Discussion

- CT Chest is considered medically necessary for mediastinal and/or hilar abnormalities detected on chest x-ray or other non-dedicated advanced imaging (Jain et al., 2025; Munden et al., 2018). CT allows for further tissue characterization and can distinguish between calcium, macroscopic fat and water attenuation fluid (Jain et al.,

2025; Goldin, 2025). CT has higher contrast resolution than plain chest radiography (Munden et al., 2018). CT does carry with it the risk of both iodinated contrast exposure and ionizing radiation exposure (Munden et al., 2018; Ackman et al., 2021).

- Asymptomatic, incidental mediastinal and hilar lymph nodes less than 15mm (in the short axis) do not require follow up. Evison et al found that size was the greatest predictor of lymph node etiology with those less than 15mm always found to be reactive (Evison et al., 2014; Munden et al., 2018).
- For mediastinal and hilar lymph nodes greater than or equal to 15mm (in the short axis), follow-up should be directed by suspected etiology. For those with low or no clinical suspicion for malignancy and no other thoracic abnormalities, follow up CT chest at least 3 months after the initial imaging study is considerd medically necessary (O'Dowd et al., 2023; Munden et al., 2018). If the lymph nodes have increased in size on follow-up imaging, PET/CT or tissue biopsy is considered medically necessary (O'Dowd et al., 2023; Evison et al., 2014).
- For those with no known condition that fully accounts for the lymphadenopathy and mediastinal lymph nodes greater than or equal to 15mm, PET/CT is considered medically necessary. However, PET/CT has well-documented false positive results in this setting given the overlap of increased FDG uptake in both oncologic and infection or inflammatory disease processes Munden et al., 2018; Roy & Digumarthy, 2025).

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Chest Imaging Guidelines

Cough (CH-3)

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Chest Imaging Guidelines

Cough (CH-3.1)

CH.CH.0003.1.A
v1.0.2027

Criteria

- Initial evaluation should include a chest x-ray after the current episode of cough started or changed.
  - In addition all medications known to cause coughing (e.g., ACE inhibitors, Sitagliptin) should be discontinued.
- 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 treatment for a total 3-week trial and investigation after ALL of the following:
    - Antihistamine and decongestant (unless contraindicated, e.g., glaucoma, tachyarrhythmia, etc.) or intranasal glucocorticoid treatment.
    - Spirometry and/or pulmonary function tests (PFT's).
    - Empiric trial of corticosteroids (oral or inhaled) and/or leukotriene receptor antagonist (e.g., Montelukast).
    - Treatment of gastroesophageal reflux disease (GERD).
      - See **Sinus and Facial Imaging (HD-29.1)** in the Head Imaging Guidelines.
  - Current or past cigarette smokers with either:
    - new cough lasting greater than 2 weeks
    - changed chronic cough in worsening frequency or character
      - See **Hemoptysis (CH-6.1)**
  - See the relevant Chest Imaging Guideline section for advanced chest imaging to evaluate any abnormalities present on the initial chest x-ray.
  - For individuals with high suspicion for lung cancer despite normal chest x-ray:
    - See **Non-Small Cell Lung Cancer Suspected/Diagnosis (ONC-8.2)**
- CT Maxillofacial without contrast (CPT® 70486) or CT Sinus, limited without contrast (CPT® 76380) is considered medically necessary in those with suspicion of Upper Airway Cough Syndrome (UACS) in the following:
  - 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

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Evidence Discussion

CT chest is not recommended routinely in people with a chronic cough, normal chest x-ray, and normal physical exam. There is concern regarding potential cancer risk from CT radiation exposure, especially in women and children (Expert Panel on Thoracic Imaging et al., 2021; Morice et al., 2020). For individuals with cough of unknown etiology or a chronic cough refractory to therapy, a CT chest may identify changes not seen on chest x-ray, such as interstitial lung disease or bronchiectasis (Expert Panel on Thoracic Imaging et al., 2021; Morice et al., 2020; Truba et al., 2023).

Current or former smokers with a new cough or change in chronic cough do not need a trial of therapy for UACS, asthma or GERD prior to a chest CT if an initial chest x-ray is abnormal or non-diagnostic (Irwin et al., 2018; Expert Panel on Thoracic Imaging et al., 2021).

CT maxillofacial may be considered for suspected chronic rhinosinusitis (CRS) as the cause of chronic cough after clinical examination and chest x-ray if there is no response to empiric therapy or if the history and nasal endoscopy findings are concerning for CRS (Donaldson, 2023; Pratter, 2006; Dykewicz et al., 2020).

Objective evidence of classic asthmatic cough conventionally requires some evidence of variable airflow obstruction such as peak flow variability, or reversibility to bronchodilator of ≥10% change in FEV1 (Stanojevic et al., 2022)

When cough remains refractory to treatment, high-resolution CT scanning of the thorax is recommended to rule out parenchymal lung disease that is not visible on plain chest x-ray (Morice et al., 2020; Expert Panel on Thoracic Imaging et al., 2021; Irwin & Madison, 2025).

Cough Health Equity Considerations

Health Equity Considerations for Cough

- Chronic cough is more prevalent in older adults. Younger adults with chronic cough are more likely to be men, and older adults are more likely to be women.

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v1.0.2027

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Non-Cardiac Chest Pain (CH-4)

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

CH.CP.0004.1.A
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Criteria

- Initial evaluation should include a chest x-ray after the onset of presenting or current symptoms.
  - 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:
    - Cardiac evaluation (See General Guidelines (CD-1) in the Cardiac Imaging Guidelines)
    - GI treatment with any ONE of the following:
      - Trial of anti-reflux medication, or pH probe, or esophageal manometry or
      - Barium swallow or endoscopy
    - Pulmonary Function Test (PFT's) in those with known or suspected respiratory disease
  - CT Chest with contrast (CPT® 71260) if persistent:
    - The initial chest x-ray reveals no abnormalities with known Sickle cell disease
- 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 procedure
  - For suspected migration of implantable contraceptive devices, see Implantable Contraceptive Devices (PV-10.3)

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Evidence Discussion

It is important to rule out potentially life-threatening causes of acute chest pain, such as an acute coronary syndrome, aortic dissection, and pulmonary embolus. These topics are discussed in other guideline summaries (CD 1.0, CD 1.4, PVD 6.2 and PVD 6.3, CH 25.1). A specialized imaging protocol called the "triple rule-out" is sometimes used to evaluate the pulmonary arteries, aorta and coronary arteries. However, it is associated with higher non-diagnostic imaging quality, radiation and contrast doses Burris et al., 2015). The population for which it may be useful is unknown. It is yet to be proven useful in large clinical trials, and its appropriate use needs to be further defined (Burris et al., 2015; Hollander & Chang, 2015; Kirsch et al., 2022).

An evaluation for the cause of non-cardiac "angina-like" chest pain should be done if it persists or recurs despite a negative stress test or anatomic cardiac evaluation, or a low risk designation by a clinical decision pathway.[11] The differential diagnosis of non-cardiac chest pain is broad. The most common causes in a primary care setting are chest wall pain, reflux esophagitis, and costochondritis (McConaghy et al., 2020). Respiratory causes include pneumonia, pleuritis , and pneumothorax. People with COPD or acute asthma exacerbations may experience chest pain (Edmondstone, 2000; Lee et al., 2015). A thorough history and physical exam are important to help narrow the differential diagnosis and direct imaging. Musculoskeletal causes are usually diagnosed based on history and physical exam (point tenderness, reproducibility with palpation) without the need for diagnostic imaging. Most individuals should have an ECG and chest x-ray (CR) (Gulati et al., 2021). CR is rapid, non-invasive and is considered medically necessary in the initial evaluation of acute non-specific chest pain with a low probability of coronary artery disease (CAD) (Beache et al., 2020; Gulati et al., 2021). In individuals without evidence of cardiac or pulmonary disease, evaluation for a GI cause is reasonable. An empiric trial of acid suppression may be merited. If this is ineffective or there are alarm symptoms, an EGD, pH probe and/or motility study should be considered (Frieling, 2018; Gulati et al., 2021; Yamasaki & Fass, 2017).

Individuals with sickle cell disease and acute chest pain should have a CR initially (Gulati et al., 2021). Acute chest syndrome is defined by a new infiltrate on CR with fever and/or respiratory symptoms. In the presence of unexplained hypoxemia and an unremarkable CR, CT chest may be obtained to evaluate the pulmonary vasculature and lung parenchyma (Jain et al., 2017).

CR is considered medically necessary for non-traumatic chest wall pain and no history of malignancy to evaluate for a specific etiology, such as rib fracture, pneumonia, or pneumothorax (Bader et al., 2020; Stowell et al., 2021). Following a normal CR, CT chest is considered medically necessary to evaluate chest pain in the setting of known or suspected malignancy, suspected infectious or inflammatory condition, or a history of prior chest intervention (Stowell et al., 2021). CT is more sensitive than CR for characterizing chest wall neoplasms, chest wall infections, and subtle osseous and soft

tissue lesions. Chest MRI is useful if there is a high suspicion for necrotizing fasciitis and for surgical planning prior to debridement (Stowell et al., 2021).

Chest Imaging Guidelines

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

CH.CP.0004.2.A
v1.0.2027

Criteria

- Initial evaluation should include a chest x-ray.
- CT chest (CPT® 71250 or CPT® 71260) is considered medically necessary for inconclusive or nondiagnostic findings on chest x-ray AND one of the following:
  - concern for infectious or neoplastic processes
  - persistent symptoms >3 weeks (despite treatment)
- For MRI requests, see the applicable section:
  - **Infection (MS-9.0)**
  - **Muscle and Tendon Injuries (MS-11)**
  - **Joint Instability and Dysfunction (MS-30)**
  - **Chest Wall Mass (CH-22.1)**
- For slipping rib syndrome, dynamic chest ultrasound (CPT® 76604) is considered medically necessary.
  - CT chest (CPT® 71250 or CPT® 71260) is considered medically necessary only for pre-surgical planning
- For other conditions not mentioned, see **Non-Cardiac Chest Pain - Imaging (CH-4.1)**

Evidence Discussion

Costochondritis is a common cause of chest wall pain in adults presenting to the emergency department and physician's office (Proulx & Zryd, 2009; Mott et al., 2021). It is defined as inflammation of costochondral junctions of ribs or costosternal joints, usually at multiple levels and without any swelling or induration (Proulx & Zryd, 2009). It is a self-limited condition. The diagnosis is largely based on history and physical examination, which reproduces pain on palpation of the chest wall. Upper body movement, deep breathing, and exertional activities often exacerbate the pain (Proulx & Zryd, 2009; Mott et al., 2021). Tietze syndrome presents similarly to costochondritis but includes visible edema at the involved joint(s), typically is unilateral involving the second rib, and is often incited by infection or trauma. Imaging should be directed toward excluding alternative diagnoses, such as chest wall mass, infection, trauma, or other suspected pathology, rather than confirming the diagnosis of Tietze syndrome (Boran & Boran, 2017; Mott et al., 2021; Rokicki et al., 2018). Dynamic chest ultrasound

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accurately diagnoses slipping rib syndrome in 89% of cases and has a 100% negative predictive value (Foley Davelaar, 2021).

There are no laboratory tests or imaging tests findings specifically for the diagnosis of costochondritis (Mott et al., 2021). If an individual relates a history of dyspnea or chest wall trauma, a chest radiograph or rib series is considered medically necessary (Expert Panel on Thoracic Imaging et al., 2021; Mott et al., 2021). Chest radiographs can help identify potential sources of previously undifferentiated chest pain such as pneumothorax, pneumomediastinum, fractured ribs, acute and chronic infections, pneumonia, lung mass, and malignancies (Expert Panel on Cardiac Imaging et al., 2020; Expert Panel on Thoracic Imaging et al., 2021). A large observational study found that 91% of individuals with new-onset costochondritis had resolution of pain after three weeks of treatment with rest and nonsteroidal anti-inflammatory drugs. Thus, chest CT should be reserved for individuals who have persistent symptoms greater than 3-4 weeks, or where there is high suspicion for infection or neoplastic processes (Proulx & Zryd, 2009). Scintigraphy has been studied to determine its usefulness to diagnose costochondritis, but it is not specific for the diagnosis (Proulx & Zryd, 2009).

Most treatment recommendations are conservative in nature and have been traditionally accepted, perhaps because of the self-limited nature of the condition (Proulx & Zryd, 2009; Mott et al., 2021).

Recalcitrant cases may respond to corticosteroid injections (Mott et al., 2021).

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Dyspnea/Shortness of Breath (CH-5)

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Chest Imaging Guidelines

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Dyspnea/Shortness of Breath (CH-5.1)

CH.SB.0005.1.A
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Criteria

- Initial evaluation should include a chest x-ray since onset or change in symptoms.
  - CT Chest without contrast (CPT® 71250) OR CT Chest with contrast (CPT® 71260) if x-ray is abnormal.
  - 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, since onset or change in symptoms, and are indeterminate:
    - ECG, echocardiogram or stress testing, and
    - Pulse oximetry and pulmonary function studies (PFT's)
- If pulmonary embolus (PE) is suspected, see **Pulmonary Embolism (PE) (CH-25)**.
- If tracheobronchomalacia is suspected, see Imaging of the Larynx, Trachea, and Bronchus (Neck-9.1).
- For persistent dyspnea post-COVID-19 infection, see Coronavirus Disease 2019 (COVID-19) (CH-13.2).

Evidence Discussion

Dyspnea is the subjective experience of breathing discomfort (Parshall et al., 2012). There is no standard approach for the evaluation of chronic dyspnea, and data that test diagnostic algorithms against standard clinical care are limited; however, clinical practice algorithms have been proposed and found to be effective (Budhwar & Syed, 2020; Hudler et al., 2022; Oelsner et al., 2015; Sunjaya et al., 2022). If the diagnosis is not evident after a history and physical exam, initial diagnostic testing with pulse oximetry, spirometry, chest radiography (CR), ECG, and labs is recommended (Budhwar & Syed, 2020; Oelsner et al., 2015; Sunjaya et al., 2022). While the individual utility of these tests varies for a specific diagnosis, they are commonly available and easy to perform (Ferry et al., 2019).

Spirometry can identify obstructive lung disease or suggest restrictive lung disease. The flow-volume loop may suggest intra- or extra-thoracic airway obstruction. Some authors recommend full pulmonary function tests as part of the initial investigation, while others consider spirometry an appropriate initial test (Hudler et al., 2022; Sunjaya et al., 2022). Diagnostic accuracy is improved when spirometry is done in addition to a clinical assessment (Ferry et al., 2019).

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ECG has a high negative predictive value for cardiac disease but low specificity. Thus, further testing such as echo is often necessary (Ferry et al., 2019). The recommended timing of echocardiography differs between algorithms but echo is an important test for cardiac causes of dyspnea (Budhwar & Syed, 2020; Ferry et al., 2019). The American College of Radiology (ACR) states that for dyspnea of suspected cardiac origin, the initial diagnostic imaging should usually be CR followed by transthoracic echo (Expert Panel on Cardiac Imaging, 2022).

CR remains a valuable first line investigation of dyspnea (Budhwar & Syed, 2020). The ACR states that CR should generally be the first imaging study (Expert Panel on Thoracic Imaging, 2024). It may reveal abnormalities or guide further imaging decisions. Data on the diagnostic utility of chest CT for chronic dyspnea are limited. It is often used following an abnormal CR or if other initial testing is negative. The ACR states that CT may be useful when CR abnormalities require further characterization or clinical findings necessitate additional imaging despite a normal CR (Expert Panel on Thoracic Imaging, 2024). CT without intravenous contrast is usually sufficient unless there is a suspicion for vascular abnormalities. The disadvantage is exposure to ionizing radiation; therefore, CT "requires careful patient selection with consideration given to patient age, risk of diagnostic radiation exposure and estimated diagnostic yield"(Ferry et al., 2019).

Dyspnea/Shortness of Breath Health Equity Considerations

- Dyspnea disproportionately affects individuals with a low socioeconomic status.

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Pre-Operative Assessment (CH-5.2)

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Criteria

- For pre-operative assessment prior to a planned segmental, lobar, or lung removal, as well as for pre-interventional assessment prior to a planned endobronchial valve (e.g., Zephyr valve) placement, the following are considered medically necessary:
  - "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.
  - For robotic assisted lung resection, CT chest (CPT® 71250 OR CPT® 71260) is considered medically necessary if:
    - Previous diagnostic scan was ≥6 weeks ago
    - CPT® 76497 (Unlisted CT procedure) if a CT Chest has been performed < 6 weeks ago

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

CH.SB.0005.3.A
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Criteria

- Suspected Post EBV Complication:
  - Initial evaluation should include a chest x-ray
    - CT Chest without contrast (CPT® 71250) or CT Chest with contrast (CPT® 71260) is considered medically necessary 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

Evidence Discussion

The most common acute complications following EBV placement are pneumothorax, pneumonia, COPD exacerbation and valve migration (Slebos et al., 2017). Pneumothorax occurs in 20-30% of individuals, the majority within the first 48 hours after the procedure. Individuals who have an acute increase in dyspnea, cough or chest pain, or an acute perceived loss of benefit, should have a chest X-ray (CR) to rule out pneumothorax. If the CR is non-diagnostic, a CT chest should be done to evaluate the valve position, the target lobe and volume reduction more precisely (Koster et al., 2020).

Following EBV placement, it may take several days to one month for significant volume reduction and atelectasis of the target lobe to occur. If no significant lung volume reduction is seen on CR at one month, a CT should be done to evaluate valve position (Slebos et al., 2017). A CT chest is performed routinely at some centers 6-8 weeks after EBV placement (Koster et al., 2020). If there has been no clinical benefit and no lobar atelectasis is evident on CT at 6 weeks, a revision bronchoscopy may be necessary (Klooster & Slebos, 2021). The two most common causes of lack of benefit are the presence of interlobar collateral ventilation or valve misplacement/migration.

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Chest Imaging Guidelines

Hemoptysis (CH-6)

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Chest Imaging Guidelines

Hemoptysis (CH-6.1)

CH.HS.0006.1.A
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Criteria

- After hemoptysis has started or worsened the following is considered medically necessary:
  - Chest X-ray (CPT® 71046); AND/OR
  - CT Chest with contrast (CPT® 71260) or CTA Chest (CPT® 71275)
- For recurrent hemoptysis (hemoptysis occurring after medical therapy or embolization), or related to pre-bronchial artery embolization planning, the following is considered medically necessary:
  - CTA Chest (CPT® 71275) (preferred) or CT chest with contrast (CPT® 71260) if requested

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.

Evidence Discussion

Hemoptysis is most commonly caused by acute respiratory tract infections, respiratory tract neoplasm, bronchiectasis, and tuberculosis (O'Gurek & Choi, 2022), and clinically unstable (massive) hemoptysis requires immediate stabilization, often in an ICU setting, given the primary risk of asphyxiation rather than exsanguination (Charya et al., 2021; Kathuria et al., 2020). For non-massive hemoptysis, chest x-ray remains a reasonable initial imaging choice, particularly to confirm a benign etiology such as acute bronchitis or pneumonia, though there are no recent studies directly comparing its diagnostic utility to other imaging modalities (Expert Panel on Thoracic Imaging, 2020); CT chest with intravenous contrast, however, is now the established imaging modality for determining the etiology of non-massive hemoptysis and has diagnostic accuracy superior to bronchoscopy for identifying the underlying cause and bleeding site (Expert Panel on Thoracic Imaging, 2020; O'Gurek & Choi, 2022), so CT chest with contrast or CTA chest is considered medically necessary after hemoptysis has started or worsened regardless of chest x-ray findings, including when the chest x-ray is normal (O'Gurek & Choi, 2022). For recurrent hemoptysis or pre-embolization planning, CTA chest is considered medically necessary and preferred over CT chest with contrast because it more precisely localizes bronchial and non-bronchial systemic

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arterial supply, and pre-procedural CT and/or bronchoscopic localization is valuable since angiographic localization alone can be time-consuming, technically challenging, and requires a substantial contrast load, so the choice of arteries to embolize is based on a combination of CT findings, bronchoscopic localization when applicable, and angiographic findings (Charya et al., 2021; Kathuria et al., 2020).

Chest Imaging Guidelines

Reference (CH-6)

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Chest Imaging Guidelines

Bronchiectasis (CH-7)

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Chest Imaging Guidelines

Bronchiectasis (CH-7.1)

CH.BR.0007.1.A
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Criteria

- High resolution CT Chest (HRCT) without contrast (CPT® 71250) is considered medically necessary for ANY of the following:
  - To confirm suspected diagnosis of bronchiectasis after an initial x-ray.
  - For known bronchiectasis with worsening symptoms or worsening PFT's.
  - For hemoptysis with known or suspected bronchiectasis. See Hemoptysis (CH-6).

Evidence Discussion

The British Thoracic Society (BTS) recommends performing a baseline chest x ray (CR) in people with suspected bronchiectasis followed by a thin section (< or equal to 1 mm slice thickness) CT scan to confirm the diagnosis (Hill et al., 2019). According to the American College of Radiology (ACR), CR is relatively insensitive but is considered medically necessary and often performed as initial imaging for evaluation of associated conditions and exclusion of diseases that cause similar symptoms (Little et al., 2024). High resolution CT chest (HRCT) is considered the most accurate imaging modality for the diagnosis of bronchiectasis (Ledda et al., 2021). The ACR states that CT chest without contrast is considered medically necessary for suspected bronchiectasis to identify and characterize the severity and distribution of bronchiectasis and to evaluate any associated parenchymal lung diseases (Little et al., 2024). CT chest can help identify an etiology, such as allergic bronchopulmonary aspergillosis, Primary Ciliary Dyskinesia, tracheobronchomegaly, or a foreign body (Hill et al., 2019; Ledda et al., 2021).'

MRI chest for suspected bronchiectasis is not considered medically necessary because it is inferior to CT for evaluating lung parenchyma, and its use is mainly limited to research settings (Little et al., 2024).

CR is often the initial chest imaging exam to evaluate acute conditions in people with bronchiectasis, such as pneumonia or hemoptysis. CT chest without contrast is considered medically necessary for the evaluation of complications and assessing changes in clinical status (Little et al., 2024). CT chest with contrast is considered medically necessary in the setting of a suspected acute infection and associated complication, such as abscess (Little et al., 2024). The BTS recommends a CT chest for people with a deteriorating clinical status, such as worsening symptoms, increased frequency or severity of acute exacerbations, or decreasing lung function (Hill et al., 2019). They recommend a CT chest with contrast if PE is suspected. CTA chest with contrast is considered medically necessary in the setting of hemoptysis to identify

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dilated bronchial arteries or systemic collateral vessels and for pre-procedure planning (Ledda et al., 2021; Little et al., 2024).

High quality evidence in favor of repeated imaging is lacking (Ledda et al., 2021).CR may not show structural changes. Repeat HRCT carries the risk of increased radiation. Individuals with diseases associated with bronchiectasis may be evaluated with CT to help guide therapy and provide prognostic information (Little et al., 2024). The current indication for repeat HRCT is clinical deterioration (Hill et al., 2019).

Bronchiectasis Health Equity Considerations

- Bronchiectasis is more prevalent among females. The most aggressive disease occurs among post-menopausal females.

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Adult Cystic Fibrosis (CH-7.2)

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Criteria

- CT Chest without contrast (CPT® 71250) or with contrast (CPT® 71260) is considered medically necessary 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)**

Evidence Discussion

Imaging is an important method of evaluating the lungs in people with cystic fibrosis (CF). It has a stronger correlation with disease severity than pulmonary function tests and facilitates prompt therapy which may help limit irreversible lung damage (Crowley et al., 2021). Chest x- ray (CR) is less sensitive than CT chest at detecting early structural changes and disease progression (Ciet et al., 2022). However, CR is still most commonly used as the first line imaging examination for the assessment of acute complications due to its low cost, availability, low radiation and speed of acquisition (Murphy et al., 2016). CT is increasingly being used to monitor disease progression and make treatment decisions, but the routine use of CT for short term follow up during pulmonary exacerbations is not recommended due to the risk of a high cumulative radiation dose. Low dose chest CT (LDCT) is useful in individuals with persistent respiratory symptoms and decreased lung function despite appropriate therapy (Ciet et al., 2022). There is little evidence regarding the optimal timing of CT monitoring. The current best clinical practice in several European CF centers is a CT every two years with a radiation dose as low as reasonably achievable (ALARA). Follow up imaging is determined by individual-dependent clinical factors (Ciet et al., 2022). The CF Foundation guidelines for adult CF clinical care recommend CR every 2-4 years in those with a stable clinical status and state that imaging should be considered if there are symptoms or signs of an acute pulmonary exacerbation, pneumothorax, lobar atelectasis or hemoptysis (Yankaskas et al., 2004; Flume et al., 2010).

Several emerging techniques offer promising means of pulmonary imaging using less ionizing radiation, including ultra-low dose CT (ULDCT) and MRI (Crowley et al., 2021;

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Goralski et al., 2021; Hallouch et al., 2022; McBennett et al., 2022). The radiation dose with CR is 0.02mSv, 5.4 mSv for standard dose CT, 1 to 2 mSv for LDCT, and 0.05-0.08mSv for ULDCT. While pulmonary MRI has promise as a means of routinely monitoring CF lung disease, it is currently limited by a lack of availability, high cost, lack of validation and standardized protocols, and the need for sedation or anesthesia in some individuals (Ciet et al., 2022; Crowley et al., 2021).

Adult Cystic Fibrosis Health Equity Considerations

- There are disparities in cystic fibrosis outcomes related to race, ethnicity, socioeconomic status, geographic location, sexuality, and gender identity.
  - People with disadvantaged backgrounds have worse cystic fibrosis health outcomes and tend to die younger than those without.
  - Women tend to have worse cystic fibrosis outcomes than men.

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Bronchitis (CH-8)

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Bronchitis (CH-8.1)

CH.BH.0008.1.A
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Criteria

- Chest x-ray is considered medically necessary as initial imaging if symptoms persist or worsen. Advanced imaging is not medically necessary for bronchitis unless directed by condition specific guideline.
  - See the following guidelines for additional information:
    - For Pneumonia, see: Pneumonia (CH-13.1).
    - For Cough, see: Cough (CH-3.1).
    - For Pleural Effusion, see: Pleural Effusion (CH-18.1).
    - For pulmonary mass, see: Pulmonary Nodule (CH-16.1), Pulmonary Nodule (CH-16.1).

Evidence Discussion

Acute bronchitis is a self-limited respiratory infection characterized by cough due to acute inflammation of the trachea and large airways without evidence of pneumonia (Braman, 2006; Kinkade & Long, 2016). This syndrome should be distinguished from the common cold, an acute exacerbation of chronic bronchitis and acute asthma (Braman, 2006).

Cough associated with acute bronchitis typically lasts about two to three weeks. Other diagnoses must be considered when cough persists for more than three weeks (Braman, 2006). Acute bronchitis is mainly caused by viruses, and antibiotics are not typically indicated in individuals without chronic lung disease (Braman, 2006; Kinkade & Long, 2016). Imaging is primarily used to rule out pneumonia. Evidence-based guidelines from the American College of Chest Physicians state that imaging is not needed in individuals with acute bronchitis symptoms who have normal vital signs and normal lung examination findings (Kinkade & Long, 2016).

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Asbestos Exposure (CH-9)

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Asbestos Exposure (CH-9.1)

CH.AE.0009.1.A
v1.0.2027

Criteria

- Chest x-ray as radiographic screening for individuals with known or suspected asbestos exposure.
  - Stable asymptomatic calcified pleural plaques on chest x-ray do not require advanced imaging of the chest.
- CT Chest is not considered medically necessary to screen populations at risk for asbestos-related diseases.
- High resolution CT Chest (HRCT) (CPT® 71250) for ANY of the following:
  - Any change seen on chest x-ray
  - Progressive respiratory symptoms that may indicate the development or progression of asbestos related lung disease
- See **Interstitial Disease (CH-11)** for additional information.
- For malignant mesothelioma, See Malignant Pleural Mesothelioma – Suspected/ Diagnosis (ONC-10.1).

Evidence Discussion

Several well-conducted epidemiologic studies of occupationally exposed workers, family contacts of workers, and persons living near asbestos mines have demonstrated that exposure to asbestos is associated with an increased incidence of asbestosis, lung cancer, mesothelioma, as well as other neoplasms. Asbestosis is a fibrotic lung disease caused by accumulation of asbestos fibers in the lungs (Banks et al., 2009; ATSDR, 2011). The diagnosis of asbestosis is most commonly made based on a history of exposure to asbestos, the presence of characteristic radiologic abnormalities, end-inspiratory rales, and other clinical features. The American College of Radiology states that chest radiograph and CT are complementary in the initial workup of suspected occupational lung disease, with chest radiograph's primary role being to exclude alternative diagnoses (Bacchus et al., 2016) (OSHA, 1910.1001 App H; Banks et al., 2009).

A chest x-ray of an individual exposed to asbestos may show pleural plaques, pleural calcifications, pleural fibrosis, or small irregular parenchymal opacities. Lung cancer risk is not elevated among individuals with asbestos-related pleural plaques in the absence of asbestosis.

Low-dose CT (LDCT) is not considered medically necessary as a first-line or standalone screening tool for asbestos-related lung cancer risk. While some literature has

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advocated for expanded lung cancer screening eligibility in select high-risk populations with heavy asbestos exposure, this evidence has limited generalizability, including low screening rates among non-smokers, and there are currently no major society recommendations for routine LDCT screening on the basis of asbestos exposure alone (Markowitz, 2022).

Chest x-ray is considered medically necessary to screen for lung changes resulting from asbestos exposure and is recommended for those who have had relatively heavy exposure to asbestos. However, chest x-rays lack specificity. When a chest x-ray abnormality is indeterminate, High Resolution CT Chest (HRCT) is useful in revealing characteristic parenchymal abnormalities. There is a lack of consensus among experts regarding the value of HRCT for screening of asbestos-related pulmonary disease (Bacchus et al., 2016) (OSHA, 1910.1001 App H; Banks et al., 2009).

Chest Imaging Guidelines

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Chest Imaging Guidelines

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

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Chest Imaging Guidelines

COPD (CH-10.1)

CH.PD.0010.1.A
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Criteria

- Chest x-ray should be performed initially.
  - CT Chest without contrast (CPT® 71250) or CT Chest with contrast (CPT® 71260) can be performed if:
    - Emphysema is known or suspected and a pre-operative study for Lung Volume Reduction Surgery (LVRS) is being requested. OR
    - For known COPD:
      - individuals with persistent exacerbation OR
      - symptoms out of proportion to disease severity OR
      - FEV1 <45% of predicted
    - PFT's, appropriate laboratory studies, and chest x-ray do not reveal a definitive diagnosis and there is suspicion of an additional diagnosis including, but not limited to:
      - Bronchiectasis
      - Sarcoidosis
      - Emphysema
      - Pneumoconiosis
      - Idiopathic pulmonary fibrosis
      - Langerhans cell histiocytosis
      - Hypersensitivity pneumonitis
      - Bronchiolitis obliterans
      - Lipoid pneumonia
      - Drug toxicity
      - Lymphangitic cancer
      - 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)**

Evidence Discussion

Chest x-ray (CR) is usually the appropriate initial imaging study for suspected COPD to exclude alternative diagnoses and evaluate for comorbidities and complications

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(Christensen et al., 2024; Global Initiative for Chronic Obstructive Lung Disease [GOLD], 2025; Raoof, Shah, Braman, et al., 2023). CR, pulmonary function tests (PFT's) and selected blood tests lead to a specific diagnosis in a significant proportion of people with chronic dyspnea (Raoof, Shah, Braman, et al., 2023). CT has increased sensitivity and specificity for determining the type, severity, and distribution of emphysema and bronchial abnormalities (Christensen et al., 2024; Raoof, Shah, Braman, et al., 2023). It is an important part of the pre-procedure evaluation process for lung volume reduction surgery, endobronchial valve placement, and lung transplantation (Raoof, Shah, Braman, et al., 2023). The GOLD 2026 report recommends that CT be considered for individuals with COPD with persistent exacerbations and concern for another diagnosis, such as bronchiectasis or an atypical infection, or symptoms out of proportion to the disease severity suggested by PFT's (GOLD, 2025). Some authors have proposed broadening the definition of COPD to include CT-detected emphysema, air trapping or airway wall thickening, even in the absence of airflow obstruction on spirometry (Lowe et al., 2019; Ferrera et al., 2021).

CT is helpful if a smoking-related interstitial lung disease, such as pulmonary Langerhans cell histiocytosis or Combined Pulmonary Fibrosis and Emphysema, is suspected (Cottin et al., 2022; Guiot et al., 2022). It is recommended following a diagnosis of alpha-1 antitrypsin deficiency (Stoller et al., 2006). CT is also used in the evaluation of central airway abnormalities associated with COPD, such as tracheobronchomalacia and excessive dynamic airways collapse (Raoof, Shah, Braman, et al., 2023). Annual lung cancer screening CT's should be performed in current or former smokers who meet the USPSTF criteria, but screening CT's are not recommended for those with COPD not due to smoking because there is insufficient evidence to establish benefit over harm (Raoof, Shah, Braman, et al., 2023).

COPD exacerbations are characterized by dyspnea, cough and/or sputum which worsen over a period of less than two weeks (Raoof, Shah, Braman, et al., 2023). They are mainly caused by respiratory viral infections. CR is often performed to rule out alternative diagnoses, such as pneumonia, pneumothorax or pulmonary edema.

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Interstitial Disease (CH-11)

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Interstitial Lung Disease (ILD)/Diffuse Lung Disease (DLD) (CH-11.1).....66
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Chest Imaging Guidelines

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

CH.ID.0011.1.A
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Criteria

- EITHER high resolution CT Chest (HRCT) without contrast (CPT® 71250) (the diagnostic modality of choice) OR CT Chest with contrast (CPT® 71260) to evaluate for the following:
  - Interstitial changes or diffuse parenchymal changes identified on other imaging (including chest x-ray) (See **Dyspnea/Shortness of Breath (CH-5.1)**
  - In individuals that have pulmonary symptoms with abnormal pulmonary function studies (PFT's) and a normal chest x-ray and there is high clinical suspicion for ILD or DLD, including but not limited to, the following entities: Hypersensitivity Pneumonitis, Cryptogenic Organizing Pneumonia (COP, formally known as BOOP), and Eosinophilic Pneumonia.
  - Initial imaging to identify ILD/DLD in individuals with a high suspicion for connective tissue disease or diagnosis of connective tissue disease (based upon autoantibody testing, serology, etc.), including, but not limited to:
    - rheumatoid arthritis
    - scleroderma
    - idiopathic inflammatory myopathies (polymyositis, dermatomyositis, inclusion body myositis)
    - systemic lupus erythematosus
    - Sjögren's syndrome
    - mixed connective tissue disease
  - Significant exposure to a substance or medication (linked to ILD/DLD) and concern for:
    - Asbestosis
    - Silicosis
    - Coal miner's lung disease
    - Drug induced pulmonary toxicity including pneumonitis
      - Follow-up CT chest (CPT® 71250 or CPT® 71260) for worsening symptoms or PFT's, guide for steroid taper, or baseline prior to re-exposure to offending agent
      - Timing at the discretion of the treating provider
  - Radiation-induced lung injury

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        - Follow-up imaging as requested by the treating provider.
        - For follow-up imaging of the primary cancer, see relevant section in the Oncology guidelines
    - 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:
        - 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
    - Annually in individuals with known pulmonary fibrosis if needed for:
        - 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)**
- HRCT can be done even if a regular CT Chest has been done previously. HRCT is done with a thinner-slice protocol that can provide additional details to help determine ILD subtype.
- HRCT can also be done with inspiratory/expiratory and supine/prone views.

Evidence Discussion

DLD refers to diffuse parenchymal lung diseases or interstitial lung diseases. There are a multitude of pathologies that demonstrate involvement of the alveoli, 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 (Montesi et al., 2020)

ILD is often suspected in those with chronic dyspnea or non-productive cough, especially in the setting of an inhalational exposure or systemic disease known to be associated with lung involvement (Cox et al., 2020; Hobbs et al., 2021; Joy et al., 2023). Chest x-ray (CR) and CT chest without contrast are considered medically necessary for suspected ILD and provide complementary information (Cox et al., 2020; Hobbs et al., 2021). A normal CR does not rule out ILD, as CR can be normal in up to 10% of individuals with ILD. Its primary function is to evaluate for an alternative diagnosis. CR remains an important imaging modality to screen for occupational lung disease (Cox et al., 2020). High resolution CT (HRCT) has higher sensitivity and specificity for ILD. HRCT may help guide a biopsy site or provide a definitive diagnosis, making a biopsy unnecessary (Cox et al., 2020; Hobbs et al., 2021). CT can provide prognostic information: individuals with honeycombing or a usual interstitial pneumonia (UIP) pattern on CT have increased mortality (Montesi et al., 2020).

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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 (Hobbs et al., 2021)

CR and CT chest without contrast are considered medically necessary for evaluation of an acute exacerbation of ILD. They can help exclude alternative causes for worsening clinical symptoms and confirm abnormalities consistent with progression of ILD. There are no data to support routine surveillance imaging of ILD, but serial CT's can improve diagnostic accuracy and evaluate disease stability, reversibility or progression (Hobbs et al., 2021). The optimal interval for follow up HRCT to determine disease progression in idiopathic pulmonary fibrosis (IPF) is unknown. Raghu et al recommend consideration of an annual HRCT in people with IPF if there is clinical suspicion of worsening fibrosis or to screen for complications such as lung cancer (Hobbs et al., 2021). In people with an ILD other than IPF and radiologic evidence of fibrosis, disease progression on HRCT is one of three criteria used to define progressive pulmonary fibrosis Raghu et al., 2022; Wong et al., 2020).

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 (Wong et al., 2020)

Drug-induced pulmonary toxicity is a diagnosis of exclusion, supported by temporal association with an implicated agent, exclusion of infection, cardiogenic edema, and progression of the underlying disease, and by improvement after the agent is withdrawn (Skeoch et al., 2018; Bridi et al., 2024). No CT pattern is specific to a given drug, and reported patterns include nonspecific interstitial pneumonia, organizing pneumonia, hypersensitivity pneumonitis, eosinophilic pneumonia, and diffuse alveolar damage, so HRCT is the modality of choice for initial characterization (Skeoch et al., 2018; Hobbs et al., 2021). Follow-up CT is used to assess worsening symptoms or pulmonary function, to guide corticosteroid taper, and to establish a baseline before planned re-exposure to the offending agent, with timing determined by the treating provider (Bridi et al., 2024).

Radiation-induced lung injury is referenced to the radiation therapy completion date, with an acute exudative phase at approximately 4 to 12 weeks, a proliferative phase at approximately 3 to 9 months, and fibrosis typically after 9 months, though evolution may continue up to 2 years (Benveniste et al., 2019).CT chest (CPT® 71250 or CPT® 71260) depicts radiation damage before it is evident at radiography, and the characteristic finding is opacity confined to the radiation portal with a sharp non-anatomic margin (Benveniste et al., 2019),Follow-up imaging may be obtained at the

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discretion of the treating provider; for surveillance of the treated malignancy itself, see the relevant section in the Oncology guidelines.

Interstitial lung abnormalities (ILA) are abnormalities on CT suggestive of ILD in people without a prior clinical diagnosis (Hunninghake et al., 2022; Hatabu et al., 2020). They are common incidental findings, especially in older people. ILA are a radiologic observation. Differentiation between ILA and clinical or subclinical ILD must be on the basis of a clinical evaluation. When respiratory signs/symptoms or functional impairment is present, ILA likely represent mild ILD. The morphology and distribution of ILA are important: subpleural fibrotic ILA are most likely to progress. There is minimal evidence to support a specific management plan for ILA. Hatabu et al recommend that when ILA are detected, a dedicated HRCT chest can help confirm and characterize the abnormalities, especially if the initial scan was incomplete (i.e., a CT abdomen) or not performed with thin sections. Hunninghake et al recommend that a HRCT should be done in those with ILA. If clinically significant ILD is ruled out, Hatabu et al recommend a repeat CT at 12-24 months for those with subpleural fibrotic ILA or other risk factors for progression to ILD (Hatabu et al., 2020). However, participants in a consensus survey disagreed about repeating a HRCT at the follow up evaluation (Hunninghake et al., 2022; Hatabu et al., 2020). People with nonfibrotic nonsubpleural ILA and no symptoms or physiologic impairment do not need reimaging (Hatabu et al., 2020; Tomassetti et al., 2022).

Chest Imaging Guidelines

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

CH.ID.0011.2.A
v1.0.2027

Criteria

- Chest x-ray is considered medically necessary as first line imaging for suspected EVALI.
- CT Chest with or without contrast (CPT® 71250 or CPT® 71260) is considered medically necessary if:
  - Clinical suspicion for EVALI but negative chest x-ray
  - To identify extent of pulmonary involvement identified on chest x-ray
  - Severe (e.g., tachycardia, tachypnea, or hypoxia (O_2 95% or less)) or worsening disease (does not require a repeat chest x-ray)
  - To rule out other diagnoses (infection, pulmonary edema, etc.)
  - Clinical suspicion of pneumothorax or pneumomediastinum (See **Pneumothorax/ Hemothorax (CH-19.1)**)

Evidence Discussion

EVALI is a toxic inhalational acute lung injury with imaging and histopathologic patterns of organizing pneumonia and/or diffuse alveolar damage (Kligerman et al., 2020; Friedman et al., 2022). Individuals with EVALI mainly present with respiratory symptoms (e.g., shortness of breath, cough, chest pain), gastrointestinal symptoms (e.g., abdominal pain, diarrhea, nausea, vomiting), and systemic symptoms (e.g., fever, weight loss, fatigue) (Garg et al., 2022). The diagnostic criteria for EVALI, as defined by the CDC for a "confirmed EVALI" case, is as follows: i) individuals must have vaped within 90 days before the onset of symptoms, ii) bilateral pulmonary opacities on chest imaging, iii) a negative evaluation for infection, iv) no other plausible alternative diagnoses (Garg et al., 2022). Chest x-ray (CR) can exclude other diagnoses and is often the first imaging study. CR is not abnormal at initial assessment in all individuals with EVALI. When pulmonary abnormalities are not identified on CR or when further characterization of CR findings are needed to evaluate for another potential cause of symptoms, CT chest can be obtained (Kligerman et al., 2020; Friedman et al., 2022).

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

Guideline Page

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Pneumonia (CH-13.1)

CH.PN.0013.1.A
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Criteria

- Chest x-ray should be performed initially in all individuals with suspected pneumonia, prior to considering advanced imaging.
  - 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, necrotizing pneumonia, pneumothorax)
    - possible lung mass associated with the infiltrate or persistent radiographic abnormalities on repeat chest x-ray at or after 6 weeks
    - Follow-up CT Chest without or with contrast is medically necessary for:
      - inappropriate response to therapy
      - persistent symptoms
      - after completion of therapy
      - pneumonia or a complication of pneumonia initially detected only on CT
    - follow-up CT chest is not considered medically necessary when pneumonia was initially detected on chest x-ray, the individual has demonstrated appropriate clinical improvement, and a repeat chest x-ray shows resolution of the infiltrate.
  - CT Chest without or with contrast (CPT® 71250 or CPT® 71260) for hypoxia and/ or respiratory distress
  - CT Chest without or with contrast (CPT® 71250 or CPT®71260) after initial chest radiograph is negative or equivocal and one of the following:
    - Abnormal vital signs (including hypoxemia, pulse > 100, respiratory rate > 24, fever > 100)
    - Abnormal exam (including respiratory distress, dyspnea and or abnormal lung auscultation)
    - Advanced age (age >75), or other significant comorbidities
- If pulmonary emboli suspected, see **Pulmonary Embolism (CH-25.1).**
- If pneumonia or a complication of pneumonia is only initially detected on CT Chest without or with contrast (CPT 71250 or CPT 71260), a follow up CT Chest without or with contrast (CPT 71250 or CPT 71260) is considered medically necessary.
- CT Chest without or with contrast (CPT® 71250 or CPT® 71260) for immunocompromised individuals with any of the following:
  - High suspicion for pneumonia despite equivocal or negative chest x-ray
  - Persistent radiographic abnormalities on repeat imaging after 6-12 weeks

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- Multiple or diffuse opacities or nodules

Evidence Discussion

Chest radiography (CR) is the appropriate first imaging modality in the evaluation of suspected pneumonia. The American Thoracic Society (ATS) and the Infectious Diseases Society of America (IDSA) define a clinical diagnosis of pneumonia as symptoms and signs of pneumonia with radiographic confirmation (Metlay et al., 2019). Chest radiographs should be performed for individuals with symptoms of dyspnea, tachycardia, tachypnea and fever more than 100°F or lung findings suggestive of pneumonia (Kinkade & Long, 2016).

CT is more accurate/sensitive than CR and may be considered medically necessary when there is a high clinical suspicion for pneumonia (typical or atypical) and a delay in diagnosis could be life threatening.

CT chest without contrast is considered medically necessary and CT chest with contrast may be considered medically necessary in immunocompromised people with an acute respiratory illness and a normal/equivocal/nonspecific CR or a CR that demonstrates multiple, diffuse or confluent opacities (Lee et al., 2019).

MRI is considered not medically necessary for the imaging of pneumonia (Batra et al., 2024; Lee et al., 2019). MRI has a potential role for follow up imaging of parenchymal (Chest wall/mediastinal) disease, but CT is more sensitive and is preferred (Lee et al., 2019).

Ultrasound chest may be appropriate for the evaluation of parapneumonic effusions. It can also be used to guide pneumonia-related interventions (Batra et al., 2024; Desai et al., 2024; Boccatonda et al., 2023; Chhetri et al., 2022).

Routine use of follow up chest imaging in adults who are improving and whose symptoms have resolved within 5-7 days is not recommended by the ATS/IDSA (Metlay et al., 2019). Repeat CR or CT after the completion of therapy is generally reserved for high risk individuals, suspected complications, disease progression or when the clinical course differs from CR interpretation (Dueck et al., 2021; Lampichler, 2017). High risk individuals include individuals over the age of 50, smokers, and those with persistent symptoms (Little et al., 2013; Tang et al., 2011). For immunocompetent individuals with suspected pneumonia, follow-up imaging within 6-12 weeks is considered medically necessary to confirm resolution. The follow-up imaging modality should be the same modality in which pneumonia was detected (Batra et al., 2024).This is consistent with modality-matched follow-up: when the original detection modality was chest x-ray and a repeat x-ray confirms resolution, escalation to CT is not indicated absent one of the specific criteria above (complication, persistent abnormality at 6 weeks, or high-risk features) (Batra et al., 2024; Metlay et al., 2019; Little et al., 2013; Tang et al., 2011).

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Pneumonia Health Equity Considerations

Mortality from pneumonia is higher in non-Hispanic Black individuals than non-Hispanic White individuals. These disparities are the greatest in major metropolitan areas.

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

CH.PN.0013.2.A
v1.0.2027

Criteria

- CT Chest without contrast (CPT®71250), or with contrast (CPT®71260) is considered medically necessary 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).
    - 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, even with a normal chest x-ray (if done).
    - 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 (persistent or worsening respiratory symptoms),and/or persistent hypoxemia.

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- Symptomatic post-COVID individuals with concern for interstitial lung disease including organizing pneumonia imaging can be considered pre and post treatment.

Evidence Discussion

Chest imaging is considered not medically necessary as a screening test for COVID-19 in asymptomatic people or in people with suspected COVID-19 and mild clinical features unless they are at risk for disease progression (Rubin et al., 2020).

The American College of Radiology (ACR) states that CT chest should not be used as a screen or first-line test to diagnose COVID-19 (American College of Radiology, 2020). Viral testing is the only specific method of diagnosis and confirmation with a viral test is required even if radiologic findings on chest radiography (CR) or CT are suggestive of COVID-19.

Imaging is considered medically necessary in people with COVID-19 and a worsening respiratory status or in people who have suspected COVID-19, a high pretest probability of disease, and moderate to severe clinical features (Rubin et al., 2020). Although less sensitive than CT, chest radiography (CR) is typically the first line imaging modality (Batra et al., 2024; Rubin et al., 2020; Long et al., 2022).

Johnston et al have proposed a management algorithm for individuals with COVID-19 pneumonia which recommends a clinical assessment with CR and PFT's 3-6 months after discharge (Johnston et al., 2023). Performance of a high resolution CT chest (HRCT) is based on risk factors (ICU admission, noninvasive or mechanical ventilation; male sex; age > 60) and serial assessment of lung function and symptoms.

There is an increased risk of pulmonary embolus (PE) in people with COVID-19, including both microvascular/ in situ thrombosis and macrothrombotic events (Ortega-Paz et al., 2023). It is currently recommended that the same diagnostic strategy and the same D-dimer threshold be used for people with COVID-19 and suspected PE as in those without COVID-19 (Ortega-Paz et al., 2023; Suh et al., 2021).

Background and Supporting Information

- 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 (American College of Radiology, 2020).
  - The Centers for Disease Control and Prevention (CDC) recommends viral testing as the only specific method of diagnosis (Centers for Disease Control and Prevention, 2021).
  - The CDC has stated that symptoms may appear 2-14 days after exposure to the virus. These symptoms may include:

        - 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) (Rubin et al., 2020).
    - According to The American Society of Transplantation, screening donors is based on methods below. Screening donors encompasses three different methods (American Society of Transplantation, 2023).
        - Epidemiologic screening for travel and potential exposures
        - Screening for symptoms suggestive of COVID-19
        - Viral testing (nucleic acid testing of specimens)
        - Screening asymptomatic donors with advanced imaging is considered not medically necessary.

Chest Imaging Guidelines

References (CH-13)

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Other Chest Infections (CH-14)

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

CH.CI.0014.1.A
v1.0.2027

Criteria

- 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:
    - Positive PPD skin test or other positive tuberculin skin tests OR
    - Positive QuantiFERON-TB Gold OR
    - Suspected active (or reactivated) tuberculosis
  - Suspected NTM-PD (i.e., atypical mycobacterium infection, Mycobacterium avium complex (MAC))
  - 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.
  - Suspected complications or progression of tuberculosis (e.g., pleural tuberculosis, empyema, and mediastinitis)
  - For those with known TB, 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.

Evidence Discussion

Nontuberculous mycobacterial pulmonary disease (NTM-PD) can be caused by a wide array of pathogens, with the most common including Mycobacterium avium complex (MAC), Mycobacterium kansasii, Mycobacterium xenopi, and Mycobacterium abscessus.

Chest radiography (CR) should be the initial imaging for suspected active M. tuberculosis (MTB) infection based on clinical symptoms and demographics, a newly positive tuberculin skin test (TST), or interferon-gamma release assay (IGRA). CT is medically necessary if CR is equivocal and there is clinical suspicion of active MTB, especially in those with impaired cell-mediated immunity (Wetscherek et al., 2022; Anjos

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et al., 2020). CT may be performed to evaluate suspected complications and monitor response to therapy (Nel et al., 2022; Batra et al., 2024).

CR is medically necessary to distinguish latent from active MTB in people with evidence of new exposure (a newly positive TST/IGRA or a positive TST/IGRA with unknown prior status) but no clinical symptoms (Ravenel et al., 2017).The yield of CR for active MTB in the absence of clinical symptoms is low. CT is more sensitive than CR for the detection of latent TB (Ravenel et al., 2017; Piccazzo et al., 2014). CT is recommended when CR is equivocal for active MTB or when a diagnosis of latent MTB may affect future care (Ravenel et al., 2017; Piccazzo et al., 2014).

When a TST is not available for people who are going to live in a group home, correctional institution or nursing facility, CR is medically necessary as a surrogate screening measure.

Imaging (CR and CT) is an important component in the diagnosis and follow up of nontuberculous mycobacterial pulmonary disease (NTM-PD) (Lipman et al., 2020). The diagnosis and determination of response to therapy are based upon radiologic, clinical, and microbiologic criteria (Daley et al., 2020; Haworth et al., 2017). Serial CT imaging is important for monitoring disease progression and response to therapy. Radiologic findings provide prognostic information and may affect treatment recommendations (Daley et al., 2020; Haworth et al., 2017).

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

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Criteria

- CT Chest with contrast (CPT® 71260) or High resolution CT Chest (HRCT) without contrast (CPT® 71250):
  - Initial diagnosis of any fungal pneumonia or chest infection
  - 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
- 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.
- For suspected fibrosing mediastinitis:
  - CT chest with contrast (CPT® 71260) (preferred imaging) OR
  - MRI Chest without and with contrast (CPT® 71552)
  - CTA chest (CPT® 71275) for:
    - Procedural planning
    - Evaluation of vascular stents

Evidence Discussion

Pulmonary fungal infections can be caused by a wide array of pathogens, including the endemic mycoses (Histoplasma species, Blastomyces species, and Coccidioides species), Cryptococcus species, and Aspergillus species.

CT chest is the imaging method of choice for suspected or known pulmonary fungal infections, especially in immunocompromised hosts (Alexander et al., 2021; Lewis et al., 2023; Azar, 2024). Imaging findings are not specific but can lead to early detection of infection, help direct further diagnostic procedures and narrow the differential diagnosis (Walker et al., 2014; Lewis et al., 2023). CT is also used to monitor response to therapy and identify complications. The diagnosis of certain pulmonary fungal infections and determination of response to treatment require a combination of clinical, microbiologic and radiologic criteria (Van Braeckel et al., 2022; Setianingrum et al., 2019; Denning et al., 2016). Denning et al recommend follow up imaging 3-6 months after starting anti-fungal therapy for chronic pulmonary aspergillosis, then less frequently, or with any

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major change of clinical status based on the fact that radiologic change is slow and little change is visible on chest X-ray (CR) or CT in less than 3 months (Denning et al., 2016).

CT is considered not medically necessary in the routine evaluation of suspected asthma without a specific indication but may be of value to identify acute complications following a nondiagnostic CR with suspected alternative diagnoses or associated conditions, such as allergic bronchopulmonary aspergillosis (Ash & Diaz, 2017; Richards et al., 2016; Godet et al., 2024; Agarwal et al., 2022). Serological assays can also play a role in the diagnosis of invasive pulmonary aspergillosis, including the galactomannan and beta-d glucan (Fungitell) assays.

Fibrosing mediastinitis (FM) is a rare benign but potentially life threatening process characterized by progressive proliferation of dense infiltrative fibrous tissue in the mediastinum and/or hila. Granulomatous FM is the more common subtype in the US and is typically associated with prior infection with histoplasmosis. Nongranulomatous FM is less common and is usually associated with an autoimmune disorder, drug exposure, or prior radiation. The most common symptoms are cough, dyspnea, hemoptysis, and pleuritic chest pain. Individuals may develop SVC syndrome or post-obstructive pneumonia. Widening of the mediastinum and mediastinal/hilar lymphadenopathy are the most common abnormal findings on chest x-ray. CT chest with contrast is the modality of choice for suspected FM. MRI is equivalent to CT for evaluating extent of disease, but CT is superior for evaluation of airways and calcification. PET CT is nonspecific and not routinely used. Nonsurgical and surgical procedures for individuals with clinical symptoms are related to compression or obstruction of mediastinal structures. CTA chest may be used for procedural planning or to evaluate the patency of vascular stents. There are no consensus guidelines for follow up imaging. No routine imaging is considered medically necessary for the granulomatous subtype unless there are progressive symptoms or clinical decompensation. Regular surveillance with CT is recommended for the nongranulomatous subtype to rule out malignancy which may not have been sampled in a biopsy (Garrana et al., 2019)

Chest Imaging Guidelines

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

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- See **Small Vessel Vasculitis (PVD-6.11)** for concerns of Wegener's Granulomatosis and Related Entities in Peripheral Vascular Disease imaging guidelines.

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Suspected Sternal Dehiscence (CH-14.4)

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Criteria

- 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
  - planned debridement and/or repair

See **Infection (MS-9.0)** for concerns for osteomyelitis or soft tissue infection.

Evidence Discussion

Sternal dehiscence is defined as sternal separation with intact sternal wires migrating with a displaced sternal fragment (Hota et al., 2018). The diagnosis is often made clinically; however, early signs may be subtle, and it may be clinically occult.. Early detection of sternal dehiscence on chest x-ray (CR) is important (Hota et al., 2018). CT may be used in equivocal cases to assess for sternal separation or for preoperative planning (Hota et al., 2018; Silverborn et al., 2022; Shirke et al., 2024).

CT provides the best evaluation of sternal non-union when suspected based on pain, clicking and clinical evidence of sternal instability for > 3 months in the absence of infection (Hota et al., 2018).

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Sarcoid (CH-15)

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Chest Imaging Guidelines

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Sarcoid (CH-15.1)

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Criteria

- CT Chest with contrast (CPT® 71260) or without contrast (CPT® 71250) is considered medically necessary to:
  - Establish or rule out the diagnosis when suspected
- Subsequent CT Chest with contrast (CPT® 71260) or without contrast (CPT® 71250), in known sarcoidosis, for ANY of the following:
  - 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.
- PET/CT should not be used in the standard work-up of all sarcoidosis individuals. There is currently no evidence to support the use of PET/CT for screening.
- PET/CT (CPT® 78815) is considered medically necessary under the following conditions:
  - 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
- For evaluation of suspected or known cardiac sarcoidosis, see Sarcoid (CH-15.1).

Evidence Discussion

Sarcoidosis is a multisystem disease of unknown etiology characterized by the formation of noncaseating granulomas in various organs (Sève et al., 2021). The diagnosis is based on three major criteria: a compatible clinical presentation, the finding of nonnecrotizing granulomatous inflammation in a tissue sample, and the exclusion of alternative causes of granulomatous disease (Crouser et al., 2020). Imaging plays an important role in the diagnosis. Although chest x-ray (CR) is often the first imaging test used, high resolution chest CT (HRCT) is more sensitive than CR for the detection of nodules and subtle fibrosis (Sève et al., 2021). Histologic examination of tissue remains the gold standard for reaching a definitive diagnosis (Tana et al., 2020). However, in the appropriate clinical context, certain patterns of mediastinal and

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parenchymal involvement on HRCT are virtually diagnostic of sarcoidosis (Tana et al., 2020). The American Thoracic Society (ATS) states that if asymptomatic bilateral hilar lymphadenopathy is found on chest imaging, histologic confirmation is not always required (Tana et al., 2020; Crouser et al., 2020).

The monitoring of individuals with pulmonary sarcoidosis is not standardized. Changes in imaging along with clinical features have been used to assess changes in disease activity (Keijsers & Grutters, 2020). If spirometry and pulmonary symptoms are worsening, additional chest imaging may be useful to detect progression of pulmonary disease or an alternative diagnosis (Gupta et al., 2022). HRCT can also provide prognostic information by differentiating reversible from irreversible (i.e., fibrotic) lesions and show complications, such as mycetomas or evidence of pulmonary hypertension (Tana et al., 2020).

There is interest in the use of FDG PET CT for the diagnosis and monitoring of sarcoidosis. PET CT may reveal a more easily accessible biopsy site which is not clinically evident (Sève et al., 2021; Keijsers & Grutters, 2020). It may detect multi-organ and/or extra-thoracic involvement and demonstrate active inflammation not easily recognized by physical exam or other methods (Keijsers & Grutters, 2020; Vender et al., 2022). Studies have shown that FDG uptake in sarcoidosis represents active granulomatous inflammation (Keijsers & Grutters, 2020). The evaluation of disease activity is valuable when there is doubt regarding the activity of lesions and a change in therapy is being considered (Tana et al., 2020). Positive scans should be interpreted with caution, however, because FDG uptake can be present in other inflammatory processes and malignancy. A significant correlation between decreased metabolic activity in the lungs, increased pulmonary function tests and improved symptoms in response to immunosuppressive medication has been demonstrated (Keijsers & Grutters, 2020; Vender et al., 2022). Most of the data regarding PET CT and sarcoidosis come from retrospective studies. Prospective trials are needed to determine the role of PET CT in monitoring the efficacy of therapy and the importance of abnormal PET CT's in asymptomatic individuals (Vender et al., 2022). The threshold SUV that distinguishes active disease from fibrosis has not been determined. Few studies have compared the value of HRCT vs PET CT for diagnosis. Data on appropriate time intervals for follow up assessments and the role of PET-guided therapy are scarce (Vender et al., 2022).

Sarcoid Health Equity Considerations

- Sarcoidosis occurs 2.5 times more often in Black individuals and females.
- Individuals who are Black, female, and/or have a low socioeconomic status report lower health-related quality of life, as well as increased rates of symptoms, mortality, and hospitalizations related to sarcoidosis.

- The unequal distribution of care and resources between rural/urban locations and different states may impact the quality of care and health outcomes related to sarcoidosis.

Chest Imaging Guidelines

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Solitary Pulmonary Nodule (SPN) (CH-16)

Guideline Page

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Solitary Pulmonary Nodule (CH-16.0)

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

Chest Imaging Guidelines

Solitary Pulmonary Nodule – Imaging (CH-16.1)

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Criteria

- For these guidelines, manual nodule measurements should be based on the average of long- and short-axis diameters. The size threshold (<6mm) corresponds to a rounded measurement of 5mm 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 10mm, 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.
- 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.
- Maximum intensity projection (MIP), and Minimum intensity projection (MinIP) are 2D projections of the volumetric (3D) acquisition data. These projections may be of use in evaluation of pulmonary nodules, but these projections are included in the cross sectional imaging base codes, and is not separately reimbursable.
- EITHER CT Chest with contrast (CPT® 71260) OR CT Chest without contrast (CPT® 71250) is considered medically necessary initially for discrete nodule(s) in the following scenarios (Gould et al., 2013; MacMahon et al., 2017; Martin et al., 2023):
  - 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 (unless full lung field are noted to be included)
  - But NOT in the following which are considered initial dedicated advanced chest imaging:
    - CT Chest without and with contrast (CPT® 71270)
    - Low-dose computed tomography (LDCT) (CPT® 71271)
    - CTA Chest (CPT® 71275)

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    - 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.
    - 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)**).
- A lung nodule is defined as an approximately rounded opacity (more or less well-defined) measuring up to 3cm in diameter.
    - Rounded lesions measuring more than 3 cm in diameter are termed lung masses and should be considered indicative of lung cancer until histologically proven otherwise. The approach to lung masses differs from that of nodules, and these guidelines are specifically for abnormalities occurring within the chest that meet the definition of a pulmonary nodule or nodules.
- These criteria are not intended for use in the following groups:
    - Individuals aged 35 years or younger
        - 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
    - Known primary cancer with risk for metastases
        - Imaging should follow the recommendations in the applicable oncology imaging guideline.
    - Immunocompromised individuals at risk for infection
        - Evaluation should be based on the suspected underlying condition, including possible fungal or other opportunistic infection. See the applicable infectious or inflammatory chest imaging guideline, including Fungal Infections (CH-14.2), when appropriate.

Evidence Discussion

A pulmonary nodule is defined as a well- or poorly defined rounded opacity <3cm in diameter. Focal pulmonary lesions >3cm are considered masses. Nodule measurement is currently determined by standard linear measurement with electronic calipers. Measurements and averages should be expressed to the nearest whole millimeter. The dimension of small pulmonary nodules (<10mm) should be expressed as the average of

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the maximal long-axis and perpendicular maximal short-axis measurements in the same plane. For larger nodules and masses, both long- and short-axis dimensions should be recorded (Bankier et al., 2017).

Semi-automated nodule volumetry has superior sensitivity for detecting growth and is recommended as the preferred method by the British Thoracic Society (BTS), but it requires dedicated software and is currently not widely used in clinical practice (Bankier et al., 2017; Callister et al., 2015). Nodule growth is defined as an increase of >1.5mm (>2mm^3) by the Lung-RADS criteria, a change of at least 2mm in average diameter by the Fleischner criteria, or an increase of at least 25% in volume by the BTS (Callister et al., 2015; Christensen et al., 2024; MacMahon et al., 2017). A number of studies have established the advantage of post-processing 3D CT techniques, such as maximum intensity projection (MIP), minimum intensity projection (MinIP), and volume rendering (VR), in the detection and assessment of pulmonary nodules (Li et al., 2019; Naeem et al., 2021).

If an indeterminate nodule is seen on a chest radiograph or CT, prior studies should be reviewed to determine possible growth or stability, including comparison with the earliest available study and more recent studies (Gould et al., 2013; MacMahon et al., 2017; Martin et al., 2023). If stability of a nodule seen on a chest radiograph cannot be determined, CT Chest is appropriate (Gould et al., 2013; Martin et al., 2023). CT is the modality of choice to evaluate pulmonary nodules (Martin et al., 2023). Intravenous contrast is not required to identify or characterize nodules (de Jong et al., 2012; Martin et al., 2023). The size of the nodule is crucial for determining the appropriate timing of follow-up surveillance imaging (MacMahon et al., 2017).

For nodules detected incidentally on incomplete thoracic CT scans, such as cardiac, neck, spine, or abdominal CT, the Fleischner Society recommends no follow-up for most nodules <6mm based on the estimated low risk of malignancy. The ACR states that optional follow-up CT may be performed at 12 months for nodules <6mm with suspicious morphology and/or an upper-lobe location (Martin et al., 2023). For nodules measuring 6-8mm, the Fleischner Society and ACR guidelines recommend CT Chest after the appropriate interval of 3-12 months, depending on clinical risk. For a nodule >8mm or a highly suspicious nodule, immediate CT Chest is recommended (MacMahon et al., 2017; Martin et al., 2023).

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

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Criteria

Solid Pulmonary Nodules

- These time intervals refer to the time from initial detection of the nodule(s).

Incidentally Detected Solid Pulmonary Nodules Follow-up Recommendations*				
Nodule Type	**<6mm (<100 mm ^{3})**	**6–8mm (100-250 mm ^{3})**	**>8mm (>250 mm ^{3})**	**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 *For an 8mm solid nodule PET request, see CH-16.4	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.

*These criteria are not intended for use in:

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- individuals aged 35 years or younger, who have a low overall risk of pulmonary malignancy and whose incidentally detected nodules are more likely to be infectious than malignant; management should be individualized
- individuals with a known primary cancer with risks for metastases, for whom imaging would be dictated by the primary oncology guideline section
- immunocompromised individuals at risk for infection, including fungal infections

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

Follow-up indications after PET/CT:

- 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, non-diagnostic, or biopsy not performed, follow-up with CT at 3 months, 9-12 months, and 24 months, if stable

Sub-Solid Pulmonary Nodules

- These time intervals refer to the time from initial detection of the nodule(s).

Incidentally Detected Sub-Solid Pulmonary Nodules Follow-up Recommendations†			
Nodule Type	**<6mm (<100mm ^{3})**	**≥6mm (≥100mm^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, <6mm, consider follow-up at 2 and 4 years. If solid component(s) or growth develops, consider resection.

Chest Imaging Guidelines

Incidentally Detected Sub-Solid Pulmonary Nodules Follow-up Recommendations†			
Single Sub-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 <6mm, then annual CT should be performed for 5 years.** If the solid component has suspicious morphology (i.e., lobulated margins or cystic components), is >8mm or is growing: Consider PET/CT* or biopsy	In practice, part-solid nodules cannot be defined as such until ≥6mm. Persistent part-solid nodules with solid components ≥6mm should be considered highly suspicious.
Multiple Sub-Solid/Ground Glass	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 <6mm pure ground-glass nodules are usually benign.

†These criteria are not intended for use in:

- individuals aged 35 years or younger, who have a low overall risk of pulmonary malignancy and whose incidentally detected nodules are more likely to be infectious than malignant; management should be individualized
- individuals with a known primary cancer with risks for metastases, for whom imaging would be dictated by the primary oncology guideline section
- immunocompromised individuals at risk for infection, including fungal infections

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

**Follow-up after year 5 is considered medically necessary every 2-4 years for at least 10 years if requested.

- Follow-up indications after PET/CT:

  - 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, non-diagnostic, or biopsy not performed, follow-up with CT at 3 months, 9-12 months, and 24 months, if stable.
- Sub-solid nodules may either be a part-solid nodule, comprising of both solid and ground glass components or a pure ground glass nodule, the latter may also be referred to as "non-solid".
- For pulmonary nodule follow-up studies a CT Chest without IV contrast (CPT® 71250) is considered medically necessary. IV contrast is considered medically necessary as requested.

Pulmonary Cyst(s)

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

Endobronchial Lesion

- CT chest without contrast (CPT® 71250) at 3 months to confirm resolution or persistence
- If persistent, direct visualization with bronchoscopy is considered medically necessary

Evidence Discussion

A pulmonary nodule is defined as a well or poorly defined rounded opacity < 3cm in diameter. The Fleischner Society guidelines for the management of incidental pulmonary nodules detected on CT were last updated in 2017 (MacMahon et al., 2017). The purpose of the guidelines is to minimize both the number of unnecessary follow up exams and the chance of a malignancy advancing in stage during CT follow up prior to diagnosis. Surveillance is most appropriate if there is a very low probability of cancer or a high risk of complications from surgery or biopsy (Gould et al., 2013). It is important to establish the clinical probability of malignancy before ordering imaging (MacMahon et al., 2017; Gould et al., 2013; Callister et al., 2015). The Fleischner guidelines are not intended to apply to people younger than 35, people with known primary cancers at risk of metastases or to immunocompromised people at risk of infection. They do not apply to individuals with unexplained fever or respiratory symptoms (Expert Panel on Thoracic Imaging, 2023). For individuals younger than 35, lung cancer is rare. Management should be on a case by case basis, and the use of serial CT's should be minimized (MacMahon et al., 2017).

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Solid nodules < 6mm do not require follow up in individuals at low risk of lung cancer or in all individuals at high risk. Nodules which have a suspicious morphology or an upper lobe location may be followed up with a CT in 12 months. Solid nodules 6-8mm may be followed with a CT at 6-12 months in low risk individuals with a further follow up at 18-24 months in high risk individuals. Two follow up CT's should be sufficient to rule out growth in most individuals (Expert Panel on Thoracic Imaging, 2023; MacMahon et al., 2017; Gould et al., 2013; Callister et al., 2015).

For solid nodules >8 mm, the options are CT surveillance, an FDG PET/CT, tissue sampling or a combination of these. Surveillance CT scans for solid nodules >8 mm may be done at 3 months, 6-12 months and 18-24 months (MacMahon et al., 2017). The American College of Chest Physicians (ACCP) guidelines recommend a PET/CT or nonsurgical biopsy for solid nodules of at least 8mm when the pretest probability of malignancy is low to moderate.[2] The pretest probability affects the interpretation of PET/ CT results: high risk individuals are at risk of false negative results and low risk individuals are at risk of false positive results (Callister et al., 2015). If there is a high pretest probability of cancer, a negative PET/CT does not reliably rule out cancer and either continued surveillance for at least 2 years or tissue sampling is advised (Gould et al., 2013; Maiga et al., 2018). The ACCP states that the optimal interval for surveillance CT's for solid nodules >8mm is not determined, but standard practice is 3-6 months, 9-12 months and 18-24 months. They suggest surveillance with CT if the clinical probability of cancer is very low, the clinical probability of malignancy is low and a PET CT is negative, a PET CT is negative and a needle biopsy is non-diagnostic, or an informed individual prefers a non-aggressive approach. If a solid nodule shows clear growth on serial CT's, a non-surgical biopsy or surgical resection is recommended unless there are specific contraindications (Gould et al., 2013). A surgical diagnosis is recommended if there is a high clinical probability of lung cancer, the nodule is intensely hypermetabolic on PET/CT, a non-surgical biopsy is suspicious for cancer or an individual prefers a definitive diagnosis (Gould et al., 2013).

Multiple solid nodules <6mm are usually benign, representing granulomas or intrapulmonary lymph nodes. A 12 month follow up CT may be considered in high risk individuals. If there is clinical evidence of infection or the individual is immunocompromised, infection should be considered. A short term follow CT may be appropriate. Multiple solid nodules with at least one nodule greater than or equal to 6 mm can be followed with CT's at 3-6 months and 18-24 months. Management should be based on the largest/most suspicious nodule. Most metastases will grow over 3 months. The risk of cancer increases as the number of nodules increases from 1 to 4 but decreases if the number is greater than 4.

Subsolid nodules (SSN) include pure ground glass nodules (GGN) and part-solid nodules (PSN). SSN are more likely to be malignant than solid nodules but have a better prognosis than lung cancers which present as solid nodules (Callister et al., 2015). Many have slow growth rates and may remain stable for years. Pure GGN < 6mm do

not require routine follow up. However, this should not preclude the option of follow up CT's at 2 and 4 years in high risk individuals. GGN greater than or equal to 6mm can be followed at 6-12 months and then every two years until 5 years. The Fleischner Society states that these guidelines are not intended to preclude either shorter or longer term follow up in individuals when deemed clinically appropriate. A previous study found growth in 7% of part-solid nodules that had previously been stable for 3 years, and another study found growth >2mm in 13% of nodules after 5 years of stability (Chen et al., 2024). The ACCP states there is controversy regarding how long to follow part solid or ground glass nodules and that follow up over several years may be appropriate. In appropriate individuals, follow-up after 5 years, every 2-4 years, can be considered for at least 10 years, taking into account comorbidities, life expectancy, and individual preferences (Chen et al., 2024).

Solitary PSN < 6mm do not require routine follow up. A follow up CT may be done at 2 and 4 years. For PSN greater than or equal to 6mm with a solid component < 6mm, a follow up CT may be done at 3-6 months and then annually for a minimum of 5 years. The 5 year period is somewhat arbitrary but considered reasonable if the nodule is unequivocally stable during that time period. If the solid component is at least 6mm, follow up at 3-6 months should be done. A persistent PSN with a solid component of at least 6mm or a growing solid component is highly suspicious. If the nodule has suspicious morphology, if the solid component is growing or > 8mm, PET/CT or biopsy should be considered (MacMahon et al., 2017; Callister et al., 2015). Multiple PSN < 6mm are often infectious. A repeat CT can be done at 3-6 months, then at 2 and 4 years. If at least one of the nodules is greater than or equal to 6mm, a repeat CT can be done at 3-6 months, and management should be based on the most suspicious nodule.

The volume of lung nodules is significantly larger in CT chest with contrast compared to CT chest without contrast. Whichever CT protocol is used initially should also be used in all follow-up scans to avoid the risk of missing any relevant nodule growth (de Jong et al., 2012; Rampinelli et al., 2010).

Pulmonary cystic lesions may represent a cyst-related primary lung malignancy. There are no uniform surveillance criteria for these lesions, but some authors recommend a CT at 3-6 months to exclude rapid growth and then follow up CT's according to the SSN nodule guidelines (Mets et al., 2018).

NCCN guidelines for the management of incidental pulmonary nodules are consistent with the Fleischner guidelines (NCCN, 2024; NCCN, 2025). For pulmonary nodules detected on lung cancer screening CT's, adherence to the American College of Radiology (ACR) Lung-RADS guidelines is recommended (MacMahon et al., 2017; Expert Panel on Thoracic Imaging, 2023; NCCN, 2024; NCCN, 2025; Christensen et al., 2024). The British Thoracic Society and ACCP guidelines do not distinguish the management of screening-detected nodules from nodules detected incidentally (Gould et al., 2013; Callister et al., 2015).

Interval Imaging Outcomes (CH-16.3)

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Criteria

- Further advanced imaging is not medically necessary if a nodule has been:
  - Stable for 2 years
    - Nodules(s) stable on chest x-ray
    - Nodule(s) ≥6mm stable on CT Chest
  - Stable for 1 year
    - Nodule(s) <6mm
  - At any time, if:
    - classically benign characteristics by chest x-ray or previous CT (e.g., benign calcification pattern typical for a granuloma or hamartoma)
    - decreasing in size, (≥ 6mm at start, should be followed for a 2 year period as outlined in CH-16.2) disappearing nodule(s)
- For clinically significant lung nodule(s) (lung nodules not meeting the above criteria) which increase in size or number, serial CT screening or surveillance are not medically necessary.
  - In individuals who do not meet PET criteria (per CH-16.4) or in individuals in which biopsy is not being considered, serial CT may be performed per CH-16.2.

Evidence Discussion

If a chest x-ray (CR) or chest CT has demonstrated that a pulmonary nodule has benign characteristics, further imaging is not medically necessary (Expert Panel on Thoracic Imaging et al., 2023; MacMahon et al., 2017). Benign characteristics include intranodular fat or a diffuse, central, laminated or popcorn pattern of calcification (Expert Panel on Thoracic Imaging et al., 2023; Munden et al., 2021).

If an indeterminate nodule is seen on a CR or CT, prior studies should be reviewed to determine possible growth or stability, including comparison with the earliest available study and more recent ones (Expert Panel on Thoracic Imaging et al., 2023; Gould et al., 2013). If stability of a nodule seen on CR cannot be determined, CT chest is appropriate (Expert Panel on Thoracic Imaging et al., 2023). If a solid nodule has been stable for at least 2 years, no additional evaluation is necessary (Gould et al., 2013; MacMahon et al., 2017). Two years of radiographic stability is considered strong presumptive evidence of a benign nodule (Gould et al., 2013; Truong et al., 2014). For solid nodules seen on CT, further follow up is not needed if nodules < 6mm have been stable for one year or if nodules greater than or equal to 6mm have been

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stable for two years (Expert Panel on Thoracic Imaging et al., 2023; MacMahon et al., 2017). Malignant nodules show a wide range of growth rates with some demonstrating regression at times (Gould et al., 2013; Mazzone & Lam, 2022). Solid nodules greater than or equal to 6mm that decrease in size but do not completely resolve should be followed to resolution or lack of growth over 2 years (MacMahon et al., 2017; Expert Panel on Thoracic Imaging et al., 2023). For situations where PET, CT, and/or biopsy are not reasonable choices, ongoing surveillance would be medically necessary (Expert Panel on Thoracic Imaging et al., 2023). Clinically significant nodules that are not amendable to PET and/or biopsy may undergo serial CT exams per CH-16.2 (Expert Panel on Thoracic Imaging et al., 2023).

There is controversy regarding how long to follow part solid or ground glass nodules (Chen et al., 2024; MacMahon et al., 2017). Follow up over several years may be appropriate (Chen et al., 2024; MacMahon et al., 2017). The Fleischner guidelines state that subsolid nodules <6mm may be followed for up to 4 years but that the guidelines are not intended to preclude either shorter or longer term follow up in individuals when deemed clinically appropriate (MacMahon et al., 2017). Subsolid nodules greater than or equal to 6mm may be followed for 5 years (MacMahon et al., 2017; Chen et al., 2024). The 5 year period is "somewhat arbitrary but considered reasonable if the nodule is unequivocally stable during that time period" (MacMahon et al., 2017).

PET/CT should be considered for solid nodules greater than or equal to 8mm (Maiga et al., 2018; Mazzone & Lam, 2022). If a solid nodule shows clear growth on serial CT's, a non-surgical biopsy or surgical resection is recommended unless there are specific contraindications (Gould et al., 2013; NCCN, 2025). Non-solid nodules which grow or develop solid components are often malignant and further evaluation and/or resection should be considered (Chen et al., 2024; MacMahon et al., 2017).

If a CT demonstrates multiple solid nodules <6mm and there is clinical evidence of infection or the individual is immunocompromised, infection should be considered and a short term follow up CT may be appropriate (MacMahon et al., 2017; Munden et al., 2021). Certain findings on a lung cancer screening CT which suggest an infectious or inflammatory process (e.g., >6 new nodules or solid nodules which are greater than or equal to 8mm appearing in a short interval) are reported as Lung-RADS 0 and may be followed up with a LDCT in 1-3 months (American College of Radiology, n.d.; Christensen et al., 2024). Some findings indicative of an infectious/inflammatory process may not warrant short-term follow-up (e.g., tree-in-bud nodules or new <3 cm ground glass nodules) (Christensen et al., 2024; American College of Radiology, 2022).

Background and Supporting Information:

- Approximately 20% of observed cancers have decreased in size at least at some point during their observation period. Therefore, a decreasing size of a nodule cannot be a reliable indicator of being benign.

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- For nodules that increase in number, this is not meant for known stable or benign nodules to be counted.
  - Example, known 4mm nodule stable for 3 years, now presents with a new solid 8mm pulmonary nodule, follow-up will be driven by new nodule size and type.
  - Example #2, known granuloma 5mm from prior CT Chest one year ago and now CT Chest reveals a new 6 mm sub-solid nodule, follow-up would be driven by the new nodule size and type.

Chest Imaging Guidelines

PET (CH-16.4)

CH.SN.0016.4.A
v1.0.2027

Criteria

- PET/CT (CPT® 78815) for a solid lung nodule ≥8mm 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 ≥3.1cm.
  - 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 considered not medically necessary
  - Not considered medically necessary for infiltrate, ground glass opacity, or hilar enlargement
  - Mediastinal lymphadenopathy - See **Mediastinal Lymphadenopathy (CH-2.3)** or Sarcoid concerns – See **Sarcoid (CH-15.1)**
- If a CT finding led to ordering a PET scan, and if that CT was >3 months ago, a repeat CT (CPT® 71250) or (CPT® 72160) is considered medically necessary prior to considering a PET scan.
  - A change in the status of the original finding may find that a PET scan is considered no longer medically necessary.

Evidence Discussion

PET/CT may be performed for evaluation of a solid lung nodule greater than or equal to 8mm on chest CT (MacMahon et al., 2017; Gould et al., 2013; NCCN, 2024; NCCN, 2025). PET/CT has good sensitivity and moderate specificity for detecting malignancy in individuals with a high risk of cancer and a nodule greater than or equal to 10mm (Mankidy et al., 2023). Consensus opinion is that that nodules <8 to 10mm are not reliably characterized by PET/CT. The false negative rate of PET/CT is higher for nodules <8mm and for malignancies with low metabolic activity, such as adenocarcinoma in situ or well differentiated carcinoid tumor. PET/CT has a lower sensitivity and higher false negative rate for ground glass or part solid nodules (Gould et al., 2013; Mankidy et al., 2023). Infections and inflammatory disorders may cause false positive results.

Repeating a PET/CT is discouraged. If there is a high pretest probability of cancer, a negative PET/CT does not reliably rule out cancer and either continued surveillance for at least 2 years or tissue sampling is advised (Gould et al., 2013; Maiga et al., 2018). If a solid nodule shows clear growth on serial CT's, a non-surgical biopsy or surgical

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resection is recommended unless there are specific contraindications (Gould et al., 2013). A surgical diagnosis is recommended if the nodule is hypermetabolic on PET/CT (Gould et al., 2013).

PET/CT may be indicated for the pre-treatment staging of individuals with confirmed or strongly suspected lung cancer, as detailed in the oncology guidelines (Gould et al., 2013; NCCN, 2024; NCCN, 2025).

Background and Supporting Information

- A **nodule** is any pulmonary or pleural lesion that is a discrete, spherical opacity 2-30mm 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 (MacMahon et al., 2017; Munden et al., 2021).
- **Malignant** nodule features can include spiculation, abnormal calcification, size greater than 7-10mm, interval growth, history of a cancer that tends to metastasize to the lung or mediastinum, and/or smoking history (Baum et al., 2024; Mazzone & Lam, 2022; Woodworth et al., 2024).
  - A nodule that grows at a rate consistent with cancer (doubling time 100 to 400 days) may be sampled for biopsy or resected (Gould et al., 2013; Truong et al., 2014).
  - Less than 1% of <6mm lung nodules are malignant (MacMahon et al., 2017).
  - Three percent of all 8mm lung nodules are malignant (Gould et al., 2013; Mazzone & Lam, 2022).
  - Only one follow-up at 6-12 months is sufficient for 6-8mm nodules and not all require traditional 2 year follow-up (MacMahon et al., 2017) .
  - The larger the solid component of a subsolid nodule, the greater the risk of invasiveness and metastases (Chen et al., 2024; MacMahon et al., 2017).
  - Increased risk of primary cancer as the total nodule count increased from 1 to 4 but decreased risk in individuals with 5 or more nodules, most of which likely resulted from prior granulomatous infection (MacMahon et al., 2017).
  - A nodule that does not grow in 6 months has a risk of malignancy at <10% (Mankidy et al., 2023; Mazzone & Lam, 2022)..
- **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 (Chen et al., 2024; MacMahon et al., 2017).
- **Ground glass** or subsolid opacities, which can harbor indolent adenocarcinoma with average doubling times of 3–5 years (Gould et al., 2013; Mankidy et al., 2023).
- **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 (Christensen et al., 2024; Maiga et al., 2018).

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- **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 (Gould et al., 2013; Maiga et al., 2018).
- **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. 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% (Gould et al., 2013).

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

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Chest Imaging Guidelines

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

CH.PB.0017.1.A
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Criteria

- CT Chest with contrast (CPT® 71260) or CT Chest without contrast (CPT® 71250) (with contrast is preferred for initial evaluation) is considered medically necessary for pleural nodule(s).
  - Pleural nodule(s) seen on an imaging study other than a "dedicated" CT or MRI Chest.
  - Pleural nodule(s) identified incidentally on any of the following dedicated chest studies can replace CT Chest as the initial dedicated study.
    - CT Chest without and with contrast (CPT® 71270).
    - CTA Chest (CPT® 71275).
    - Low-dose computed tomography (LDCT) (CPT® 71271)
    - 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)**)
- PET/CT (CPT® 78815) is considered medically necessary 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.
- For diagnosis or suspicion of pulmonary sequestration:
  - CT chest with contrast (CPT® 71260) OR CTA Chest (CPT® 71275)
  - 3D reconstruction as requested (CPT® 76377) or (CPT® 76376)

Evidence Discussion

- CT Chest is considered medically necessary for the evaluation of pleural nodules (Hallifax et al., 2017; Rivera et al., 2013; Zhu et al., 2020). CT scan is widely available and allows for easy access to isotropic 3-D reformatting (Hallifax et al., 2017). A study

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looking at the utility of CT in investigation for malignancy showed a sensitivity of 68%, a specificity of 78%, a positive predictive value of 80% and a negative predictive value of 65% when CT findings were reported as malignant. CT also carries the risk of exposure to iodinated contrast and ionizing radiation (Hallifax et al., 2017).

- Follow up for previously detected pleural nodules follows guidelines addressed elsewhere in these guidelines (See **Solitary Pulmonary Nodule – Imaging (CH-16.1)** and **Incidental Pulmonary Nodules Detected on CT Images (CH-16.2)** (Rivera et al., 2013).
  - Of note, a study looking at over 8,700 LDCT chest scans identified 943 noncalcified nodules attached to the costal pleura, of these 897 were < 10mm 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 (Zhu et al., 2020).
- Pleural nodule/mass or thickening without suggestion of malignancy would undergo surveillance or biopsy (Hallifax et al., 2017; Lee & Walker, 2023).
- PET/CT may be considered when the identified pleural nodule/mass or thickening is ≥ 8mm and there is a likelihood of malignancy (Rivera et al., 2013). PET/CT may be useful in differentiating between benign and malignant disease; however, studies have shown a broad range of sensitivities (88-100%) and specifies (35-100%). PET/CT may be complicated by false positives such as infections and prior pleurodesis with talc, or false negatives such as low grade/low metabolic activity epithelioid mesothelioma (Hallifax et al., 2017).

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Pleural Effusion (CH-18)

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Chest Imaging Guidelines

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Pleural Effusion (CH-18.1)

CH.EF.0018.1.A
v1.0.2027

Criteria

- CT Chest with contrast (CPT® 71260) is considered medically necessary after:
- Chest x-ray, (upright posterior/anterior/lateral best), (lateral decubitus films can improve sensitivity); **and**

  one of the following:

  - Thoracentesis, (if possible) 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)
  - Concern for loculated effusion, empyema, paramediastinal location, subpleural lung abscess or cavitation
  - Check position of chest tube(s) or drainage catheters
  - Surgical planning
- Chest ultrasound (CPT® 76604) can be used as an alternative or adjunct to chest x-ray to evaluate for the presence of fluid within the pleural spaces and guide thoracentesis.

Evidence Discussion

The most common initial diagnostic test suggesting a pleural effusion is often chest radiography (CR). CR remains the most accessible form of chest imaging and will often be the initial study for suspected pleural disease (Shen-Wagner et al., 2023; Sundaralingam et al., 2020). Lateral decubitus CR has higher sensitivity and specificity for pleural effusion than other positions (Zaki et al., 2024). However, complicated effusions are often loculated and may not layer dependently. Lower lobe consolidation may mask the presence of an effusion. The American Association for Thoracic Surgery (AATS) states that CR, although useful as a first step, should be combined with additional imaging if pleural space infection is suspected (Shen-Wagner et al., 2023; Shen et al., 2017).' The American College of Radiology (ACR) states that consensus recommendations endorse CR as the initial imaging modality for suspected parapneumonic or malignant effusion, but there are limited empiric data to support this (Expert Panel on Thoracic Imaging et al., 2024).

Ultrasound (US) is at least as effective as lateral decubitus views for the detection of pleural fluid and provides a better estimation of fluid volume (Shen et al., 2017; Sundaralingam et al., 2020; Zaki et al., 2024). When standard CR cannot rule out a pleural effusion, US has largely replaced decubitus views due to its speed, portability

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and greater sensitivity. Identification of a pleural effusion for possible US-guided thoracentesis is the primary reason for chest US. The AATS guidelines state that CR and US are class 1 recommendations (should be done) for suspected pleural space infection (Shen et al., 2017). US is more sensitive than CR for detecting pleural effusion (Orlandi et al., 2024; Shao et al., 2022).

PA chest x-ray can show a pleural effusion with approximately 200 ml of pleural fluid while a lateral view can reduce this to 50 ml. Ultrasound is even more sensitive with as little as 3-5 ml of fluid being detected. Thoracentesis can only be safely performed with adequate fluid present. If only a trace effusion or inadequate amount of fluid is seen, a thoracentesis may not be possible (Shao et al., 2022; Sundaralingam et al., 2020; Roberts et al., 2023).

Although diagnostic imaging plays an important role in the evaluation of pleural effusions, thoracentesis with pleural fluid analysis remains the necessary first invasive step. Pleural fluid analysis is considered mandatory unless the clinical presentation suggests a high pretest probability of a transudative effusion (Sundaralingam et al., 2020). Initial evaluation should include an ultrasound (US)-guided thoracentesis to categorize the effusion as a transudate or exudate and obtain specimens for microbiology and cytology (Beaudoin & Gonzalez, 2018; Roberts et al., 2023). If a parapneumonic effusion is suspected, diagnostic aspiration must be performed to identify individuals with a complicated effusion that requires drainage (Beaudoin & Gonzalez, 2018; Shen et al., 2017).

Analysis of fluid may include: cytology, culture, cell count, and biochemical studies. 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 (Beaudoin & Gonzalez, 2018; Shen-Wagner et al., 2023).

CT is not used routinely as the initial imaging study for pleural effusion unless there is suspicion for loculated fluid in an interlobar fissure or paramediastinal location, or CR demonstrates parenchymal lesions suggestive of cancer, septic emboli or cavitation. CT can better distinguish between a loculated empyema and subpleural lung abscess. CT with IV contrast optimizes imaging of the pleura. CT chest with contrast is a class 2a recommendation (reasonable) for suspected pleural space infection in the AATS guidelines (Tsakok & Hallifax, 2021; Yamada et al., 2024). If the etiology of an exudative effusion cannot be identified, or if it is not safe to perform a thoracentesis, a CT chest with contrast is considered medically necessary (Beaudoin & Gonzalez, 2018; Roberts et al., 2023).' The American College of Radiology (ACR) states that CR or CT chest with IV contrast is considered medically necessary as initial imaging for people with recent pneumonia and suspected parapneumonic effusion or for people with dyspnea, cough or chest pain with a suspected malignant pleural effusion (Expert Panel on Thoracic Imaging et al., 2024). Thoracentesis and chest CT cannot rule out malignancy or

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tuberculosis. Pleural biopsy is indicated for a recurrent undiagnosed exudative effusion (Beaudoin & Gonzalez, 2018; Roberts et al., 2023; Sundaralingam et al., 2020).' When a diagnosis cannot be made, monitoring with interval CT scans for up to 2 years is considered medically necessary (Roberts et al., 2023). CT is used in the diagnosis and management of late-stage empyema and malignant pleural effusion and can be used to check the position of drains and plan for surgical intervention (Sundaralingam et al., 2020). CT scans have high specificity but low sensitivity in distinguishing benign from malignant pleural effusion (Orlandi et al., 2024).

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Pneumothorax/ Hemothorax (CH-19)

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Pneumothorax/Hemothorax (CH-19.1)

CH.PT.0019.1.A
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Criteria

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

- Chest x-ray is considered medically necessary 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
    - preoperative study for treatment of pneumothorax
    - pneumothorax associated with hemothorax
    - suspected complications from hemothorax (e.g., empyema)
    - suspected Alpha-1-Antitrypsin Deficiency (even without pneumothorax)
    - suspected cystic lung disease, including lymphangioleiomyomatosis (LAM), tuberous sclerosis (TS), or Birt-Hogg-Dube (BHD) syndrome
    - to determine the etiology of persistent pneumothorax/air leak, such as chest tube malposition, bronchopleural fistula, loculated pneumothorax, lung parenchymal disease
    - suspected catamenial pneumothorax/thoracic endometriosis
- 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

Evidence Discussion

The majority of pneumothorax cases can be confirmed by upright PA chest radiography (CR), which remains the standard initial exam (Tschopp et al., 2015). While US has a high sensitivity/specificity for pneumothorax, it is operator-dependent and is considered not medically necessary as a primary imaging modality (Choi et al., 2021; Ron et al., 2022; Sheng et al., 2025; Tran et al., 2021).

While CT is more sensitive than CR in detecting pneumothorax, it is generally considered not medically necessary for diagnosis and should be avoided due to excess radiation (Tschopp et al., 2015). CT may be considered medically necessary for diagnosing a very small pneumothorax or differentiating between a pneumothorax and a giant bulla in bullous emphysema. Although CT is the best method to measure the size

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of a pneumothorax, current evidence does not support basing treatment decisions solely on size (Mendogni et al., 2020).

The 2001 ACCP guidelines advise against routine CT use for a first-time primary spontaneous pneumothorax (PSP). However, CT may be considered medically necessary to evaluate suspected pulmonary disorders not apparent on CR. For secondary spontaneous pneumothorax (SSP), CT is acceptable for managing recurrent pneumothorax, persistent air leak, and surgical planning.

In contrast, the 2023 British Thoracic Society recommends CT chest for individuals with symptoms and high-risk characteristics (Roberts et al., 2023). These include hemodynamic compromise, significant hypoxia, bilateral pneumothorax, underlying lung disease, hemopneumothorax, or age over 49 with a significant smoking history. This recommendation applies if the pneumothorax size on CR is insufficient for safe needle aspiration or chest tube intervention. The European Respiratory Society suggests that CT may be useful in complicated cases, when chest tube misalignment is suspected, when underlying lung disease is suspected, and in individuals requiring surgery (Tschopp et al., 2015).

High-resolution CT (HRCT) has better sensitivity than routine CT in the pre-operative detection of blebs and bullae (Mendogni et al., 2020). However, it is unclear whether HRCT can predict the risk of recurrence or identify which individuals may benefit from surgical intervention. It may help to identify those at lower risk: the positive predictive value of CT bleb scores for ipsilateral recurrence is relatively low at 68%, while the negative predictive value is high at 94% (Barton et al., 2023).

Some experts advise considering a CT scan after a first time PSP if there are factors such as a family history of pneumothorax, presence of blebs, cysts, or bullae; female sex; or a family or personal history and/or physical examination findings suggestive of a pneumothorax-associated syndrome (Boone et al., 2019).

Although they have low specificity, the most sensitive tests for detecting pneumothorax and hemothorax are CR and CT. For detecting diaphragmatic endometriosis, Magnetic Resonance Imaging (MRI) of the chest is preferable (Nezhat et al., 2019).

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Pneumomediastinum: Subcutaneous Emphysema (CH-19.2)

CH.PT.0019.2.A
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Criteria

- Chest x-ray is initially considered medically necessary.
  - CT Chest with contrast (CPT® 71260) or without contrast (CPT® 71250) if:
    - recent vomiting and/or suspected esophageal perforation
    - associated pneumopericardium
    - associated pneumothorax
    - preoperative study for treatment

Evidence Discussion

The diagnosis of Pneumomediastinum (PM) is usually established by a clinical exam and CR. The CR should include a lateral view (Dirweesh et al., 2017). CR is the most common diagnostic imaging study (Alemu et al., 2021; Magouliotis et al., 2023; Morgan et al., 2021). The reported sensitivity of CR ranges from 60-90%. CT is more sensitive than CR, especially in cases of small amounts of air in the mediastinum (Dirweesh et al., 2017).

There is no evidence defining when CT should be used to evaluate pneumomediastinum (PM). CT should be done if the suspicion for PM remains high despite a normal CR or if there is concern for secondary PM due to a specific pathologic event (Magouliotis et al., 2023).

CT can be beneficial in detecting injury to the tracheobronchial system, pneumothorax, pneumopericardium or esophageal perforation (Susai et al., 2023). Despite the usually benign and self-limiting course of spontaneous PM, additional imaging is often undertaken to rule out esophageal perforation or other underlying disorder. A retrospective review of adolescents and young adults with spontaneous PM demonstrated that no clear criteria were used for obtaining a CT and that the CT's did not impact clinical decisions (Wald et al., 2024). The authors concluded that advanced imaging is over-utilized in individuals with suspected spontaneous PM without clinical evidence of necessity.

Inspiratory/expiratory chest x-rays are helpful in defining whether a pneumothorax is present, and an expiration chest x-ray can enhance the evaluation of an equivocal plain x-ray (Roberts et al., 2023; Tschopp et al., 2015). There is no data supporting the use of serial CT Chest to follow individuals with a known pneumothorax, pneumomediastinum,

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or hemothorax who are asymptomatic or have stable symptoms (Roberts et al., 2023; Susai et al., 2023; Tschopp et al., 2015; Wald et al., 2024).

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Mediastinal Mass (CH-20)

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Mediastinal Mass (CH-20.1)

CH.MM.0020.1.A
v1.0.2027

Criteria

- 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) is considered medically necessary to evaluate mediastinal abnormalities (e.g., 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) is considered medically necessary for indeterminate mediastinal mass on CT Chest.
  - Surveillance imaging is considered medically necessary no more frequently than 3-month intervals over 2 or more years when the lesion(s) remain indeterminate on MRI and a biopsy has not been performed.
- 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. A negative FDG PET/CT does not prevent serial CT/MRIs, due to appreciable false negative rate.
  - MRI Chest without and with contrast (CPT® 71552) or MRI Chest without contrast (CPT® 71550) is considered medically necessary 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) is considered medically necessary 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.
- For fibrosing mediastinitis: See **Fungal Infections (Suspected or Known) (CH-14.2)**

Evidence Discussion

Mediastinal nodules or masses may present as incidental findings on chest radiographs and cross-sectional imaging. Alternatively, they may be found during the evaluation

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of symptoms and signs that include chest pain, cough, dyspnea, dysphagia, cardiac tamponade, diaphragmatic paralysis, central venous thrombosis, superior vena cava syndrome, B-symptoms (in lymphoma), myasthenia gravis, and other paraneoplastic syndromes. The incidence rate is low with a reported prevalence of 0.73-4%. The most frequent lesions encountered in the mediastinum are thymoma, neurogenic tumours and benign cysts (Ackman et al., 2021; Jain et al., 2025).

CT is superior to chest radiography for detection of invasion of the mass across tissue planes, secondary to its higher contrast resolution. Anterior mediastinal tumors account for 50% of all mediastinal masses. CT has the ability to show the precise location, morphology, and pattern of contrast enhancement of an anterior mediastinal mass as well as its relationship to other mediastinal components or borders (Ackman et al., 2021; Jain et al., 2025).

MRI remains superior to CT for detection of invasion of the mass across tissue planes, including the chest wall and diaphragm, and involvement of neurovascular structures secondary to its higher soft-tissue contrast. MRI allows further tissue characterization of mediastinal masses beyond that of CT and FDG-PET/CT. Chemical-shift MRI has been shown to be useful in distinguishing normal thymus and thymic hyperplasia from thymic neoplasms and lymphoma. It can also prove the cystic nature of an indeterminate, non–water attenuation thymic mass on CT, preventing unnecessary biopsy and thymectomy. The frequency of surveillance imaging for indeterminate lesions seen on MRI is usually 3-12 month intervals over 2 years or more, depending upon level of clinical concern (Ackman et al., 2021; Kim et al., 2023; Jain et al., 2025). The diagnostic accuracy of chest MRI for the detection of mediastinal mass is 71-91% (Kim et al., 2023).

(FDG)-PET/CT offers limited additional value beyond that of conventional CT in the initial assessment of mediastinal masses, with the exception of its use for primary mediastinal lymphoma staging and surveillance and detection of metastatic lymphadenopathy. A positive FDG-PET/CT has little value for discrimination between benign and malignant lesions (Ackman et al., 2021; Proli et al., 2018; Reddy, 2022; Jain et al., 2025).

It is reasonable to perform a chest radiograph as an initial imaging step. Chest radiography can help localize a mass to a specific mediastinal compartment and thereby narrow the differential diagnosis. Chest radiography offers limited assistance regarding tissue characterization of mediastinal masses, with the exception of its occasional demonstration of calcium within a lesion (Ackman et al., 2021).

There is little relevant literature to support the use of ultrasound (US) in the initial evaluation of a clinically suspected mediastinal mass (Ackman et al., 2021).

Fibrosing mediastinitis (FM) is a rare benign but potentially life threatening process characterized by progressive proliferation of dense infiltrative fibrous tissue in the mediastinum and/or hila. Granulomatous FM is the more common subtype in the US

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and is typically associated with prior infection with histoplasmosis. Nongranulomatous FM is less common and is usually associated with an autoimmune disorder, drug exposure, or prior radiation. The most common symptoms are cough, dyspnea, hemoptysis, and pleuritic chest pain. Individuals may develop SVC syndrome or post-obstructive pneumonia. Widening of the mediastinum and mediastinal/hilar lymphadenopathy are the most common abnormal findings on chest x-ray. CT chest with contrast is the modality of choice for suspected FM. MRI is equivalent to CT for evaluating extent of disease, but CT is superior for evaluation of airways and calcification. PET CT is nonspecific and not routinely used. Nonsurgical and surgical procedures for individuals with clinical symptoms are related to compression or obstruction of mediastinal structures. CTA chest may be used for procedural planning or to evaluate the patency of vascular stents. There are no consensus guidelines for follow up imaging. No routine imaging is considered medically necessary for the granulomatous subtype unless there are progressive symptoms or clinical decompensation. Regular surveillance with CT is recommended for the nongranulomatous subtype to rule out malignancy which may not have been sampled in a biopsy (Garrana et al., 2019; Ramachandran et al., 2025).

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Chest Imaging Guidelines

Chest Trauma (CH-21.1)

CH.CT.0021.1.A
v1.0.2027

Criteria

- Chest x-ray is medically necessary initially.
  - CT Chest without contrast (CPT® 71250) or with contrast (CPT® 71260) is considered medically necessary for the following situations:
    - Rib or sternal Fracture when clinical findings or other imaging identifies associated complications including pneumothorax, hemothorax, pulmonary contusion, atelectasis, flail chest, cardiovascular injury and/or injuries to solid or hollow abdominal organs.
    - Rib or sternal facture when malignancy is suspected as the etiology for uncomplicated, single fractures, multiple fractures, non-acute fractures, or occult rib fractures that are identified on x-ray.
    - Routine follow-up advanced imaging of rib or sternal fractures is considered not medically necessary.
- CT Chest without contrast (CPT® 71250) or Tc-99m bone scan whole body (CPT® 78306) is considered medically necessary for suspected pathological rib fractures, with or without a history of trauma
- For clavicle fractures and sterno-clavicular (SC) dislocation, see **Joint Instability and Dysfunction (MS-30.0)**.
- Advanced imaging of the abdomen or pelvis is considered not medically necessary for chest trauma when there is no physical examination or laboratory evidence of abdominal and/or pelvic injury.

Evidence Discussion

- Chest x-ray, in combination with physical exam, is the appropriate initial diagnostic modality in those with suspected rib or sternal fracture after chest trauma. Although chest x-ray has low sensitivity (approximately 50%) for detection of rib fracture (Henry et al., 2019), it has the benefit of being widely and readily available and able to detect complications that may require additional imaging such as pneumo- or hemothorax and pulmonary contusions (Henry et al., 2019; Lewis et al., 2021). In addition, failure to detect rib fractures in uncomplicated cases does not significantly alter the individual management or outcomes. A study by Bansidhar et al. showed no difference in treatment in individual with minor chest trauma who did and did not have rib fractures diagnosed either clinically or radiographically (Henry et al., 2019). Therefore, in uncomplicated cases, additional advanced imaging is considered not medically necessary. Rodriguez et al. demonstrated that yield for CT of thoracic injury

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with major clinical significance after a normal chest x-ray is 1.5% and would only detect one major injury for every 67 studies (Rodriguez et al., 2017).

- In cases where complications are identified clinically or by other imaging, additional imaging with CT chest is considered medically necessary. CT does have higher sensitivity for detection of rib fractures (Henry et al., 2019) and in the detection and extent of pulmonary injuries (Lewis et al., 2021). It also may be useful in differentiating blunt cardiac injury from acute myocardial infarction. However, CT does carry with it the risk of contrast related renal injury and allergic reactions (Rodriguez et al., 2017). It also exposes the individual to a greater amount of ionizing radiation than a chest x-ray and subsequent increased risk of induced cancers (Rodriguez et al., 2017). It is estimated that undergoing chest CT will result in one radiation induced cancer per every 720 40-year-old females and 1,538 40-year-old males (Rodriguez et al., 2017).
- If a pathological rib fracture is suspected, imaging with either a CT chest or Tc-99m bone scan is considered medically necessary. CT may be helpful in differentiating primary tumor from metastasis and may aid in detection of the primary malignancy. Tc-99mm bone scan has low specificity but high sensitivity (>95%) for detection of pathologic rib fractures (Henry et al., 2019).
- Medial clavicular fractures are rare (<5% of cases) and may necessitate additional imaging with CT or MRI for evaluation (Flores et al., 2020). Midshaft and distal clavicular fractures are usually sufficiently evaluated by x-ray (Flores et al., 2020).
- Chest x-ray has poor sensitivity for identification of sternoclavicular dislocations. Given the risk for complications such as pneumothorax in posterior displacement, advanced imaging may be considered medically necessary. CT is advantageous as it has superior image resolution. It also allows for 3D reconstruction to determine exact position of the sternoclavicular joint. MRI can also be utilized but it has poorer resolution than CT. However, it may be advantageous for evaluation of soft tissue conditions or ligamentous injury (Morell & Thyagarajan, 2016).
- For isolated chest injury without signs or symptoms of abdominal or pelvic injury, advanced imaging of the abdomen or pelvis is considered not medically necessary. If abdominal or pelvic injury is suspected, imaging is as dictated elsewhere in these guidelines.

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Chest Wall Mass (CH-22)

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Chest Imaging Guidelines

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Chest Wall Mass (CH-22.1)

CH.CM.0022.1.A
v1.0.2027

Criteria

- Chest x-ray is useful in the workup of a soft-tissue mass and is considered medically necessary as the initial imaging study.
  - Chest ultrasound (CPT® 76604) is considered medically necessary 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.
  - Following a non-diagnostic chest x-ray that does not show an obvious lipoma(s) or clearly benign entity (see **Tissue Growths and Masses (MS-10)** in the Musculoskeletal Imaging Guidelines), ONE of the following is considered medically necessary:
    - 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) or
    - CT Chest without contrast (CPT® 71250)

Evidence Discussion

Radiography is medically necessary as the initial imaging study for both superficial and non-superficial soft tissue masses. Radiography can help identify calcifications, bone involvement, intrinsic fat, and unsuspected skeletal abnormality or deformity. In general, radiographic findings related to a soft tissue mass can provide helpful insight in determining the next most appropriate imaging modality for further characterization (Garner et al., 2023; Haseli et al., 2022; Mansour et al., 2022). Non-contrast enhanced ultrasound is also an excellent triage tool for evaluating superficial soft tissue masses like superficial lipomas (Garner et al., 2023; Mansour et al., 2022; Safai Zadeh et al., 2023). However, ultrasound is not sufficient to assess for malignancy. When features detected on ultrasound are not clearly benign or when findings are concerning, further advanced imaging is medically necessary (Garner et al., 2023).

MRI without and with IV contrast is medically necessary as the next imaging study for a soft tissue mass following non-diagnostic radiographs (Garner et al., 2023; Ahlawat et al., 2024; Mansour et al., 2022).

MRI helps to define intrinsic tumor characterization, vascular structures, neurovascular involvement, hemorrhage, edema, and tumor necrosis. MRI without IV contrast may be beneficial compared with CT, but the use of MR contrast improves the differentiation

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of benign from malignant soft tissue masses (Garner et al., 2023; Ahlawat et al., 2024; Mansour et al., 2022). At least 20% to 25% of soft tissue masses can demonstrate features that allow for confident diagnosis based on MRI alone, many of which are benign and thus would not warrant biopsy (Garner et al., 2023; Mansour et al., 2022; Haseli et al., 2022). MRI has a sensitivity of 96%, a specificity of 72%, a positive predictive value of 77%, a negative predictive value of 83%, and a diagnostic accuracy of 88% (Kolta et al., 2021).

When MRI is contraindicated, CT with IV contrast is medically necessary following non-diagnostic radiograph.

CT with IV contrast is useful in distinguishing vascularized from potentially necrotic regions of a tumor or calcification (Garner et al., 2023; Haseli et al., 2022; Mansour et al., 2022).

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Pectus Excavatum and Pectus Carinatum (CH-23)

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Pectus Excavatum and Carinatum (CH-23.1)

CH.EC.0023.1.A
v1.0.2027

Criteria

- CT Chest without contrast (CPT® 71250) or MRI Chest without and with contrast (CPT® 71552) and 3-D reconstruction (CPT® 76377 or CPT® 76376) if:
  - candidates for surgical correction and/or to calculate preoperative Haller Index; AND/OR
  - cardiac or pulmonary dysfunction has been identified on either objective cardiac or pulmonary testing, including any of the following
    - ECG, echocardiography, Cardiac MRI, PFTs, spirometer, or cardio-pulmonary exercise stress test

Evidence Discussion

- Measurements of the chest, such as the Haller Index, aid in the pre-operative assessment of pectus deformities. Chest CT is commonly used for pre-operative planning (Abid et al., 2017; Scalise & Demehri, 2023; Janssen et al., 2023). Chest CT can also be utilized to assess cardiac compression or the presence of concomitant thoracic anomalies (Abid et al., 2017; Scalise & Demehri, 2023; Janssen et al., 2023; Coorens et al., 2024) and allows for 3D reconstruction of the chest wall (Coorens et al., 2024). However, CT does carry with it the risk of ionizing radiation (Abid et al., 2017; Scalise & Demehri, 2023; Janssen et al., 2023; Coorens et al., 2024; Sun et al., 2019). MRI can also be utilized for preoperative planning and does not carry the risk of ionizing radiation (Janssen et al., 2023; Coorens et al., 2024; Sun et al., 2019) and allows for possible real-time imaging (Coorens et al., 2024). However, MRI has a longer acquisition time, can be complicated by motion artifacts, and is incompatible with some implanted devices and metallic objects (Sun et al., 2019). Chest x-ray has also been used for the pre-operative calculation of pectus indices (Scalise & Demehri, 2023; Coorens et al., 2024) and has the benefit of reduced radiation exposure as compared to CT. Studies have shown, however, that it had decreased measurement accuracy in cases of unbalanced asymmetry as compared to CT (Coorens et al., 2024).
- For individuals with cardiac symptoms, further workup with ECC and echocardiography is considered medically necessary (Janssen et al., 2023).
- For individuals with pulmonary dysfunction, further work up with spirometry is considered medically necessary (Janssen et al., 2023).

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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 (Abid et al., 2017; Coorens et al., 2024).
- 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 (Coorens et al., 2024).
- Some have suggested that a CXR can replace the CT Chest for Haller Index calculation with a strong correlation and high diagnostic accuracy (Coorens et al., 2024).
- 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) (Janssen et al., 2023).

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Chest Imaging Guidelines

Pulmonary Arteriovenous Fistula (AVM) (CH-24)

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Chest Imaging Guidelines

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Pulmonary AVM (CH-24.1)

CH.AV.0024.1.A
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Criteria

- 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:
  - suspected pulmonary AVM, including individuals with HHT (Hereditary Hemorrhagic Telangiectasia) or who have a first degree relative with HHT
  - 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
  - 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
  - treated or untreated PAVM's with recurrent symptoms

Evidence Discussion

Chest x-ray is the most appropriate initial imaging exam with presentation of hypoxemia or hemoptysis but it does have low sensitivity for pulmonary arteriovenous malformation (PAVM) (Pillai et al., 2024).

CT chest is the test of choice for diagnosing a PAVM. Contrast may be considered for an atypical nodule/soft tissue lesion on CT chest without contrast and suspicion for a PAVM. CTA chest is the gold standard for defining the vascular anatomy of a previously identified PAVM. It is not routinely used for diagnosis except in the setting of concomitant embolization therapy, diagnostic uncertainty, or pre-intervention planning (Pillai et al., 2024). MRA chest avoids ionizing radiation but is not as sensitive or specific as CT for the diagnosis of PAVM and has limitations detecting PAVM <5mm (Pillai et al., 2024). It has a potential role in younger people with Hereditary Hemorrhagic Telangiectasia (HHT) who may require lifelong surveillance (Pillai et al., 2024).

CT chest without contrast may be done to screen for PAVM in people with possible or confirmed Hereditary Hemorrhagic Telangiectasia (HHT) (Faughnan et al., 2020). A negative CT chest with or without contrast helps to exclude a clinically significant PAVM (Shovlin et al., 2017).

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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. (Lee & Hyun, 2022; Salibe-Filho et al., 2023; Shovlin et al., 2017).

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Pulmonary Embolism (PE) (CH-25)

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Pulmonary Embolism (CH-25.1)

CH.PE.0025.1.A
v1.0.2027

Criteria

- CT Chest with contrast with PE protocol (CPT® 71260) or CTA Chest (CPT® 71275) is considered medically necessary 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:
    - Dyspnea, new onset and otherwise unexplained;
    - Chest pain, pleuritic;
    - Tachypnea
  - AND, with any ONE of the 3:
    - 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**	SYMPTOMS ATTRIBUTED TO PE**
Immobilization via hospitalization or institutional care 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 or myeloproliferative disorder	Right heart strain or failure
Recent history of a long airplane flight	Systolic BP <90
Use of estrogen-based contraceptives (birth control pills), oral estrogen	Syncope
Advanced age (≥70)	Cough

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RISK FACTORS**	SYMPTOMS ATTRIBUTED TO PE**
Congestive heart failure, congenital heart disease, hypertension, superficial venous thrombosis, and/or indwelling central vein catheter	Heart Rate >100
Obesity (BMI ≥30)	Palpitations
COVID-19 for those post-hospitalization or those within 30 days of diagnosis	
Recurrent pregnancy loss	
COPD	
Thrombotic disorders, antiphospholipid antibody syndrome, and/or autoimmune disease	
Inflammatory bowel disease	
Nephrotic syndrome	
In vitro fertilization (IVF) treatment	

Well's Criteria for Clinical Probability of PE*	
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
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

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Well's Criteria for Clinical Probability of PE*
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.

- Cases which do not meet above 2-step criteria, should undergo prior to advanced imaging:
  - Chest x-ray (to rule out other causes of symptoms)
  - EKG to rule out potential cardiac etiologies
- MRA Chest with IV contrast is considered medically necessary as an alternative to CT Chest with contrast with PE protocol (CPT 71260) or CTA Chest (CPT 71275) when there is a contraindication to iodinated contrast and V/Q scan is nondiagnostic, unavailable, or otherwise not preferred.
- Pregnancy is a risk factor for thrombo-embolic events in and of itself. Additional risk factors are not required. Pregnant individuals with suspected PE should proceed with:
  - If signs/symptoms of DVT are present, Doppler studies of the lower extremities (CPT® 93970 bilateral study or CPT® 93971 unilateral study) are considered medically necessary
  - If no signs/symptoms of DVT, then chest x-ray first.
  - If chest x-ray is normal, then V/Q scan (CPT® 78580 or CPT® 78582) (preferred test), or CTA Chest (CPT® 71275) or CT Chest with contrast with PE protocol (CPT® 71260)
  - 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):
  - Is not a replacement for CTA Chest
  - Is considered medically necessary 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 ventilation-perfusion lung scan to evaluate for interval change (CPT® 78580)

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    - Suspected Chronic thromboembolic disease or Chronic thromboembolic pulmonary hypertension*, usually after 3 months of effective anticoagulation (CPT® 78580 or CPT® 78582)
- Follow-up imaging in stable or asymptomatic individuals with known PE is considered not medically necessary
- 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, or
  - Elevated D-dimer which is persistent or recurrently elevated, or
  - Current evidence for right heart strain or failure identified by EKG, ECHO or heart catheterization
- For Pulmonary Artery Hypertension (PAH), see **Pulmonary Artery Hypertension (PAH) – Indications (CD-8.1)** in the Cardiac Imaging Guidelines.

Evidence Discussion

Symptoms and signs of pulmonary embolus (PE) are nonspecific and common; therefore, knowing whom to test for PE is challenging (Kahn & de Wit, 2022). In North America, PE is diagnosed in only 5% of people tested for it (Konstantinides et al., 2020). Chest x-ray (CR) is nonspecific but may rule out other causes of dyspnea and chest pain. Avoiding the overuse of imaging tests is important, given the potential harms of radiation exposure, high costs and complications. The pretest clinical probability has an important effect on the predictive value of CT pulmonary angiography (CTPA) (Kahn & de Wit, 2022). Determining the clinical pretest probability of PE depends on clinical judgment, which lacks standardization and is subjective, or prediction rules (Ishaaya & Tapson, 2020; Konstantinides et al., 2020). Kahn et al recommend diagnostic imaging in those with a likelihood of PE greater than or equal to 15%, based on the "implicit sense" of the clinician, and either a structured clinical probability score (Wells, Revised or Simplified Geneva score) or a D-dimer above a pre-specified threshold (Kahn & de Wit, 2022). Other experts recommend that imaging be done in those with a high pretest probability based on empirical clinical judgment or a prediction rule and in those with a low/intermediate pretest probability and a positive D-dimer (Kirsch et al., 2022; Konstantinides et al., 2020). Imaging can be avoided in people with both a structured clinical probability score at or below the given cutoff and a D-dimer below the given cutoff value (Kahn & de Wit, 2022). Imaging is considered not medically necessary in those with a low/intermediate pretest probability based on clinical judgement and a normal D-dimer (Kirsch et al., 2022; Konstantinides et al., 2020).

CTPA is highly sensitive and specific and is the imaging method of choice for suspected PE (Ishaaya & Tapson, 2020; Kahn & de Wit, 2022; Kirsch et al., 2022; Konstantinides et al., 2020). It may also demonstrate other potential causes of the presenting symptoms. CTPA is a CT angiogram with intravenous (IV) contrast. The timing of the scan is tailored so that contrast enhances the pulmonary arterial system to identify

potential filling defects. CT with contrast is usually considered not medically necessary. According to the American College of Radiology, when IV contrast is given during CT acquisition for suspected PE, the study should be performed as a CTPA (Kirsch et al., 2022).

Planar V/Q may preferentially be used in outpatients with a low clinical probability of PE and normal CR, in young (especially female) individuals, pregnant women, and individuals with a history of contrast allergy or renal failure (Konstantinides et al., 2020). The proportion of diagnostic V/Q scans is higher in individuals with a normal CXR. A normal V/Q scan has a high negative predictive value, but there is a high proportion of non-diagnostic scans and it cannot provide alternative diagnoses (Konstantinides et al., 2020). Abnormal regional lung perfusion may suggest PE but is not specific and requires correlation with ventilation studies or other imaging. Investigators have studied single-photon emission CT (SPECT) to improve the sensitivity and specificity of V/Q scans. Kahn et al state that V/Q SPECT is a low radiation option to minimize lung and breast tissue irradiation in younger individuals (Currie & Bailey, 2023). Some authors believe that V/Q SPECT should be the preferred study in the evaluation of suspected PE (Currie & Bailey, 2023). However, large scale prospective trials are needed to validate SPECT techniques before its widespread incorporation into diagnostic algorithms (Konstantinides et al., 2020). SPECT has over 90% sensitivity and 72-98% specificity, and V/Q SPECT/CT has the highest diagnostic accuracy (Bang et al., 2024; Iftikhar et al., 2024; Squizzato et al., 2023).

A normal perfusion scan and a negative CTPA appear equally safe for ruling out PE in pregnancy (Konstantinides et al., 2020). There is debate regarding which is the first test of choice. CTPA is more expensive and exposes the pregnant woman to more radiation than the fetus; V/Q scans have low radiation and no contrast-related side effects (Tester et al., 2020).A compression duplex ultrasound of the lower extremity is considered medically necessary if there are symptoms/signs of a DVT. If a DVT is diagnosed, anticoagulation can be administered without further imaging. A CXR is considered medically necessary. An alternative diagnosis may be found, and it can inform the choice between CTPA and a V/Q scan as the next test when there is no clinical evidence of a DVT (Kirsch et al., 2022). If there is no DVT and a CXR is normal, CTPA or a perfusion scan is medically necessary. If the perfusion scan is normal, a ventilation scan may not be needed. If the CXR is abnormal, alternative causes have been considered and PE is still suspected, CTPA is considered medically necessary (Konstantinides et al., 2020).

Acute PE is treated for at least 3 months with anticoagulation. Individuals should have a follow-up visit 2 weeks to 3 months after PE. If symptoms worsen or the diagnosis is complex, follow-up may occur sooner (Rivera-Lebron et al., 2019). Whether anticoagulation is stopped after 3 months or continued indefinitely depends on whether the reduced risk of recurrent venous thromboembolism (VTE) outweighs the increased risk of bleeding (Konstantinides et al., 2020). The risk of recurrent VTE after stopping

anticoagulation is related to the risk factor category for the index PE/VTE event. There are many genetic and acquired risk factors for VTE associated with a low, intermediate or high risk of recurrence (Konstantinides et al., 2020; Mount et al., 2022).

Patency of the pulmonary arterial bed is restored in the majority of people within the first few months, and routine CTPA imaging is considered not medically necessary (Nijkeuter et al., 2006; Konstantinides et al., 2020). Konstantinides et al recommend a transthoracic echocardiogram in those with dyspnea or functional limitation at follow up. If the probability of pulmonary hypertension is felt to be high, planar V/Q is considered the first line imaging test for suspected chronic thromboembolic pulmonary hypertension (CTEPH). CTPA should not be used as a stand alone test to rule out CTEPH. The diagnosis is based upon measurements made during right heart catheterization and mismatched perfusion defects on V/Q scan more than 3 months after an acute PE (Konstantinides et al., 2020).

MRA chest with IV contrast is an appropriate initial imaging option for suspected, recurrent or residual PE, ranked alongside CTA and V/Q scanning in this clinical setting. MRA is generally considered an alternative modality in diagnosing acute PE and is useful for diagnosing central or lobar PE, though some of its limitations include decreased sensitivity in the detection of peripheral PE, and in the PIOPED III trial, MRA was technically inadequate in 25% of patients across all centers, while in technically adequate studies it identified 57% of those with PE, with a sensitivity of 78% and specificity of 99%. Separately, V/Q scanning remains the initial diagnostic test of choice in the evaluation of residual/chronic PE, supporting a sequence where MRA serves as the next-line alternative when V/Q is nondiagnostic or unavailable (Renapurkar et al., 2025).

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% (Kahn & de Wit, 2022).
- 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% (Konstantinides et al., 2020; Kahn & de Wit, 2022).
  - D-dimer can be falsely elevated with surgery, injury, malignancy, sepsis, diabetes, pregnancy, or other conditions where fibrin products are likely to be present (Kahn & de Wit, 2022).
- 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 (Ishaaya & Tapson, 2020).

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- The decision to terminate anticoagulation treatment after previous pulmonary embolism (PE) with absent or stable symptoms is based on clinical evaluation and risk factors (Kearon et al., 2016; Konstantinides et al., 2020).
- 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 (Nijkeuter et al., 2006; Robin et al., 2023).
- Half to two thirds of individuals with primary thromboembolism have residual pulmonary artery clot at 6 months and 50% remain at one year, depending on modality at follow-up (Nijkeuter et al., 2006).
- 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 (Konstantinides et al., 2020).
- 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 (American College of Obstetricians and Gynecologists, 2018; Kalaitzopoulos et al., 2022).

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 10mGy to 60mGy and 39.5mGy, respectively, with CTPA ,as compared with 0.98mGy to 1.07mGy and 5.7mGy to 13.5mGy, respectively, with V/Q scan (Tester et al., 2020).

Pulmonary Embolism Health Equity Considerations

- Black individuals and female individuals have a higher risk of pulmonary embolism.
- Underrepresented racial/ethnic groups are less likely to undergo advanced therapies for pulmonary embolism.
- Several risk factors for pulmonary embolism (e.g., hyperestrogenic state due to oral contraceptives, pregnancy, or HRT) are exclusive to female individuals.

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- Individuals with a low socioeconomic status have reduced access to high-quality imaging centers and undergo fewer advanced interventions for pulmonary embolism.

Chest Imaging Guidelines

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Pulmonary Hypertension (CH-26)

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Pulmonary Hypertension (CH-26.1)

CH.PH.0026.1.A

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

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Subclavian Steal Syndrome (CH-27)

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Subclavian Steal Syndrome – General (CH-27.0)

CH.SS.0027.0.A

v1.0.2027

- See **Subclavian Steal Syndrome (PVD-4.1)** for concerns of Subclavian Steal Syndrome in Peripheral Vascular Disease imaging guidelines.

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

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SVC Syndrome (CH-28.1)

CH.SV.0028.1.A

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- For concerns of SVC syndrome, see **Upper Extremity Venous - Imaging (PVD-4.2)** in Peripheral Vascular Disease Imaging guidelines.

Chest Imaging Guidelines

Elevated Hemidiaphragm (CH-30)

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Chest Imaging Guidelines

Elevated Hemidiaphragm (CH-30.1)

CH.EH.0030.1.A
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Criteria

- CT Chest with contrast (CPT® 71260) and/or CT Neck with contrast (CPT® 70491) for newly diagnosed diaphragmatic paralysis or elevation when:
  - 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.
- Repeat advanced imaging studies in the absence of new signs or symptoms are considered not medically necessary.

Evidence Discussion

Diaphragmatic dysfunction includes eventration, weakness and paralysis. Diagnosis is based in part on static and dynamic imaging tests (Ricoy et al., 2019; Nason et al., 2012). Unilateral diaphragmatic paralysis is often asymptomatic and suspected when an elevated hemidiaphragm is found incidentally on chest x-ray (CR). CR is a simple and effective test to evaluate the pulmonary parenchyma and the diaphragm (Ricoy et al., 2019). CR has a sensitivity of 66.6% and a specificity of 44% (Laghi et al., 2021). The positive and negative predictive value of an elevated hemidiaphragm on CR for diaphragmatic dysfunction is 33% and 93%, respectively. The presence of diaphragm elevation is not necessarily a sign of dysfunction, but its absence makes it unlikely (Ricoy et al., 2019).

Flouroscopy has traditionally been the gold standard for diagnosing diaphragmatic paralysis since it can visualize the diaphragm throughout the respiratory cycle and during forced inspiratory maneuvers (i.e., the "sniff test"). Some authors now consider US to be the imaging method of choice for the evaluation of diaphragmatic dysfunction (Ricoy et al., 2019; Windisch et al., 2016). US is non-invasive, portable, quick and does not expose the individual to ionizing radiation. Absence of thickening of the diaphragm during inspiration, absence of caudal movement during normal inspiration or paradoxical movement during the sniff maneuver confirms paralysis (Laghi et al., 2021).

A common concern is whether there is an underlying serious condition in those individuals with unilateral hemidiaphragm paralysis with no evident etiology after a history, physical exam and CR. Piehler et al (1982) concluded that such individuals are unlikely to have an underlying occult malignant or neurologic condition.[3] However, Windisch et al (2016) recommended that a one-time CT chest be done if there is clinical

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suspicion of possible malignancy with damage to the phrenic nerve (Windisch et al. 2016).

Additional imaging may be needed to rule out conditions which can cause an elevated hemidiaphragm but are not associated with respiratory muscle weakness. For example, abdominal imaging can be done for suspected hepatic abscess, ascites, or splenomegaly.

Background and Supporting Information

- The right hemidiaphragm sits about 2cm higher than the left (Patel & Bechmann, 2023).
- “Eventration” is thin membranous replacement of muscle, usually on the right, as the most common cause of elevation (Nason et al., 2012; Patel & Bechmann, 2023).
- Any injury to the phrenic nerve from neck to diaphragm can lead to paralysis (Nason et al., 2012; Patel & Bechmann, 2023).
- Common phrenic causes are traumatic or surgical injury or malignancy involving the mediastinum (Patel & Bechmann, 2023).
- Any loss of lung volume or increased abdominal pressure can lead to diaphragm elevation (Patel & Bechmann, 2023).

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Chest Imaging Guidelines

Thoracic Outlet Syndrome (TOS) (CH-31)

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Chest Imaging Guidelines

Thoracic Outlet Syndrome (CH-31.1)

CH.TO.0031.1.A

v1.0.2027

- For concerns of Thoracic Outlet Syndrome, see **Thoracic Outlet Syndrome (PVD-4.2)** in Peripheral Vascular Disease Imaging Guidelines.
- For concerns of Neurogenic Thoracic Outlet Syndrome, see **Brachial Plexus (PN-4.1)** in Peripheral Nerve and Neuromuscular Disorders (PNND) Imaging Guidelines.

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Lung Transplantation (CH-32)

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Chest Imaging Guidelines

Pre-Transplant Imaging Studies (CH-32.1)

CH.LT.0032.1.A
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Criteria

- Individuals on the waiting list or being considered for the lung transplant can undergo advanced imaging per that institution's protocol, or any of the studies listed below are considered medically necessary:
  - 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 (CPT® 71275), and/or CTA Abdomen and Pelvis (CPT® 74174) and/or CTA Aorta with bilateral lower extremity run-off (CPT® 75635) is considered medically necessary (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 (CPT® 71275) and/or CTA Abdomen and Pelvis (CPT® 74174) and/or CTA Aorta with bilateral lower extremity run-off (CPT® 75635) is considered medically necessary (after initial ABI's and/or arterial duplex) for the following individuals:
    - Initial ABI's and/or arterial duplex suggest the presence of PAD as evidenced by 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 are considered medically necessary include V/Q scan and Six Minute Walk Test.
- See **Transplant (CD-1.6)** in the Cardiac Imaging Guidelines.

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Evidence Discussion

- Computed Tomography (CT) is often performed for evaluation of individuals prior to lung transplantation. CT allows for surgical planning to delineate extent of the disease and assess for any contraindications to transplant (Kim et al., 2021). CT carries the risk of exposure to iodinated contrast and ionizing radiation.
- Evaluation of donors is commonly performed by chest radiography (Calvert & Hazelton, 2020; Kim et al., 2021). Occasionally, evaluation of donors is performed by chest CT to assess for malignancy, pneumonia, emphysema, and other diseases (Kim et al., 2024).
- Cardiac evaluation with echo and/or ischemic evaluation (image stress testing or heart catheterization) is considered medically necessary prior to lung transplantation.
- Extracorporeal Membrane Oxygenation (ECMO) has been increasingly utilized for bridging prior to lung transplantation or as an adjunct procedure post-transplant (Faccioli et al., 2021; Hoetzenecker et al., 2020). Given the risk of vascular complications (Bonicolini et al., 2019), preoperative evaluation of the vasculature is reasonable. For those that are asymptomatic without previously known peripheral artery disease (PAD), initial work up with ankle-brachial index (ABI) and/or arterial duplex is considered medically necessary (Gornik et al., 2024). For those that are symptomatic, have a history of known PAD (either from prior imaging or previous vascular intervention) or initial work up has suggested the presence of PAD, advanced imaging is considered medically necessary for further evaluation (Gornik et al., 2024).

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Post-Transplant Imaging Studies (CH-32.2)

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v1.0.2027

Criteria

- CT Chest with and without contrast (CPT® 71270), CT Chest with contrast (CPT® 71260), or CT Chest without contrast (CPT® 71250) is considered medically necessary for:
  - initial post-transplant follow-up
  - suspected complication, either surgical, medical or infectious
  - worsening PFT's
  - new finding on other imaging, including chest x-ray
- CTA chest (CPT® 71275) is considered medically necessary for suspected torsion
- See **Transplant (CD-1.6)** in the Cardiac Imaging Guidelines.

Evidence Discussion

- There are no universally accepted follow-up protocols for routine post-transplant surveillance (Kim et al., 2021). CT chest is supported for initial post-transplant follow up (DeFreitas et al., 2021; Kim et al., 2021). CT carries with it the risk of exposure to iodinated contrast and ionizing radiation (Calvert & Hazelton, 2020; Kim et al., 2024) .
- Additional follow-up is based on clinical presentation, suspected complication, or findings on other imaging (DeFreitas et al., 2021; Kim et al., 2021).

Lung Transplant Health Equity Considerations

- The majority of individuals who receive lung transplants in the United States are of White race and are male. Compared to a matched person of another gender or race, these individuals have a higher likelihood or being allocated a lung transplant.

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Lung Cancer Screening (CH-33)

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LDCT: Lung Cancer Screening (CH-33.1)

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Criteria

- Low-dose CT Chest (CPT® 71271) for lung cancer screening† in asymptomatic individuals* annually when all of the following criteria have been met:

Screening Indications	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)

† Individuals with a known diagnosis of lung cancer should be evaluated under the applicable disease-specific imaging guideline rather than under lung cancer screening criteria.See **Lung Metastases (ONC-31.1)** , **Non-Small Cell Lung Cancer – Suspected/Diagnosis (ONC-8.2)** and **Small Cell Lung Cancer – Suspected/ Diagnosis (ONC-7.1)** .

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.

*Symptoms of lung cancer (e.g., hemoptysis, unexplained cough, and/or unexplained weight loss of >15 pounds in the past year) warrant diagnostic evaluation, not screening.

**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

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COPD and its symptoms, including cough, shortness of breath would not “substantially limit life expectancy.”

***NCCN (2025) and the American Cancer Society (Wolf et al., 2024) have, however, eliminated the years-since-quit limit from their eligibility criteria. The 15-year threshold is retained here, consistent with the U.S. Preventive Services Task Force (2021) recommendation.

Lung Cancer Screening Health Equity Considerations

- Black men, individuals with lower levels of education, and individuals with lower household income levels are less likely to be eligible for screening.
- Among individuals who are eligible for lung cancer screenings, Black individuals and those with a lower socioeconomic status are screened at a lower rate and have lower adherence to screening follow-up. This could be attributed to differences in referral rates among providers.
- Barriers to lung cancer screenings include:
  - Individual-level barriers, such as limited knowledge about screening, lack of education and recommendations from providers, distrust of the medical system, and lack of transportation
  - Provider-level barriers, such as lack of knowledge about screening recommendations and lack of time for shared decision-making
  - System-level barriers, such as misconceptions about screening requirements, lack of scanners, limited resources, and low reimbursement rates

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

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Criteria

- Any Lung-RADS requiring 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
1: Negative - very low likelihood of becoming a clinically active cancer	Annual LDCT screening (CPT® 71271) in 12 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

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Lung-RADS Primary Category/ Category Descriptor	Management
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 (CPT® 71250) at 6 months, if stable or decreased in size on this CT, return to annual LDCT screening (CPT® 71271) in 12 months
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, see 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**.

*If an intervening diagnostic or screening CT Chest is performed, the date of that examination resets the 12-month interval for the next annual lung cancer screening examination.

Evidence Discussion

- Low-dose computed tomography (LDCT) Chest for lung cancer screening has been shown to have sensitivity ranging from 59% to 100%, a specificity of 26.4% to 99.7%, a negative predictive value of 97.7% to 100% and a positive predictive value from 3.3% to 43.5% (U.S. Preventive Services Task Force, 2021). The benefit of lung cancer screening is early detection and treatment. The NLST trial showed a

relative risk reduction in lung cancer mortality of 20% (U.S. Preventive Services Task Force, 2021). The radiation dose of a LDCT is typically 10% to 30% of a standard-dose CT (U.S. Preventive Services Task Force, 2021). The harms of a screening program would include false-positive results and subsequent unnecessary tests and procedures, the exposure to ionizing radiation and ensuing radiation-induced cancer, and increased anxiety and distress (U.S. Preventive Services Task Force, 2021).

- The risk of malignancy associated with a Lung CT Screening Reporting and Data System (Lung-RADS) score is as follows: a score of 2 is <1%; a score of 3 is 1%-2%; a score of 4A is 5%-15%; a score of 4B and 4X is >15% (American College of Radiology, 2022). The American College of Radiology (ACR) recommends follow up imaging of incidental pulmonary nodules detected on low dose lung cancer screening CT's based on the Lung-RADS score (American College of Radiology, 2022; Christensen et al., 2024b); however, there is limited data on the impact of screening intervals (Christensen et al., 2024b). The NLST and NELSON studies demonstrating reduction in lung cancer mortality were based on screening intervals of 1 year and 1, 3, and 5.5 years, respectively (Christensen et al., 2024b). Multiple studies have shown that the 3 month follow up recommended for Lung-RADS 4A nodules is optimal, but have raised concerns on stepwise downgrading of a stable 4A nodule to a Lung-RAD 2 (Christensen et al., 2024b). Therefore the ACR has modified follow up intervals with stepped management using the following criteria:
  - Nodules that are stable or decreased at follow-up are downgraded to the next lower Lung-RADS category (Christensen et al., 2024b).
  - Nodules that completely resolve or are proven benign after an appropriate diagnostic evaluation are reclassified based on the most concerning finding (Christensen et al., 2024b).
  - Follow-up recommendations are timed from the current examination (Christensen et al., 2024b).

For further specific details concerning Lung-RADS, see v2022 by the ACR (American College of Radiology, 2022).

References (CH-33)

v1.0.2027

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Imaging Related to Hypoglossal Nerve Stimulation (HGNS) (CH-34)

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Chest Imaging Guidelines

Imaging Related to Hypoglossal Nerve Stimulation (HGNS) (CH-34.1)

CH.AV.0024.1.A
v1.0.2027

Criteria

Pre-implantation

Imaging prior to initial implantation of a hypoglossal nerve stimulation device is not medically necessary, as it is not used to diagnose obstructive sleep apnea, plan surgery or predict surgical outcomes.

Post-implantation

- CT Chest with contrast (CPT® 71260) or without contrast (CPT® 71250) is considered medically necessary after an inconclusive chest x-ray and EITHER of the following:
  - Respiratory sensing lead damage or displacement is suspected after device interrogation confirms malfunction
  - Prior to planned surgical revision or replacement of the respiratory sensing lead
- Routine advanced imaging is not medically necessary for explantation or replacement of the HGNS implantable pulse generator only, without lead removal.

Notes

- For concerns related to chest pain, see **Non-Cardiac Chest Pain – Imaging (CH-4.1)** .
- For concerns related to pneumothorax, see **Pneumothorax/Hemothorax (CH-19.1)** .
- For concerns related to pleural effusion, see Pleural Effusion (CH-18.1).
- For concerns related to dyspnea, see **Dyspnea/Shortness of Breath (CH-5.1)** .
- For concerns related to neck pain, see Neck Mass/Swelling/Adenopathy (Neck-5.1) and Sore Throat/Throat Pain/Odynophagia (Neck-12.1).

Background and Supporting Information

A hypoglossal nerve stimulator is a surgically implanted device that delivers stimulating electrical pulses to the hypoglossal nerve. This activates the genioglossus muscle in coordination with respiratory effort to increase upper airway patency. Hypoglossal nerve stimulation is used to treat obstructive sleep apnea.

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The first U.S. Food and Drug Administration (FDA) approval for an HGNS system was granted in April 2014 for Inspire Upper Airway Stimulation (UAS) (U.S. Food and Drug Administration, 2014). Approval was expanded in 2023 to include pediatric patients with Down syndrome between 13 and 18 years of age (U.S. Food and Drug Administration, 2023).

The Inspire system includes an implanted pulse generator. A stimulation lead is connected to the generator and tunneled superiorly to the distal ipsilateral hypoglossal nerve, which is located deep to the submandibular gland and mylohyoid muscle between the hyoid and mandible. A respiratory sensing lead is connected to the generator and tunneled inferiorly between the external and internal intercostal muscles at the second or fifth intercostal space, depending on the incision technique (Inspire Medical Systems, Inc., 2024).

The Inspire V model, approved in August 2024, incorporates respiratory sensing into the neurostimulator, eliminating the need for a separate respiratory sensing lead (Inspire Medical Systems, Inc., 2025).

A second HGNS system, the Genio System 2.1, was approved by the FDA in August 2025 for adults (U.S. Food and Drug Administration, 2025a). The system includes an implanted stimulator positioned under the chin with paddle electrodes that stimulate the bilateral terminal branches of the hypoglossal nerve (U.S. Food and Drug Administration, 2025b).

A third HGNS system, the aura6000 system, was approved by the FDA for adults in March 2026 (U.S. Food and Drug Administration, 2026a). The system is similar to Inspire V but stimulates the proximal hypoglossal nerve (U.S. Food and Drug Administration, 2026b).

Evidence Discussion

There are no standardized society guidelines addressing imaging in individuals with HGNS devices. Available literature is limited to retrospective cross-sectional studies, systematic reviews, case reports, and product manuals.

Preoperative planning does not involve routine advanced imaging. The patient selection process is based on sleep study results, body mass index, physical exam, PAP therapy intolerance, and drug-induced sleep endoscopy findings (Inspire Medical Systems, Inc., 2024; Inspire Medical Systems, Inc., 2025; U.S Food and Drug Administration, 2025).

The Inspire IV and Inspire V system implant manuals recommend obtaining at least one anterior-posterior and one lateral x-ray after implantation to document the location of all system components. Both head and neck imaging and chest x-rays may be needed to capture the entire implanted system (Inspire Medical Systems, Inc., 2024, 2025). Pneumothorax occurs most commonly intraoperatively and was reported in 4% of cases

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identified in the Manufacturer and User Facility Device Experience database (Bentan & Nord, 2024).

Serious adverse effects associated with HGNS devices are uncommon. Among 20,881 HGNS implantations performed between January 1, 2018, and March 31, 2022, the explantation rate was 0.723% and the revision rate was 1.542% during the first year. Among 5,820 implantations with 3 years of follow-up, the explantation and revision rates were 2.680% and 3.557%, respectively. Infection was the most common indication for explantation during the first year. Explantations after the first year and revisions at any time during the 3-year review were most commonly associated with device migration, lead damage, or product defects (Moroco et al., 2024).

A review of the Manufacturer and User Facility Device Experience database identified 75 cases of respiratory sensing lead migration between January 1, 2000, and December 1, 2022. Among 765 reported adverse events, 151 events, or 19.7%, were related to the respiratory sensing lead. The 75 cases of sensing lead migration represented approximately half of all reported sensing lead complications. Of these cases, 63 involved separation and migration of the sensing lead tip and 12 involved migration of the entire lead. Commonly documented symptoms included pain, dyspnea, and device malfunction manifested by a diminished respiratory sensing signal (Commesso et al., 2025).

Commesso et al. (2025) proposed an evaluation pathway for suspected respiratory sensing lead migration in an implanted individual who develops a clinical change, including chest pain, shortness of breath, or altered voltage requirements. The proposed evaluation may include device testing, chest x-ray or CT Chest, and a cardiopulmonary workup that may include electrocardiography, echocardiography, laboratory testing, and multidisciplinary consultation.

Another review of the Manufacturer and User Facility Device Experience database covering July 2014 through December 2023 identified 287 device-related adverse events. Device migration accounted for 116 events, or 40.4%. Of these migration events, 95, or 82%, involved the respiratory sensing lead. All sensing lead migration events required surgical intervention, including repositioning, reinstallation, or explantation (Bentan & Nord, 2024).

Cross-sectional studies and case reports indicate that respiratory sensing lead migration may present with chest pain, dyspnea, fatigue, pleural effusion, hydropneumothorax, or recurrent obstructive sleep apnea symptoms. Device interrogation frequently demonstrates malfunction (Commesso et al., 2025; Islam et al., 2024).

Published case reports have discussed the use of chest x-ray and CT Chest before revision or explantation of a respiratory sensing lead. In two cases, separation of the sensing lead tip from the main body of the lead was discovered during surgery and was not evident on preoperative chest x-ray. CT Chest was not performed in either case

(Islam et al., 2024). Another case series described an individual in whom CT Chest helped localize an intramuscular respiratory sensing lead tract as the source of pain (Urban et al., 2023).

Simple explantation or replacement of the implantable pulse generator, without revision or replacement of the device leads, does not typically require advanced imaging according to the Inspire system implant manuals for Models 3028 and 3150 (Inspire Medical Systems, Inc., 2024, 2025).

MRI may be unsafe and should be carefully considered when the HGNS system is not intact, including when abandoned leads or lead fragments are present (Inspire Medical Systems, Inc., 2026).

Chest Imaging Guidelines

References (CH-34)

CH.AV.0024.1.A

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Chest Imaging Guidelines

Procedure Codes Associated With Chest Imaging

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CPT Code	Description
32408	Percutaneous core needle biopsy of the lung or mediastinum, including imaging guidance when performed
70486	CT maxillofacial area without contrast
70491	CT soft tissue neck with contrast
71250	CT chest without contrast, including HRCT or diagnostic low-dose CT when applicable
71260	CT chest with contrast
71270	CT chest without and with contrast
71271	Low-dose CT chest for annual lung cancer screening
71275	CTA chest
71550	MRI chest without contrast
71552	MRI chest without and with contrast
71555	MRA chest without and with contrast
72160	CT thoracic spine with contrast
74160	CT abdomen with contrast
74174	CTA abdomen and pelvis without and with contrast

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CPT Code	Description
74176	CT abdomen and pelvis without contrast
74177	CT abdomen and pelvis with contrast
75635	CTA abdominal aorta and bilateral iliofemoral lower-extremity runoff
76376	3-D rendering with interpretation and reporting, not requiring postprocessing on an independent workstation
76377	3-D rendering with interpretation and reporting, requiring postprocessing on an independent workstation
76380	Limited or localized CT study; used in this guideline for limited CT sinus without contrast
76497	Unlisted CT procedure
76536	Ultrasound of soft tissues of the head and neck
76604	Ultrasound of the chest, including mediastinum and chest wall
76641	Breast ultrasound, unilateral, complete
76642	Breast ultrasound, unilateral, limited
76882	Limited nonvascular extremity ultrasound; used in this guideline for axillary ultrasound
76942	Ultrasound guidance for needle placement, with imaging supervision and interpretation
78306	Bone imaging, whole body
78580	Pulmonary perfusion imaging
78582	Pulmonary ventilation and perfusion imaging

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CPT Code	Description
78597	Quantitative differential pulmonary perfusion, including imaging when performed
78598	Quantitative differential pulmonary perfusion and ventilation, including imaging when performed
78815	PET with concurrently acquired CT, skull base to mid-thigh
78830	SPECT with concurrently acquired CT for attenuation correction and anatomic localization, one area
93970	Duplex scan of extremity veins, complete bilateral study
93971	Duplex scan of extremity veins, unilateral or limited study

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