Thoracic Imaging

This exam content assesses the candidate's knowledge and skills related to the clinical practice of thoracic imaging. The domain encompasses mostly CT and radiography. Some mediastinal MR may be included.

Included in this document:

Domain Critical Concepts

1. Demonstrate knowledge of diffuse lung disease diagnostic approaches (based on demographic, pattern, location) on CT and CXR
2. Diagnose lung cancer and understand findings that may impact staging
3. Distinguish between mediastinal masses based on location and imaging properties
4. Recognize important findings on radiographs, including misplaced catheters and potential complications of catheters, lobar collapse, pneumonia and pleural conditions requiring intervention
5. Recognize acute PE and other pulmonary emboli

Domain Blueprint

1. Anatomy, normal variants: 5%-10%
    a. Lobar
    b. Segmental
    c. Azygous lobe
    d. Bronchi
    e. Mediastinum
2. Pneumonia: 5%-10%
    a. Immunocompetent
    b. Immunocompromised
    c. TB
    d. Fungal
    e. Viral
    f. Septic Emboli
3. Bronchogenic Cancer: 5%-10%
    a. Staging
    b. Treatment
    c. SPN
    d. Screening
    e. Perception
    f. Diagnostic approach

    g. Persistent consolidation
4. Other tumors: up to 5%
    a. Metastases
    b. Carcinoid
    c. Lymphoma
    d. Hamartoma
5. Lines, tubes, devices and cardiovascular radiography: up to 5%
    a. Central lines
    b. ETT
    c. Chest tubes
    d. NG tubes
    e. PA line
    f. Pneumoperitoneum
    g. Cardiac devices
    h. Cardiovascular conditions on radiography including pericardial effusions and valvular disease
6. Trauma: 5%-10%
    a. Pneumothorax
    b. Pneumomediastinum
    c. Bronchial injury
    d. Hemothorax
    e. Diaphragmatic injury
    f. Flail chest
    g. Fractures
    h. Aorta
7. Congenital lung/mediastinal disease: up to 5%
    a. Cysts
    b. Atresia
    c. AVM
    d. PAPVR
    e. Persistent left SVC
    f. Swyer-James
    g. Poland
    h. Sequestration
    i. Congenital cystic adenomatoid malformations
8. Interstitial lung disease: 5%-10%
    a. Cystic lung disease
    b. Pneumoconioses
    c. Fibrosis
    d. CHF
    e. Drug toxicity
    f. Lymphangioleiomyomatosis
    g. Sarcoid
9. Alveolar lung disease/inflammatory: up to 5%

    a. Pulmonary alveolar proteinosis
    b. Lipoid pneumonia
    c. Cyptogenic organizing pneumonia
    d. PIE
    e. HP
10. Central airways/bronchiectasis: up to 5%
    a. Tracheal tumors
    b. Cystic fibrosis
    c. Stenosis
    d. Immotile cilia
    e. Malacia
    f. Small airways disease
    g. MAI/MAC
    h. Bronchiolithiasis
    i. ABPA
    j. Aspiration pneumonia
11. Pulmonary manifestations of systemic disease: up to 5%
    a. Rheumatoid arthritis
    b. Collagen vascular disease
    c. Pulmonary/renal syndromes
    d. Hepatopulmonary syndrome
    e. Vasculitis
12. Pleura, diaphragm and chest wall: up to 5%
    a. Mesothelioma
    b. Metastases
    c. Empyema
    d. Pneumothorax
    e. Lipoma
    f. Fibrous tumors of the pleura
    g. Plaque
    h. Effusion
    i. Opacification
    j. Hernia
    k. Paralysis
    l. Neurofibromatosis
    m. Chest wall tumors
13. Mediastinal masses: up to 5%
    a. Superior
    b. Anterior
    c. Middle
    d. Posterior
    e. Fibrosing mediastinitis
    f. Esophageal lesion (achalasia)
    g. Vascular

h. Varices

14. Atelectasis and Collapse: up to 5%
    a. Lobar collapse
    b. Round atelectasis
    c. Golden S sign
    d. Whole lung collapse
15. Pulmonary arteries: up to 5%
    a. Acute PE
    b. Chronic PE
    c. Pulmonary infarct
    d. PE mimics
    e. Vasculitis
    f. Pulmonary pseudoaneurysm

Domain Overview

1. Basics of Imaging, including Chest Radiography (CXR), CT and MRI, Ultrasound (US), and Percutaneous Intervention
    1. Indications and limitations of the modalities
2. Normal Anatomy, including Variants, Encountered on CXR, CT, MRI and US
    1. Lungs, including tracheobronchial and pulmonary lobar anatomy, and fissures
    2. Mediastinal and thoracic inlet anatomy
    3. Chest wall anatomy
3. Physiology Relevant to Thoracic Imaging, including Pulmonary Function Tests, Restrictive and Obstructive Patterns
4. Definition, Identification, and Significance of Signs and Finding Nomenclature in Thoracic Radiology. Knowledge should include diseases for which these signs are classic, potential alternative diagnoses, or pitfalls [Hansell et al. Fleischner Society: Glossary of Terms for Thoracic Imaging. Radiology 2008;246:697-722]
    1. Air bronchogram
    2. Air crescent sign
    3. Deep sulcus sign on a supine radiograph
    4. Continuous diaphragm sign
    5. Ring around the artery sign
    6. Fallen lung sign
    7. Flat waist sign
    8. Gloved finger sign
    9. Golden S sign
    10. Luftsichel sign
    11. Hampton hump
    12. Silhouette sign
    13. Cervicothoracic sign, tapered margins sign
    14. Figure 3 sign
    15. Fat pad sign or sandwich sign
    16. Scimitar

17. Hilum overlay sign and hilum convergence sign
18. Beaded septum sign
19. Tree-in-bud
20. Centrilobular nodules
21. Perilymphatic nodules
22. Random or miliary nodules
23. Crazy paving
24. Ground glass halo
25. Mosaic attenuation
26. Consolidation
27. Ground glass opacity
28. Honeycombing
29. Interlobular and intralobular septal thickening and reticulation
30. Juxtaphrenic peak
31. Secondary pulmonary lobule
32. Mass and nodule
33. Parenchymal and subpleural bands
34. Pleural plaques or pseudoplagues
35. Reverse halo sign
36. Signet ring sign (also known as pearl ring sign)
37. Split pleura sign
38. Headcheese sign
39. Thoracoabdominal sign
40. Westermark sign
41. CT angiogram sign
42. Bulging fissure sign
43. Fleischner sign
44. Comet tail sign
45. Thymic sail sign
46. Split pleura sign
47. Positive bronchus sign
48. Double density sign
49. Unilateral hyperlucent lung/hemithorax
50. Opaque hemithorax with contralateral versus ipsilateral mediastinal shift

5. Infectious Pneumonia - CXR and CT Findings
    1. Mycobacterial and fungal
    2. Viral
    3. Community- and hospital-acquired bacterial pneumonia
    4. Pneumonia in the immunocompromised, including patients:
        1. with HIV/AIDS
        2. with post-transplantation status
        3. on chemotherapy, receiving corticosteroids, or with immune conditions
        4. Septic emboli
6. Lung Cancer and other Parenchymal Neoplasms

1. Solitary pulmonary nodule (SPN)
    1. Approach to diagnosis (contrast-enhancement, imaging features)
    2. Management (PET, biopsy, follow-up/comparison)
    3. Perception and errors in perception
2. Screening for lung cancer – current status
3. Chronic alveolar disease as a manifestation of neoplasm
4. Lung cancer staging
5. Manifestations of small cell and non-small cell carcinoma, and bronchoalveolar cell carcinoma, including common locations for metastases
6. Other tumors
    1. Metastases
    2. Carcinoid
    3. Hamartoma
    4. Lymphoma
    5. Chondrosarcoma

7. The Intensive Care Unit CXR - The Expected Location of the Support Devices and the Ability to Recognize Misplaced Lines and Complications (Pneumothorax, Hemothorax, Hematoma, Pneumoperitoneum)
    1. Central lines (including wrong vein and intra-arterial)
    2. Esophageal tubes/probes (including esophageal, nasogastric, and feeding tubes, endobronchial or intrapleural misplacement
    3. Endotracheal and tracheostomy tubes
    4. Pulmonary artery (Swan-Ganz) catheters (including peripheral placement and pseudoaneurysm formation)
    5. Chest tubes (including intraparenchymal and intrafissural placement)
    6. Assist devices
8. Trauma, including Blunt and Penetrating Trauma
    1. Acute traumatic aortic injury
    2. Esophageal injury
    3. Tracheobronchial injury
    4. Lung injuries (contusion, shear injury, aspiration, laceration)
    5. Diaphragm injury, both acute and delayed presentations
    6. Tension hemopneumothorax, pneumothorax, pneumomediastinum
    7. Flail chest, skeletal fractures, and dislocations
    8. Fat emboli
9. Congenital Lung and Mediastinal Disease Manifesting in the Adult
    1. Foregut duplication cysts, including bronchogenic cysts and esophageal duplication cysts
    2. Bronchial atresia
    3. Arteriovenous malformations
    4. Partial anomalous pulmonary venous return
    5. Left superior vena cava (SVC) and duplicated SVC
    6. Swyer-James syndrome (unilateral bronchiolitis obliterans)
    7. Poland syndrome
    8. Sequestration (intralobar and extralobar)

9. Congenital cystic adenomatoid malformation
10. Aortic arch anomalies

10. Diffuse Lung Disease
    1. Cystic disease
        1. Langerhans cell histiocytosis
        2. Lymphangioleiomyomatosis
        3. Tracheobronchial papillomatosis
        4. Lymphocytic interstitial pneumonia
        5. Cystic metastases
        6. Chronic pneumocystis
    2. Pneumoconioses
        1. Silicosis/coal workers pneumoconiosis
        2. Asbestosis
        3. Berylliosis
    3. Idiopathic /fibrotic
        1. Usual interstitial pneumonia (UIP)
        2. Nonspecific interstitial pneumonia (NSIP)
        3. Desquamative interstitial pneumonia (DIP)
        4. Acute interstitial pneumonia (AIP)
    4. Pulmonary edema
        1. Cardiogenic
        2. Noncardiogenic
    5. Drug toxicity, including chemotherapy agents such as bleomycin and medications such as Amiodarone
    6. Sarcoidosis, including CXR staging
    7. Lymphangitic carcinomatosis
    8. Differential diagnoses for chronic upper lobe predominant disease and chronic lower lobe predominant disease
11. Diffuse Alveolar Disease and Inflammatory Conditions
    1. Pulmonary alveolar proteinosis
    2. Lipoid pneumonia
    3. Organizing pneumonia, including cryptogenic
    4. Eosinophilic pneumonia
    5. Hypersensitivity pneumonia/extrinsic allergic alveolitis
    6. Differential diagnosis of peripheral alveolar opacities
12. Central Airways Diseases, Bronchiectasis, and Obstructive Lung Disease
    1. Tracheal/bronchial tumors or masses
        1. Squamous cell cancer and papillomas
        2. Adenocarcinoma
        3. Mucoepidermoid
        4. Adenoid cystic carcinoma
        5. Carcinoid
        6. Metastases
    2. Cystic fibrosis

3. Tracheal stenosis
    1. Inhalation and iatrogenic (such as tracheostomy or endotracheal tube)
    2. Granulomatous disease (Sarcoid, Wegener, tuberculosis)
    3. Amyloidosis
    4. Conditions that spare the posterior membrane (relapsing polychondritis; tracheopathia osteochondroplastica)
4. Tracheobronchomalacia
5. Bronchiectasis, including upper versus lower lobe predominant bronchiectasis
    1. Immotile cilia syndrome (Kartagener)
    2. Recurrent aspiration
    3. Tracheobronchomegaly (Mounier-Kuhn)
    4. Tuberculosis
6. Small airway disease
    1. Asthma
    2. Bronchiolitis obliterans
    3. Graft-versus-host disease
7. Small airway infection, including Mycobacterium avium-intracellulare (MAI)
8. Broncholithiasis
9. Allergic bronchopulmonary aspergillosis (ABPA)
10. Aspiration and foreign bodies
11. Emphysema, including centrilobular, paraseptal, panacinar, and paracicatricial
12. Giant bulla

13. Thoracic Manifestations of Systemic Disease
    1. Rheumatoid arthritis
    2. Scleroderma and mixed connective tissue disease
    3. Systemic lupus erythematosus
    4. Hepatopulmonary syndrome
    5. Vasculitis (Wegener, Goodpasture)
    6. Tuberous sclerosis
    7. Neurofibromatosis
    8. Sickle cell disease
    9. Polymyositis/dermatomyositis
    10. Sjögren syndrome
    11. Metastatic pulmonary calcification
14. Diseases of the Pleura, Chest Wall, and Diaphragm
    1. Mesothelioma
    2. Pleural metastases
    3. Fibrous tumor of the pleura
    4. Lipoma
    5. Empyema
    6. Chylothorax
    7. Pleural plaques, including asbestos exposure, hemothorax, prior infection
    8. Unilateral pleural calcification
    9. Pleural effusions, including differential diagnosis for unilateral and bilateral effusions

10. Diaphragmatic hernias, including post-traumatic, Bochdalek, Morgagni, sliding hiatal
11. Disorders of diaphragm motion, including role of sniff test
12. Neurofibromatosis
13. Chest wall tumors, including metastases, sarcomas, and desmoid tumors

15. Mediastinal Masses (Including Cardiac and Vascular-related Masses)
    1. Anterior mediastinum
        1. Thymic origin, including thymoma, carcinoma, carcinoid, and cyst
        2. Germ cell tumors, including seminoma and teratoma
        3. Lymphoma
        4. Goiter
    2. Middle mediastinum
        1. Duplication cysts
        2. Lymph node enlargement
        3. Esophageal origin, including cancer, diverticulum, achalasia, varices
        4. Airway masses
        5. Vascular masses
    3. Posterior mediastinum
        1. Nerve sheath tumors (neurofibromas, schwannomas)
        2. Paragangliomas (ganglioneuroma and ganglioneuroblastoma)
        3. Spine and paraspinal processes, including extramedullary hematopoiesis, metastases, diskitis
    4. Superior mediastinal / thoracic inlet masses
        1. Goiter
        2. Lymphangioma
    5. Differential diagnoses of mediastinal masses based on location and CT attenuation (fat, fluid, calcified, enhancing)/MRI signal characteristics
    6. Vascular masses (aneurysms and pseudoaneurysms)
    7. Diffuse mediastinal disease
        1. Mediastinitis
        2. Fibrosing mediastinitis
    8. Differential diagnosis for egg-shell calcifications
    9. Mediastinal lymph node enlargement
16. Atelectasis and Collapse, including CXR/CT Findings and Differential Diagnosis
    1. Lobar collapse (right upper, middle, right lower, left upper, lingual, left lower, and combined right middle/lower)
    2. Unilateral lung collapse
    3. Collapse from an obstructing mass
    4. Round atelectasis
17. Pulmonary Arteries
    1. Acute pulmonary embolism
    2. Chronic pulmonary embolism
    3. Pulmonary infarct
    4. Pulmonary embolism mimics, including pulmonary artery sarcoma
    5. Pseudoaneurysm

6. Vasculitis (Takayasu)

18. Postoperative and Post-treatment Thorax
    1. Lung resection, including post-lobectomy, post-wedge resection, pneumonectomy, and post-pneumonectomy syndrome
    2. Lobar torsion
    3. Radiation fibrosis and pneumonitis
    4. Post lung transplantation, including acute, subacute, and chronic complications, single and bilateral transplantation
    5. Post-esophagectomy
    6. Post-lung volume reduction surgery
    7. Airway and esophageal stents
    8. Eloesser flap
19. Percutaneous Thoracic Interventions
    1. Aspiration, biopsy and drainage
    2. Clinical indications and contraindications
    3. Techniques
    4. Accuracy
    5. Complications
    6. Post-procedure care