CHEST RADIOLOGY: Goals and Objectives

ROTATION 1 (Radiology Years 1):

Resident responsibilities:

- ED chest CTs
- Inpatient and outpatient plain films including the portable intensive care unit radiographs
- Consultations with referring clinicians

MEDICAL KNOWLEDGE:

- Residents must demonstrate knowledge about established and evolving biomedical, clinical, and cognitive sciences and the application of this knowledge to patient care.

At the end of the rotation, the resident should be able to:

- Identify normal radiographic and CT anatomy of the chest
- Identify and describe common variants of normal, including aging changes.
- Demonstrate a basic knowledge of radiographic interpretation of atelectasis, pulmonary infection, congestive heart failure, pleural effusion and common neoplastic diseases of the chest
- Identify the common radiologic manifestation of thoracic trauma, including widened mediastinum, signs of aortic laceration, pulmonary contusion/laceration, esophageal and diaphragmatic rupture.
- Know the expected postoperative appearance in patients s/p thoracic surgery and the expected location of the life support and monitoring devices on chest radiographs of critically ill patients (intensive care radiology); be able to recognize malpositioned devices.
- Identify cardiac enlargement and know the radiographic appearance of the dilated right vs. left atria and right vs. left ventricles, and pulmonary vascular congestion
- Recognize common life-threatening cardiovascular pathologies, such as pulmonary emboli, aortic dissection and aneurysm, pericardial effusion with tamponade.

PRACTICE -BASED LEARNING AND IMPROVEMENT

Residents must be able to investigate and evaluate their patient care practices, appraise and assimilate scientific evidence, and improve their patient care practices.

Residents are expected to:

- Apply knowledge of study designs and statistical methods to the appraisal of clinical
studies and other information on the diagnostic effectiveness of thoracic imaging and its role in clinical care of the patient

- Use information technology to manage information, access on-line medical information; and support their own education
- Facilitate the learning of students and other health care professionals
- Locate, appraise and assimilate evidence from scientific studies about thoracic imaging
- Recognize limitations in personal knowledge and skills, being careful to not make decisions beyond the level of personal competence

SYTEMS-BASED PRACTICE

Residents must demonstrate an awareness of and responsiveness to the larger context and system of health care and the ability to effectively call on system resources to provide all that is of optimal value.

Residents are expected to:

- Understand how their professional practice affects other health care professionals, the health care organization and the larger society, and how these elements affect their own practice
- Assist referring clinicians in providing cost effective healthcare
- Practice cost-effective health care and resource allocation that does not compromise quality of care
- Recognize when the submitted study does not answer the posed clinical question

PATIENT CARE

Residents must be able to provide age appropriate patient care that is compassionate, appropriate and effective for the diagnosis and treatment of health problems.

Residents are expected to:

- Communicate effectively and demonstrate caring and respectful behaviors when interacting with patients and their families
- Gather essential and accurate medical and radiological history pertinent to the procedure for which the patient is scheduled
- Make informed decision about diagnostic and therapeutic interventions based on patient information, up-to-date scientific evidence and clinical judgment
- Work with healthcare professionals, including those from other disciplines to provide patient-focused case
- Dictate examinations accurately after review by the attending radiologist

INTERPERSONAL AND COMMUNICATION SKILLS

Residents must be able to demonstrate interpersonal and communication skills that result in effective information exchange with technologists, referring physicians and other medical personnel.
Residents are expected to:

- Work professionally and effectively with the technologist
- Determine when to request that a repeat examination is needed because of technical inadequacy
- Communicate findings effectively with the referring clinicians
- Communicate and document the communication of critical findings with the appropriate medical personnel in a timely fashion
- Preliminary review plain films and discuss findings with the radiologist, then dictate as directed
- Suggest the appropriate study to answer clinical question after consultation with attending radiologist

PROFESSIONALISM

Residents must demonstrate a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse patient and professional population.

Residents are expected to:

- Demonstrate respect, compassion and integrity
- A commitment to excellence and on-going professional development
- Demonstrate a commitment to ethical principles pertaining to provision or withholding of clinical care, confidentiality of patient information and business practices
- Demonstrate sensitivity and responsiveness to patient’s culture, age, gender and disabilities

ROTATION 2 (Radiology Year 2)

Inpatient chest CT scans and overflow outpatient CTs as needed; inpatient and outpatient chest radiographs
Chest CT protocols, consultations with clinicians
Performing thoracic percutaneous needle biopsies with attending supervision

MEDICAL KNOWLEDGE

Residents must demonstrate knowledge about established and evolving biomedical, clinical, and cognate sciences and the application of this knowledge to patient care.

At the end of the rotation, the resident should be able to:

- Discuss the common radiographic and CT patterns of interstitial lung diseases
- List the five broad categories of alveolar diseases of the lung
- Discuss atelectasis, common diseases of the airway, and obstructive lung diseases
- Discuss congestive heart failure and give the differential diagnosis of cardiogenic vs. non-cardiogenic edema
- Recognize and localize mediastinal masses and give a differential according to their location in the mediastinal compartments
• Recognize a solitary pulmonary nodule and know the common differential and the workup
• Recognize multiple pulmonary nodules and know the differential
• Know the radiographic appearance, work up, and staging of the common thoracic neoplasms, such as primary lung carcinoma, carcinoid, mesothelioma, thymoma, esophageal carcinoma, lymphoma, and metastases.
• Recognize enlarged pulmonary arteries on a chest radiograph, distinguish them from adenopathy, and give a differential diagnosis of pulmonary arterial hypertension
• Know the normal anatomic variants of the thoracic aorta and discuss the differences in appearance and prognosis of the mirror image vs. non-mirror image right aortic arch.
• Recognize the CT appearance of common aortic diseases, dissection (DeBakey and Stanford classifications), and implications for classification on medical versus surgical management, aneurysm, intramural hematoma, penetrating ulcer, coarctation with associated cardiac anomalies, and arteritis
• Describe the coronary anatomy on cardiac CT and know the significance of coronary calcifications
• Know the common acute and chronic complications of myocardial ischemia and infarction and define the common types of cardiomyopathy
• State the most common benign and malignant cardiac tumors and distinguish them from a thrombus on chest CT
• Recognize the appearance of valvular stenosis and regurgitation on chest X-ray and CT
• Describe and identify the radiographic and CT signs of pericardial effusion and constrictive pericarditis; recognize pericardial hematoma, pneumopericardium, congenital absence of the pericardium
• Know the common appearance of congenital heart disease in the adult, including increased and decreased pulmonary vascularity, shunt vascularity, the appearance of Eisenmenger physiology, atrial and ventricular septal defects, partial anomalous pulmonary venous return, coarctation of the aorta, persistent left superior vena cava, and cardiac malposition, including abnormal situs

PRACTICE-BASED LEARNING AND IMPROVEMENT

Residents must be able to investigate and evaluate their patient care practices, appraise and assimilate scientific evidence, and improve their patient care practices.

Residents are expected to:

• Apply knowledge of study designs and statistical methods to the appraisal of clinical studies and other information on the diagnostic effectiveness of thoracic imaging and its role in clinical care of the patient
• Use information technology to manage information, access on-line medical information; and support their own education
• Facilitate the learning of students and other health care professionals
  Locate, appraise and assimilate evidence from scientific studies about thoracic imaging
• Recognize limitations in personal knowledge and skills, being careful to not make decisions beyond the level of personal competence
SYSTEMS BASED PRACTICE

Residents must demonstrate an awareness of and responsiveness to the larger context and system of health care and the ability to effectively call on system resources to provide all that is of optimal value.

Residents are expected to:

• Understand how their professional practice affects other health care professionals, the health care organization and the larger society, and how these elements affect their own practice
• Assist referring clinicians in providing cost effective healthcare
• Practice cost effective health care and resource allocation that does not compromise quality of care
• Recognize when the submitted study does not answer the posed clinical question

PATIENT CARE

Residents must be able to provide age appropriate patient care that is compassionate, appropriate and effective for the diagnosis and treatment of health problems.

Residents are expected to:

• Communicate effectively and demonstrate caring and respectful behaviors when interacting with patients and their families
• Gather essential and accurate medical and radiologic history pertinent to the procedure for which the patient is scheduled
• Make informed decisions about diagnostic and therapeutic interventions based on patient information, up-to-date scientific evidence and clinical judgment
• Work with health care professionals, including those from other disciplines to provide patient focused care
• Dictate examinations accurately after review by the attending radiologist

INTERPERSONAL AND COMMUNICATION SKILLS

Residents must be able to demonstrate interpersonal and communication skills that result in effective information exchange with technologists, referring physicians and other medical personnel.

Residents are expected to:

• Work professionally and effectively with the technologists
• Determine which cases are appropriate for repeat radiographic follow-up and which are appropriate for CT or MR examination
• Communicate findings effectively with the referring clinicians
• Communicate and document the communication of critical findings with the appropriate medical personnel in a timely fashion
• Preliminary review plain films and discuss findings with the radiologist, then dictate as directed
• Suggest the appropriate study to answer clinical questions after consultation with
PROFESSIONALISM

Residents must demonstrate a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse patient and professional population.

Residents are expected to:

- Demonstrate respect, compassion and integrity
- A commitment to excellence and on-going professional development
- Demonstrate a commitment to ethical principles pertaining to provision or withholding of clinical care, confidentiality of patient information, and business practices
- Demonstrate sensitivity and responsiveness to patients' culture, age, gender and disabilities
- Recognize limitations in personal knowledge and skills, being careful to not make decisions beyond the level of personal competence

Rotation 3 (Radiology Year 3)

Inpatient chest CT scans and overflow outpatient CTs as needed; inpatient and outpatient chest radiographs
Chest CT protocols, consultations with clinicians on chest CTs
Performing chest biopsies with attending supervision

MEDICAL KNOWLEDGE

Residents must demonstrate knowledge about established and evolving biomedical, clinical, and cognate sciences and the application of this knowledge to patient care.

At the end of the rotation, the resident should be able to:

- Name and describe characteristics of chest disease that are seen infrequently in routine work but have distinctive radiographic and/or clinicopathological signs.
- Correlate pathological and clinical data with radiographic findings on the chest film.
- State the clinical indications and correctly protocol HRCT examinations, obtaining inspiratory, expiratory, and prone images when indicated
- Discuss pulmonary differential diagnosis of ground glass attenuation (focal, multifocal and diffuse), consolidation (focal, multifocal and diffuse), and chronic reticularity, including the responses of these patterns in specific disease to the standard treatment of these entities
- Discuss the CT appearances of Stage IA, IB, IIA, IIB, IIIA, IIB and IV lung cancer including the contemporary controversy concerning CT screening
- Discuss the CT patterns of pulmonary infections in the immunocompromised host
- Know the appearance and complications of cardiac and pulmonary transplantation
- Describe a chest CT protocol optimized for evaluation of aorta and great vessels, suspected pulmonary embolism, and the tracheobronchial tree
• Define the role of ventilation-perfusion scintigraphy, chest CT, chest MRT/MRA and lower extremity venous studies in the evaluation of a patient with suspected venous thromboembolic disease, including the advantages and limitations of each modality
• State the advantages and disadvantages of echocardiography and MRI for evaluation of valvular heart disease
• Define the role of angiography, echocardiography, stress perfusion scintigraphy, chest CT, and chest MRI in the evaluation of a patient with suspected ischemic heart disease, including the advantages and limitations of each modality
• State the advantages and disadvantages of echocardiography, CT, and MRI for evaluation of cardiomyopathy and cardiac tumors
• State the advantages and disadvantages of CT, MR7/MRA and transesophageal echocardiography in the evaluation of the thoracic aorta
• Know the appearance of pericardial constriction vs. restrictive cardiomyopathy on MRI
• Define the role of angiography, echocardiography, chest CT, and chest MRI in the evaluation of an adult patient with congenital heart disease, including the advantages and limitations of each modality depending on patient presentation

PRACTICE-BASED LEARNING AND IMPROVEMENT
Residents must be able to investigate and evaluate their patient care practices, appraise and assimilate scientific evidence, and improve their patient care practices.

Residents are expected to:

• Apply knowledge of study designs and statistical methods to the appraisal of clinical studies and other information on the diagnostic effectiveness of thoracic imaging and its role in clinical care of the patient
• Use information technology to manage information, access on-line medical information; and support their own education
• Facilitate the learning of students and other health care professionals
• Locate, appraise and assimilate evidence from scientific studies about thoracic imaging
• Recognize limitations in personal knowledge and skills, being careful to not make decisions beyond the level of personal competence

SYSTEMS BASED PRACTICE
Residents must demonstrate an awareness of and responsiveness to the larger context and system of health care and the ability to effectively call on system resources to provide all that is of optimal value.

Residents are expected to:

• Understand how their professional practice affects other health care professionals, the health care organization and the larger society, and how these elements affect their own practice
• Assist referring clinicians in providing cost effective healthcare
• Practice cost effective health care and resource allocation that does not compromise quality of care
• Recognize when the submitted study does not answer the posed clinical question

PATIENT CARE

Residents must be able to provide age appropriate patient care that is compassionate, appropriate and effective for the diagnosis and treatment of health problems.

Residents are expected to:

• Communicate effectively and demonstrate caring and respectful behaviors when interacting with patients and their families
• Gather essential and accurate medical and radiologic history pertinent to the procedure for which the patient is scheduled
• Make informed decisions about diagnostic and therapeutic interventions based on patient information, up-to-date scientific evidence and clinical judgment
• Work with healthcare professionals, including those from other disciplines to provide patient focused care
• Show competency in percutaneous needle biopsy of chest lesions
• Dictate examinations accurately after review by the attending radiologist

INTERPERSONAL COMMUNICATION SKILLS

Residents must be able to demonstrate interpersonal and communication skills that result in effective information exchange with technologists, referring physicians and other medical personnel. Residents are expected to

• Provide appropriate CT protocols for parenchymal lung diseases, metastatic neoplasm, aortic dissection and pulmonary embolism
• Communicate findings effectively with the referring clinicians
• Communicate and document the communication of critical findings with the appropriate medical personnel in a timely fashion
• Preliminary review CT's and discuss findings with the radiologist, then dictate as directed
• Suggest the appropriate study to answer clinical questions after consultation with attending radiologist
• Consult with referring clinicians regarding the performance of CT guided, percutaneous, thoracic biopsy procedures
• Discuss appropriately with surgeons issues of chest CT imaging concerning placement and functioning of chest tubes

PROFESSIONALISM

Residents must demonstrate a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse patient and professional population. Residents are expected to

• Demonstrate respect, compassion and integrity
• A commitment to excellence and on-going professional development
• Demonstrate a commitment to ethical principles pertaining to provision or withholding of clinical care, confidentiality of patient information, and business practices
• Demonstrate sensitivity and responsiveness to patients’ culture, age, gender and disabilities
• Recognize limitations in personal knowledge and skills, being careful to not make decisions beyond the level of personal competence

Required reading:
Rotation II: Chest Radiology - Plain Film Patterns and Differential Diagnoses by James Reed; C.V. Mosby; 5th edition (2003)
Thoracic Radiology: the Requisites; Mosby 1998
Cardiac Imaging: the Requisites; Mosby, second edition, 2004
Required reading:
High-Resolution CT of the Lung; Lippincott Williams & Wilkins; 3rd edition (2001)
Chest Radiology - Plain Film Patterns and Differential Diagnoses by James Reed; C.V. Mosby; 5th edition (2003)
Thoracic Radiology: the Requisites; Mosby 1998
Cardiac Imaging: the Requisites; Mosby, second edition, 2004

Didactic lecture series: over the 2 year period (* to be given in the beginning of each academic year)

• Basics
  - Radiographic and cross-sectional anatomy, normal variants, lobar pneumonia, pleural effusions, pneumothorax and hydropneumothorax, atelectasis, pulmonary edema

• Airspace diseases
  - Pulmonary edema, infection, non-infectious inflammatory processes (interstitial pneumonia, hypersensitivity pneumonitis, sarcoidosis), neoplasm (diffuse bronchioloalveolar Ca, leukemia), pulmonary hemorrhage, alveolar proteinoses

• Thoracic infections
  - Including tuberculosis and infections of the immunocompromised host

• Intensive Care Radiology

• Thoracic trauma

• Signs in chest radiology (case conference)
- air bronchogram, air crescent sign, deep sulcus sign, continuous diaphragm sign, fallen lung sign, flat waist sign, gloved finger sign, Golden S sign, luftsichel, Hampton's hump, silhouette sign, tapered margins sign (a lesion in the chest wall), figure 3 sign, Oreo cookie sign, hilum overlay sign, CT angiogram sign, halo sign, and split pleura sign

- Diseases of the pleura and the pericardium
- Congestive heart failure and valvular heart disease
- Atelectasis and airways diseases, including bronchiectasis, bronchitis, bronchiolitis, and emphysema
- Differential diagnosis of mediastinal masses
- Solitary pulmonary nodule; workup and differential diagnosis
- Hyperlucent lung and congenital lung disease (case conference)
- Pulmonary hypertension, primary and secondary (including pulmonary emboli, PPH, PVOD, pulmonary capillary hemangiomatosis
- Diseases of the aorta and the great vessels
- Interstitial diseases of the lung I
- The four patterns of ILD as seen on HRCT (random, perilymphatic, centrilobular ground glass, centrilobular "tree-in-bud")
- Interstitial diseases of the lung II
- Cystic diseases of the lung, upper lobe predominant diseases (CASSETT)
- Sarcoidosis
- Immunologic diseases of the lung (including collagen vascular diseases, hypersensitivity pneumonitis, vasculitis
- Drug toxicity and complication of lung/heart transplantation
- Lung carcinoma including screening
- Other thoracic neoplasms
- AIDS and other forms of immunocompromise
• Idiopathic interstitial pneumonias (“the alphabet song”)

• Diseases of the esophagus and the diaphragm (including trauma)

• Multiple pulmonary nodules

• Pneumoconioses

• Congenital heart diseases – cardiomyopathy

• Myocardial diseases
  
  o cardiomyopathy (dilated, hypertrophic, restrictive), right ventricular dysplasia, cardiac masses (inc. benign and malignant neoplasms)

• CT and MRI of the coronary arteries and ischemic heart disease