

Rotation: **Diagnostic and Nuclear Imaging**

Duration of Rotation (hours): Longitudinal

Contact Person: Chris Bernheisel, Kathleen Downey

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Faculty oversight: Bernheisel, Downey, and various faculty

RRC Requirements:

ACGME requirements (2007): pg. 33-34. IV.A.5b).(11)-(11).a

Diagnostic Imaging and Nuclear Medicine:

The program must provide the residents with a structured opportunity to learn the appropriate application of techniques and specialty consultations in the diagnostic imaging and nuclear medicine therapy of organs and body systems. Instruction should include the limitations and risks attendant to these techniques. The format of the instruction should be adapted to the resources available, but must include radiographic film/diagnostic imaging interpretation and nuclear medicine therapy pertinent to family medicine.

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Content Areas Covered

1. Chest

a. X-ray

- i. Adequacy of AP, PA, and Lateral
 - ii. Abnormalities:
 - 1. Cardiomegaly
 - 2. Airspace disease
 - 3. Interstitial lung Disease
 - 4. Effusions
 - 5. Pneumothorax, pneumomediastinum
 - 6. Confirmation of placement of lines and tubes
 - b. CT
 - i. Indications
 - ii. Types
 - 1. With or without IV Contrast
 - 2. High Resolution
 - 3. CT pulmonary Angiography
 - iii. Risks
 - c. Ventilation Perfusion Scan
 - i. Indications
 - ii. Limitations
 - iii. Risk
 - d. Cardiac Imaging
 - i. CT
 - 1. Calcium score
 - 2. Coronary Angio
 - ii. MRI
 - iii. Nuclear
 - 1. Stress test
 - 2. MUGA
 - iv. Echo
2. Abdomen
- a. Abdominal X-rays
 - i. Views
 - ii. Abnormalities
 - 1. Obstruction and ileus
 - 2. Extraluminal air
 - 3. Nephrolithiasis

- b. CT
 - i. Types
 - 1. Contrast (PO and IV)
 - 2. CT Angio
 - 3. Pancreatic
 - 4. Liver three phase
 - ii. Indications
 - iii. Risks:
 - 1. Radiation
 - 2. Contrast
 - c. Ultrasound
 - i. Liver
 - ii. Renal
 - iii. Aorta
 - d. Nuclear
 - i. Liver-Spleen Scan
 - ii. HIDA
 - iii. VCUG
 - e. MRI
 - i. MRCP
 - ii. Renal MRA
3. Neuro
- a. CT
 - i. Head
 - ii. Back
 - iii. Myelogram
 - iv. Angiogram
 - b. MRI
 - i. Head
 - 1. With and without
 - 2. Angio
 - 3. Venous
 - ii. Back
 - 1. With and without
4. Skeletal

- a. Plain Films
 - b. Nuclear
 - i. Tag Studies
 - ii. Bone Scan
 - c. Ultrasound (newborns)
5. Breast Imaging
- a. Mammography
 - b. Ultrasound
 - c. MRI
6. Vascular
- a. Venous Duplex
 - b. Arterial Studies
 - i. PAD
 - ii. Aorta
 - 1. Ultrasound
 - 2. CT

Specific Educational Strategies:

Diagnostic and Nuclear Imaging is a longitudinal curriculum over the entire residency. It is composed of online modules, quizzes, lectures and experiential learning throughout residency training.

Teaching Methods & Venues:

1. Self-study
 - a. CXR module
 - b. AXR module
 - c. Appropriate imaging cases
2. Self assessments
 - a. Pre-assessments (CXR, AXR, cases)
 - b. Post-assessments (CXR, AXR, cases)
 - c. Practice exam (CXR, AXR)
3. Grand Rounds: Kathy Downey (2013)
4. Didactic
 - a. Noon Conference Series
 - b. November lecture series
5. Clinical experience
 - a. Inpatient medicine

b. Outpatient rotations

Evaluation Methods and Timing:

1. Residents have pre- and post-assessment quizzes regarding how to choose the appropriate diagnostic study done within the first 6 mo of training.
2. The residents have an oral exam on reading chest x-rays and ankle x-rays after completion of the self-study online modules.
3. There is an exit survey given to graduating residents to assess the effectiveness of the radiology curriculum and elicit suggestions for improvement.
4. The resident has an abdominal plain film pre- and post-quiz to be done during the surgery rotation.

Goals: (address, broad over reaching needs in a curriculum)

1. To educate and reinforce the core clinical issues in outpatient and inpatient family medicine with regards to diagnostic imaging.
2. To cover curricular items that do not have other educational outlets.

Recommended Resources:

1. TCHUCFM Website (tchucfm.squarespace.com)
2. Lieberman's Primary Care Radiology: Excellent tutorial on indications, contraindications of basic radiology tests including link to patient instructions for these tests (Menu of Radiologic Tests). Also has mult videos with cases for imaging evaluation of common complaints (low back pain, etc).
3. Radquiz.com: Links to multiple other sites and Google images. MedPix(R) cases fun if you have downtime.
4. American College of Radiology (ACR) website link to Appropriateness Criteria: More than 180 topics covered in detail.
5. Cleveland Clinic Pediatric Radiology: Phenomenal image gallery of common and rare pediatric cases.
6. Yottalook: Free medical imaging search engine. Good quick imaging search engine and includes case stem.

7. LearnRadiology.com: Great site with brief lectures (3-5min) and also great imaging section with thumbnails and one word diagnoses. Recommend images - Bones section.
8. [Chest x-ray site](#): Good review on cross-sectional anatomy.
9. [Indiana University School of Medicine site](#): 11 cases that are interactive and fun. Recommend Cases 3 and 5.
10. [Amiga Radiologist Home page](#): Click on Access Unknowns for quick cases and quizzes. Downside is that cases somewhat rare.

Objectives/Evaluation Tools: (written as specific measurable, outcome based statements encompassing knowledge, skills, and attitudes)

1. Articulate a systematic approach to accurately reading a chest x-ray as measured during an oral exam with the faculty member.
2. Demonstrate an ability to choose appropriate radiographic testing for a variety of patient cases. Competency will be assessed by an online case-based exam as well as the resident's performance during the inpatient medicine rotation.
 - a. RLQ pain
 - b. RUQ pain
 - c. LLQ pain
 - d. Headache
 - e. Head trauma (peds and adult)
 - f. Ankle injury
 - g. Asymptomatic hematuria
 - h. Pancreatitis
 - i. Knee pain
 - j. Pulmonary embolus
 - k. Chest pain
3. Be able to accurately and systematically read a plain x-ray of an ankle after completion of an online tutorial as determined by adequate accuracy on an oral exam with the faculty member.
4. Demonstrate an appreciation of the costs involved with common radiographic procedures.
5. Understand the risks of imaging techniques including contraindications for use of contrast materials.
6. Be able to accurately and systematically read a plain abdominal x-ray to determine presence of ileus or obstruction. Competency will be assessed during an oral exam on the surgery rotation.
7. Determine adequate placement of various lines and tubes on plain films as assessed during an interactive lecture in the first November of residency.