UT Family Medicine Residency
Radiology Rotation
Christopher Knight, MD (updated June 2021)

Rotation Goal

The specialty of radiology encompasses diagnostic imaging as well as therapeutic intervention. There are numerous longitudinal experiences during the three year course of this residency program designed to teach residents fundamental radiologic concepts relevant to the practice of family medicine. The radiology rotation serves as a jump-start for learning the capabilities of a hospital radiology department and learning to appropriately apply radiology to the primary care practice. Residents have access to our American College of Radiology teaching file, which is available on VolShare for self-study at all times.

The cognitive and behavioral objectives for the radiology rotation, are comprehensive, and should thus be viewed as skills that develop throughout the residency experience. Further implementation of the goals beyond the two-week radiology rotation will be achieved in the other rotational experiences, clinic experiences and in the scheduled conferences and seminars throughout the three-year residency program.

During this rotation, residents should achieve competency in the following areas:

I. Understand the role of radiologists as specialists and consultants working with other medical staff as part of the healthcare team (Systems-based Practice).
II. Interpret basic clinical images such as plain films that are common in the outpatient setting of family medicine (*Patient Care, Medical Knowledge).*
III. Develop an understanding of the basic anatomy referable to all applications of diagnostic imaging such as plain films, CT, US, and MRI (*Medical Knowledge, Practice-based Learning and Improvement).*
IV. Identify applications of radiology as a screening modality of disease and for use in guiding medical and surgical interventions and effectively communicate this to patients and consultants in a manner that is respectful to gender, cultural, religious, economic and educational differences (*Medical Knowledge, Professionalism, Patient Care, Interpersonal and Communication Skills, Systems-based Practice).*
V. Ability to stay current evidence-based medicine in choice of radiological imaging, procedures and appropriate interpretation (*Medical Knowledge, Practice-based Learning and Improvement)*
VI. Understand the basic concepts of risk management, malpractice, and confidentiality, as it applies to radiology and the legal obligations to protect patients' interests (*Systems-based Practice, Professionalism).*
VII. Develop an appropriate differential diagnosis and recommend appropriate imaging (*Patient Care, Systems-based Practice*)
VIII. Develop a familiar understanding of diagnostic and therapeutic modalities provided by interventional radiology (*Systems-based Practice, Patient Care, Medical Knowledge).*
Develop skills necessary to discuss findings on radiological images to patients (*Professionalism, Interpersonal and Communication Skills, Patient Care).*

Radiology Experience

1. **Radiology –** The Radiology Rotation is a two-week block during the PGY-1 year. During the rotation, residents with work one-one-one with board certified radiologist. They will have time in a reading room as well as in the procedure room assisting/performing therapeutic interventions.
    a. Jackson Madison County General Hospital Department of Radiology
    620 Skyline Dr, Jackson, TN 38301
    Evaluating Preceptor: Matthew Graham, MD

Contact: Marci, 541-6174 (fax: 541-8008)

b. Direct observation is provided by supervising physicians. Supervising physicians include:
c. Rotation Structure:
    i. Three to four half-days per week in continuity clinic at the UTFMC.
    ii. Six to seven half-days per week at Jackson Madison County General Hospital Department of Radiology.
d. Responsibilities:
    i. Residents should review the Residency Master Schedule to determine the exact times and dates that they are to work.
    ii. Residents are expected to act and dress in a professional and ethical manor at all times in accordance with the residency manual.
    iii. **One week prior to the beginning of the rotation, residents should contact Marci to learn time and location of first day.**
    iv. Residents should actively participate in the care of patients and develop an appropriate differential diagnosis for patients in the radiology department and demonstrate effective exchange of information and collaboration with other health professionals.
    v. Residents should gain a better understanding of the role of the primary care physician, specialist, and ancillary staff to gain understanding of the importance of a multidisciplinary approach to optimize individualized care.
    vi. Gain a better understanding of proper referral patterns.
    vii. Residents should demonstrate knowledge of radiology gained by reading selected topics.
    viii. Residents should become familiar and perform proper techniques for common interventional procedures such as central venous access with ultrasound, lumbar punctures, diagnostic/therapeutic paracentesis, diagnostic/therapeutic thoracentesis, and chest tube insertion with the goal of meeting credentialing targets.

2. Longitudinal Exposure to Radiology – Longitudinally, the resident has immediate faculty involvement on the interpretation of all x-rays taken at the UTFP clinic at the point of care. Preceptors assist the residents in interpreting plain x-rays and give them immediate feedback while the patient is being evaluated in clinic. Residents will also spend time with the radiology technician at the UT Family Medicine Center (UTFMC) to gain a basic understanding of office based plain films, gain experience in the actual procedure of taking and processing plain films and to explore options for office based x-ray capabilities. Radiologic topics are also covered in depth on numerous clinical rotations including OB1, OB2, GYN, Emergency Medicine, Inpatient Pediatrics, Outpatient Pediatrics, In-house 1, In-house 2, SS, orthopedics, NICU and ICU. In addition, office-based radiology with an emphasis on safety, billing and various other business aspects are covered during the MFPU rotation.

3. Didactic Experience – Residents will receive structured didactic lectures on issues related to radiology throughout their three years of residency.

Rotation Objectives

By the end of the Radiology rotation, PGY I residents are expected to expand and cultivate skills and knowledge learned during previous training and to achieve the following objectives based on the six general competencies. The resident should exhibit an increasing level of responsibility and independency as he or she progresses throughout the year.

Competency	Required Skill(s)	Teaching Method(s)	Formative Evaluation Method(s)	Frequency of Evaluation
Patient Care	**SPECIALTY SPECIFIC OBJECTIVES**			
	Identify what diagnostic imaging studies should be ordered to aid in making a clinical diagnosis • Fetal ultrasound • Pelvic and intra-vaginal ultrasound	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly

	• Mammogram • Breast ultrasound • DEXA scan • Chest x-ray • Abdominal flat plate, upright and decubitus • Upper GI series • Barium Enema • Ultrasound abdomen, liver, GB, pancreas • Tagged red cell study • HIDA scan • IVP • Arteriogram • MRI brain • MRA brain • MRI c-spine, t-spine and LS spine • Echocardiogram • Venous Doppler • Carotid Doppler • C-spine in the Emergency Department (ED) • CT abdomen the in the ED • Spiral CT chest • Thyroid scan (RAIU scan) • Thyroid ablation • VCUG • Sinus CT	Chart Review Project		
	Write orders for studies that help the radiologist in his/her interpretation	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials Chart Review Project	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly
	Interpret findings of above studies in the context of the clinical presentation	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials Chart Review Project	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly
	Order sedation when needed for MRI (claustrophobia) or other studies for which it is required	Conferences/Didactics Daily Rounds Self Directed Learning	Direct Feedback Global Evaluation Procedure Log Review	Daily Monthly Monthly

		Online tutorials Chart Review Project	Conference Attendance	
	Use evidence-based medicine principles to determine the appropriate radiographic work-up for the following presentations to optimize the diagnosis in balance with cost-effectiveness and potential patient complications. • Cardiac ischemia • Pulmonary embolism • Acute abdomen • Neck and back pain • Neurological syndromes including spinal cord compression, seizures, cerebrovascular accident, headaches, focal neurological findings, mental status changes, and head trauma • Child abuse • Preventive medicine including spiral CT for pulmonary nodules, bone densitometry scans for osteoporosis, mammograms for breast cancer screening, and prostate ultrasound for cancer screening and nodule evaluation • Bone and joint pain • Normal and abnormal pregnancy • Staging of common cancers • Hematuria and flank pain • Gastrointestinal bleeding • Aortic aneurysms/dissections • Physical findings including ascites, abnormal heart sounds, prostate nodules, bruits, aneurysm, testicular masses, thyroid nodules, and breast lumps • Trauma	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials Chart Review Project	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly
	Interpret the following types of x-rays: • Plain chest x-rays (10) • Extremity x-rays (10) • Abdominal x-rays (5) • C-spine x-ray (5) • CT head (5) • CT chest (5) • CT abdomen (5)	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials Chart Review Project	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly

	Perform the following procedures: • Lumbar Puncture (3) • Diagnostic paracentesis (3) • Diagnostic thoracentesis (3) • Central venous access with ultrasound guidance (3) • Therapeutic paracentesis (3) • Therapeutic thoracentesis (3) • Chest tube insertion (3)			
Medical Knowledge	**SPECIALTY SPECIFIC OBJECTIVES**			
	Know appropriate terminology used to describe various radiographic findings	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials Chart Review Project	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly
	Plain Radiographs 1. Identify normal anatomy on PA, AP, and lateral chest films 2. Recognize abnormal chest films including pleural effusion, pneumothorax, pneumonia and lobe location, changes of congestive heart failure, changes of chronic obstructive pulmonary disease, atelectasis, pulmonary nodules and masses, and hyaline membrane disease of the newborn 3. Identify normal anatomy on four views of the abdomen 4. Recognize abnormal abdominal films including ileus, small bowel obstruction, large bowel obstruction, free air, and calcifications 5. Identify normal anatomy of the spine and long bones in both adults and children 6. Recognize abnormal bone radiographs including fractures, degenerative joint disease, osteoporosis (including vertebral collapse), and primary versus metastatic bone malignancy 7. Identify normal anatomy on barium enema, and upper gastrointestinal series	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials Chart Review Project	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly
	Computed Tomography 1. Recognize and treat contrast allergy, it's signs and symptoms, and implications to the patient	Conferences/Didactics Daily Rounds Self Directed Learning	Direct Feedback Global Evaluation Procedure Log Review	Daily Monthly Monthly

	2. Discuss principles of CT function and applications 3. Discuss differences between CT, MRI, plain film, and US, including the comparative benefits/drawbacks and strengths/weaknesses of each modality 4. Discuss general indications of when to use CT as the imaging of choice 5. Identify normal anatomy found on CT of the head, spine, chest, abdomen, and pelvis 6. Recognize abnormal head CTs including acute hemorrhage (subarachnoid, subdural, and parenchymal), infarcts, edema, mass effect, and hydrocephalus in an infant and adult 7. Recognize abnormal chest CTs including pulmonary nodules and masses 8. Recognize abnormal abdominal/pelvis CTs including diverticular disease, appendicitis, bowel obstruction, abdominal aortic aneurysms, pancreatitis, abdominal abscesses, ascites, and hepatic, pancreatic and renal masses 9. Recognize abnormal CTs of the spine, including metastatic disease, degenerative joint disease, and disc disease	Online tutorials Chart Review Project	Conference Attendance	
	Magnetic Resonance Imaging 1. Discuss principles of magnetic resonance imaging, including differences in abilities and applications of MRI versus CT 2. Identify normal anatomy on MRI of the head and spine 3. Recognize abnormal head and spine MRIs including central nervous system infection, masses, stroke syndromes, multiple sclerosis, disc disease, metastatic vertebral column disease, and cord compression	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials Chart Review Project	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly
	Ultrasound 1. Discuss general principles of ultrasound including the differences between 2D, Doppler, and M mode 2. Discuss indications and limitations of a. ultrasound for specific OB/Gyn situations (molar pregnancy, anencephalic pregnancy, placenta previa, fetal age using bi-parietal diameter and femur length, and ectopic pregnancy)	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials Chart Review Project	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly

	b. vascular Doppler ultrasound (aneurysm, deep vein thrombosis, and carotid artery and peripheral vascular disease) c. ultrasound for gallbladder, bile ducts and liver d. echocardiogram (transthoracic versus trans-esophageal echocardiography, chamber size, valvular disease, and pericardial effusions) e. renal ultrasound for cysts and tumors f. prostate ultrasound (for evaluation of nodules and biopsy) g. FAST ultrasound for trauma h. RUSH Exam			
	Mammography 1. Discuss basics of normal and abnormal mammograms 2. Discuss indications and utility of mammography, including usefulness as a screening method and as a surgical tool for resection and biopsy	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials Chart Review Project	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly
	Nuclear Medicine 1. Discuss general principles and therapeutic uses of nuclear medicine 2. Discuss mechanisms, indications, and limitations of HIDA scans, bone scans, tagged RBC scans, myocardial perfusion and function scans, bone densitometry scans, and ventilation/perfusion scans	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials Chart Review Project	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly
	Angiography 1. Discuss diagnostic and therapeutic principles of angiography 2. Discuss indications for obtaining angiograms 3. Discuss applications and utility of MRA angiograms 4. Recognize normal anatomy of the great vessels and other vasculature on angiograms 5. Discuss indications for angiograms for abnormal processes including subarachnoid hemorrhage and berry aneurysms, vascular stenotic lesions, pulmonary angiogram for PE, aortic dissection, aortic trauma, and gastrointestinal bleeding	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials Chart Review Project	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly
	Become familiar with the various treatment modalities provided by interventional radiologists 1. Ultrasound-guided vascular access 2. Paracentesis	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly

	3. Thoracentesis, chest tube insertion and management 4. Ultrasound-guided cyst aspirations and soft tissue biopsy 5. Embolization procedures 6. Vertebroplasty 7. Vascular stenting 8. Thyroid ablation therapy 9. Thrombolytic therapy for PE/DVT	Chart Review Project		
Practice Based Learning and Improvement	**SPECIALTY SPECIFIC OBJECTIVES**			
	See General Family Medicine Objectives for a comprehensive list.			
	Develop tools to help meet the needs of patients	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials Chart Review Project	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly
	Facilitate learning of medical students, residents and other health care professionals to encourage quality improvement in patient care	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials Chart Review Project	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly
Interpersonal and Communication Skills	**SPECIALTY SPECIFIC OBJECTIVES**			
	See General Family Medicine Objectives for a comprehensive list.			
	Communicate effectively with patients and their families while in the presence of their daily preceptor.	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials Chart Review Project	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly
	Convey information in a clear and concise manner to patients, families, and other health professionals (i.e., use appropriate vocabulary choice, realistic outcomes, and working with difficult patients and family)	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials Chart Review Project	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly
Professionalism	**SPECIALTY SPECIFIC OBJECTIVES**			
	See General Family Medicine Objectives for a comprehensive list.			
	Provide compassionate and high quality care to all patients regardless of gender, age, culture, race, religion, disabilities, sexual orientation or socioeconomic class	Conferences/Didactics Daily Rounds Self Directed Learning	Direct Feedback Global Evaluation Procedure Log Review	Daily Monthly Monthly

		Online tutorials Chart Review Project	Conference Attendance	
	Behave in a professional manner when interacting with patients or other health care providers (i.e., integrity, respect, accountability, punctuality)	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials Chart Review Project	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly
Systems-Based Practice	**SPECIALTY SPECIFIC OBJECTIVES**			
	See General Family Medicine Objectives for a comprehensive list.			
	Incorporate considerations of cost awareness and risk-benefit analysis in patient care	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials Chart Review Project	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly
	Advocate for quality patient care and optimal patient care systems	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials Chart Review Project	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly
	Develop an understanding of the role of radiologic imaging and intervention in evaluation and treatment of disease	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials Chart Review Project	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly
	Develop an understanding of coding and billing relevant to radiologic imaging.	Conferences/Didactics Daily Rounds Self Directed Learning Online tutorials Chart Review Project	Direct Feedback Global Evaluation Procedure Log Review Conference Attendance	Daily Monthly Monthly

Selected Reading Topics:

1) Indications, contraindications, complications, limitations, alternatives and interpretation of the following studies:
    a. X-ray
    b. GI Studies
    c. CT
    d. MRI
    e. Ultrasound
    f. PET Scan

2) Indications, contraindications, complications, limitations, alternatives and interpretation of the following procedures:
    a. Lumbar puncture with fluoroscopic guidance
    b. Ultrasound guided paracentesis and thoracentesis
    c. Use of ultrasound for central line placement
    d. CT and ultrasound guided biopsies and drainages
3) Appropriate use of diagnostic imaging for patients with the following conditions:
    a. Acute abdomen
    b. Back or neck pain with and without neurological findings
    c. Chest pain with suspicion or aortic dissection
    d. Hematuria and flank pain
    e. Adrenal nodule
    f. Neurological symptoms, including headache, focal sensory or motor findings, mental status changes, paresthesias, seizures, and symptoms of cord compression
    g. Pulsatile and non-pulsatile abdominal masses
    h. Suspected pulmonary embolism
    i. Swollen leg or arm
    j. Trauma – C-spine evaluation
    k. Vaginal bleeding.
    l. Congestive heart failure
    m. Pneumonia
    n. COPD
    o. Asthma
    p. Interstitial lung disease
    q. Foreign body
    r. Skull fracture
    s. Hydrocephalus
    t. Acute stroke
    u. Multiple sclerosis
    v. Abscess
    w. Thyroid nodule
    x. Esophageal obstruction
    y. Gastric or duodenal ulcer
    z. Pancreatic mass
    aa. Liver lesion
    bb. Acute cholecystitis
    cc. Appendicitis – Adult and children
    dd. Renal Stone
    ee. Pelvic pain
    ff. Cauda equina syndrome

4) Understand appropriate study selection and timing of studies to enhance diagnostic value
5) Interpret results within the context of patient comorbidities, pretest probability of disease, and sensitivity and specificity of the study
6) Basic knowledge of radiation, its effects, and radiation protection
7) Lung cancer screening guidelines
8) Lung nodules: Fleischner Society Recommendations
9) Breast cancer screening guidelines
10) AAA screening guidelines
11) Computed tomography coronary artery screening and calcium scoring
12) Colles' fracture
13) Smith's fracture
14) Navicular fracture
15) Jones fracture
16) Salter Harris classification

References:

1. Daffner, Richard H. Clinical Radiology The Essentials, 2nd Edition. Philadelphia, PA. Lippincott Williams & Wilkins, 1999
2. Mettler, Fred A. Primary Care Radiology. Baltimore, MA. Saunders, 2000.
3. Mettler, Fred A. Essential of Radiology 3rd Edition. Philadelphia, PA. Elsevier, 2014
4. Introduction to Radiology. An Online Interactive Tutorial. www.med-ed.virginia.edu/courses/rad/
5. www.uptodate.com (available free through www.utdol.com in Jackson General Hospital)
6. www.epocrates.com
7. www.emedicine.com

www.aafp.org

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