



---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

### **GOALS AND OBJECTIVES**

The principal goal of the diagnostic radiology residency program is to meet or surpass the requirements of the AOA/AOCR in training competent, caring osteopathic radiologists who possess the knowledge, skills and competencies necessary to:

1. Pass the three core AOBR exams during residency
2. Pursue a fellowship, enter private practice or begin an academic career.
3. Practice radiology according to the standards set by the AOBR, AOCR/ACR and other professional organizations.
4. Participate in life-long learning and quality improvement.

### **GENERAL COMPETENCIES**

#### ***Patient Care***

- To produce radiologists that provide patient care through safe, efficient, appropriately utilized, quality-controlled diagnostic and/or interventional radiology techniques and effectively communicate results to the referring physician and/or other appropriate individuals in a timely manner. Our residents learn how to provide a meaningful contribution to patient care.

#### ***Medical Knowledge***

- To acquire and synthesize medical knowledge in all Radiology subspecialties, using an organized approach.
- To engage in continuous learning and apply appropriate state of the art diagnostic and/or interventional radiology techniques to meet the imaging needs of patients, referring physicians, and the health care system.

#### ***Professionalism***

- To commit to high standards of professional conduct, demonstrating altruism, compassion, honesty and integrity.
- To follow principles of ethics and confidentiality and consider religious, ethnic, gender, educational and other differences in interacting with patients and members of the health care team.

#### ***Interpersonal and Communication Skills***

- To communicate effectively with patients, colleagues, referring physicians and members of the health care team concerning imaging appropriateness, informed consent, safety issues, and results of imaging tests or procedures.

#### ***Practice Based Learning and Improvement***

- To develop the habits of life long learning and improvement through an understanding of the performance improvement process, journal reading and analysis, and research methods and performance.



---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

### ***Systems Based Practice***

- To understand how the components of the local and national healthcare system function interdependently and how changes to improve the system involve group and individual efforts.
- To optimize coordination of patient care both within one's own practice and within the healthcare system.
- To consult with other healthcare professionals, and educate healthcare consumers, regarding the most appropriate utilization of imaging resources.

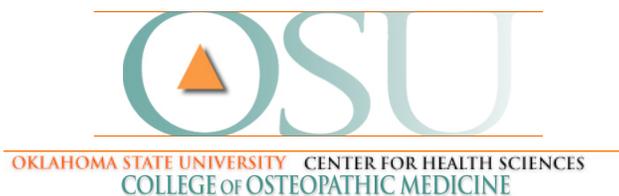
### ***Osteopathic Philosophy and Osteopathic Manipulative Medicine***

- To recognize clinical situations where OMM is appropriate
- To show understanding of somato-visceral relationships and the role of the musculoskeletal system in disease
- To provide accurate structural diagnosis
- To perform appropriate OMT as a procedural skill when given the opportunity
- To take each patient's illness into account when dealing with that individual
- To provide osteopathic health care services using behavioral medicine when applicable
- To advocate for patient's welfare, autonomy, and quality of care

### **DURATION OF TRAINING**

Four (4) years of full-time broad-based residency training in diagnostic radiology (48 months of training rotations in specialty areas as defined by the AOA/AOCR) are required of a resident entering training on or after July 1, 1989, in a program approved by the AOA. The American Osteopathic Board of Radiology requires that the period of training be at least 48 months for those entering training on or after July 1, 1989. Extended absences, whether for financial, maternity/paternity leave, illness, disability, etc., must be made up.

A resident beginning flexible training after January 1, 1995, may complete the required 48 months of training on a flexible basis not to exceed six (6) years. No continuous absence of more than one (1) year will be permitted. The program director will maintain records describing specific flexible residency arrangements. The certificate of completion issued by the training institution must indicate a cumulative total of forty-eight (48) months of approved training.



---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

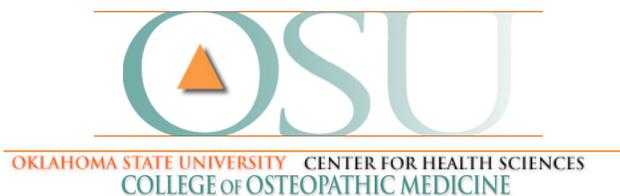
### **TRAINING PROGRAM OBJECTIVES**

The residency training program in diagnostic radiology at Oklahoma State University Medical Center – Oklahoma State University College of Osteopathic Medicine shall be 48 months in duration and shall include the following areas of training as designated and arranged by the program director. The following guidelines are based on the Basic Standards for Residency Training in Diagnostic Radiology listed by the AOA. The following listed requirements will be met in the resident's 4 years of training by designated rotations by the Program Directors to meet both departmental needs and training needs.

1. General Diagnostic Radiology - 11 months
  - a. Chest - 3 months
  - b. Gastrointestinal - 3 months
  - c. Genitourinary - 2 months
  - d. Musculoskeletal - 3 months
2. Mammography - 3 months
3. Nuclear Radiology - 4 months
4. Pediatric Radiology - 3 months
5. Cardiovascular/Interventional - 3 months
6. Neuroradiology - 4 months
7. Diagnostic Ultrasound - 3 months
8. Computed Tomography - 3 months
9. Magnetic Resonance Imaging - 3 months
10. Emergency Radiology - 2 months
11. Cardiac Radiology – 1 month
12. American Institute for Radiologic Pathology (AIRP) - 1 month
13. Electives – 7 months

Additionally, our program adheres to a four-year curriculum that meets the requirements that will prepare the radiology resident for specialty certification in diagnostic radiology through provision for a combination of didactic and clinical training opportunities.

The nine subspecialty areas of diagnostic radiology are neuroradiology, musculoskeletal radiology, vascular and interventional radiology, cardiothoracic radiology, breast radiology, abdominal radiology (GI/GU tracts), pediatric radiology, ultrasonography (including obstetrical and vascular ultrasound), and nuclear radiology (including PET and nuclear cardiology).



---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

Integration with the outlined requirement cumulative total of rotations and the nine subspecialties are primarily accomplished at OSUMC and with Diagnostic Imaging Associates hospitals they cover onsite or by teleradiology. Pediatrics exposure is accomplished with dedicated 4 weeks rotations at Childrens Mercy Hospital in Kansas City, Missouri.

The residency program has transitioned from the traditional 4 week or 1 month block schedule to a one to three week rotational schedule in order to fulfill the core competency requirements set by the AOA/AOCR. This is done due to the small size of the residency program. As our department is PACS/voice recognition integrated environment, each resident will be assigned to a specific area of imaging modality or imaging specialty. There will be times when a resident may have to cross cover other sections. Monthly rotation assignments are as follows: Chest, Body, Ultrasound (US), Musculoskeletal (MSK), Nuclear Medicine(NM), Mammography (MAMMO), Interventional (IR), Cardiac, Neuroradiology (NEURO), OSUMC float, Cancer Treatment Center (CTCA), DIA Tele or Peds, Night shift, and Flouroscopy (Flouro). Out of house rotations include Pediatrics (3 months) and AIRP course (4 weeks). The resident should make note that electives (7 months) are utilized as in house rotations to improve areas of clinical imaging deficit. Rotation through all sections will allow adequate clinical exposure to meet AOA/AOCR requirements for completion of residency training.

We address training specifically per this breakdown and cross integration of rotations:

1. Chest/Cardiac – Cardiothoracic subspecialty in which general radiology/CT/MRI rotation requirements are met. Met at OSUMC/DIA/Peds.
2. Body – abdominal radiology (GI/GU tracts) subspecialty in which general radiology/CT/MRI rotation requirements are met. Met at OSUMC/DIA.
3. Musculoskeletal – Musculoskeletal subspecialty in which general radiology/CT/MRI rotation requirements are met. Met at OSUMC/DIA.
4. Nuclear Medicine – Nuclear medicine subspecialty in which general 700 hours of nuclear medicine requirements are met at OSUMC/DIA (specifically CTCA for PETs).
5. Mammography – Mammography subspecialty in which 4 month requirement is met at OSUMC and with DIA telemammography.
6. Interventional – Interventional subspecialty requirement met a OSUMC.
7. Neuroradiology – Neuroradiology subspecialty in which CT/MRI rotation requirements are met at OSUMC/DIA.
8. Flouroscopy – Meets GI/GU subspecialty requirements along with general radiology requirements.
9. Night shift / Weekends – Accomplishes ER volumes that heavily included CT and plain radiographs and to a lesser degree MR volume.



---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

10. Pediatrics – Subspecialty requirement met by 2-3 month rotation at Children’s Mercy Hospital in Kansas City, Missouri. 1 month of Peds are available for seniors to do a dedicated Peds rotations with DIA.
11. Ultrasound – encompasses all aspects of ultrasonography

The residency program has adopted the objectives from the Association of Program Directors in Radiology to guide the resident based on clinical rotations. The monthly rotations as defined by OSUMC enable the resident to accumulate knowledge, develop technical skills, and establish decision-making processes. These objectives are to be used as general guidelines in regard to the residents' progression through the residency. As residents attain knowledge and skills at different competency levels and that fluctuation of patient loads impact upon the residents' experiences, it would not be reasonable to expect each resident to fully accomplish each objective during any rotation. The objectives, therefore, are to be used as a relative measure of progress, either as a formal measurement administered by the clinical faculty at the end of the rotation or as a personal evaluation by the resident. Objectives not completed on a first rotation in a clinical area may be carried over until the next rotation in that clinical area.

### **SUPPLEMENTAL EXCLUDED EDUCATIONAL CONTENT FROM PRIMARY SYLLABUS AND DISTRIBUTED SEPARATELY OR FOLLOWS THE SUBSPECIALTY ROTATION OBJECTIVES**

1. Academic year for Book Club
2. Monthly Journal Club schedule
3. Routine monthly Tumor Board schedule
4. Educational Media series utilized for supplemental lecture series
5. Physics lecture schedule
6. RadPrimer schedule and rotation specific reading recommendations



---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

### **CHEST RADIOLOGY**

*Knowledge Based Objectives:* The resident should be able to:

1. Identify normal anatomy of the chest as it is seen on the radiograph and CT.
2. Identify and/or describe common variants of normal.
3. Demonstrate a basic knowledge of radiological interpretation.
4. Discuss various common diseases that give altered patterns of lung disorders.
5. Describe the characteristics of common abnormal cardiac shadows.
6. Discuss the various indications for a chest CT.
7. Name and describe characteristics of chest pathologies that are seen infrequently in routine work but have distinctive radiographic and/or clinicopathological signs.
8. Correlate pathological and clinical data with radiographic findings on the chest film.

*Technical Skills:* The resident should be able to:

1. Given a chest radiograph or CT examination, distinguish normal from abnormal structures.
2. Dictate a report that is concise and understandable.
3. Communicate verbally with referring physicians and house staff about radiographic findings.
4. Recognize the following pathologic anatomy in the lungs:
  - a. air space processes
  - b. lobular processes
  - c. Interstitial processes
5. Given an appropriate radiograph, recognize cardiac enlargement.
6. Identify anatomy and significant pathology as seen on CT.
7. Read routine chest images with a high level of accuracy and efficiency.
8. Prepare and present the radiographic components of the radiology/pathology and chest conferences.
9. Fully supervise the performance of a chest CT examination.
10. Show competence in needle biopsy of chest lesions.

*Decision-Making and Value Judgment Skills:* The resident should be able to:

1. Make decisions about when to alert house staff to the immediacy of a condition that is apparent on the radiograph.
2. Determine when to request that a repeat examination is needed because of technical inadequacy.



---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

3. Determine which cases require the immediate assistance of attending radiologist.
4. Demonstrate a high degree of accuracy in interpreting and dictating cases, identifying consistently those cases with which assistance is needed.
5. Consult, with confidence, with primary care physicians and surgeons in regard to most chest imaging procedures.

### **MUSCULOSKELETAL RADIOLOGY**

*Knowledge Based Objectives:* The resident should be able to:

1. Discuss basic bone physiology.
2. Describe the stages different types of fractures go through in the process of healing.
3. List and describe the basic principles of examination of musculoskeletal studies.
4. State the indications for computed tomography, MR and bone scans.
5. Name and describe the various common types of bone and joint trauma, other than fractures.
6. Name and differentiate between various forms of arthritis, including laboratory and clinical findings of each type.
7. State the radiographic features that differentiate benign and malignant bone tumors.
8. Name and describe clinical/pathological/radiological features of congenital and acquired bone pathologies.
9. Name and describe clinical/pathological/radiological features of metabolic bone diseases.
10. Describe the radiographic features of inflammatory bone/joint diseases.

*Technical Skills:* The resident should be able to:

1. Identify, with a high level of accuracy, most types of bone fractures.
2. Recognize the commonly used radiographic projections in musculoskeletal radiology.
3. Arrange musculoskeletal images in an orderly fashion for review and interpretation.
4. Identify normal musculoskeletal structures and some of the normal variants.
5. Given an appropriate radiograph, identify the following categories of bone pathology:
  - i. Inflammatory processes




---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

- ii. Bone tumors
- iii. Congenital and acquired diseases
- iv. Metabolic diseases
- 6. Given a radiograph demonstrating bone pathology listed in #5 above and pertinent clinical/pathological information, identify common pathologies in each category.
- 7. Demonstrate increasing skill in quality and quantity of dictation of musculoskeletal images.

*Decision-Making and Value Judgment Skills:* The resident should be able to:

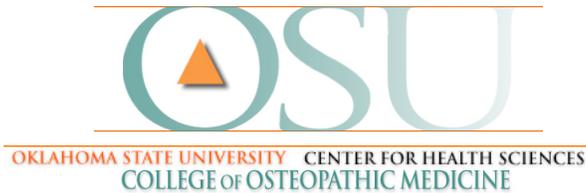
- 1. Given musculoskeletal radiographs that are not diagnostic without further study, state whether the patient should have additional exams in CT, MR, or nuclear imaging.
- 2. Given a radiograph of a healing bone fracture, determine the stage of bone healing.
- 3. Given a patient with musculoskeletal pathology, review radiographs and clinical history, then make decision about the appropriateness of nuclear, CT, and/or MR imaging.

### **BODY IMAGING: GI/GU tract**

*Knowledge Based Objectives:* The resident should be able to:

#### Anatomy

- 1. Discuss the basic principles of CT scanning and the basic protocols of CT scanning
- 2. Describe how a CT scan is acquired (planes, slice thickness, timing)  
Describe the phases of imaging  
Describe the normal enhancement patterns of the abdominal organs
- 3. Describe Hounsfield units, window and level settings, lung and bone algorithm.
- 4. Identify all normal anatomy of the chest, abdominal, and pelvis
- 5. Learn hepatic lobar anatomy and landmarks-left lobe, caudate lobe, quadrate lobe, right lobe, ligamentum venosum, ligamentum teres
- 6. Learn the location of lymph node chains-celiac, porta hepatic, porta caval, retroperitoneal, pelvic, inguinal, etc.
- 7. Know the different body compartments-peritoneal cavity, retroperitoneal spaces, extraperitoneum, and how they contribute to spread of disease in the abdomen.

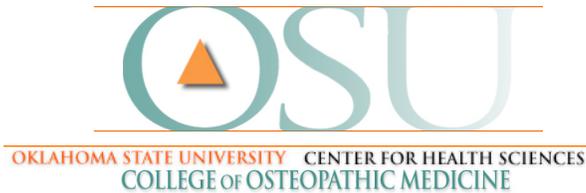


---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

8. Demonstrate the segments of the liver and be able to correctly describe the location of a lesion
9. Know the different body compartments-peritoneal cavity, the subdivisions of the retroperitoneum, and how they contribute to spread of disease in the abdomen.
10. Define the omentum, mesentery, mesenteric root
11. Compare and contrast the strengths and limitation of MRI and CT in the evaluation of masses in the solid abdominal organs.
12. Identify common pathology on CT scans of the chest, abdomen, pelvis. Inflammation: diverticulitis, appendicitis, pancreatitis. Bowel obstruction; Lung masses; Lymphadenopathy-size criteria by location; Renal calculi & hydronephrosis; Intraperitoneal & retroperitoneal hemorrhage
13. Describe the CT manifestations of common pathologies: Organ, visceral and mesenteric inflammation; Neoplasia of the solid organs; Patterns of obstruction
14. Describe the CT manifestations of common disease entities & their complications: Pancreatitis, appendicitis, diverticulitis; Organ and luminal ischemia; Traumatic injury to solid and visceral organs, skeleton, aorta and major branch vessels; Vascular dissection, aneurysm, intramural hematoma, rupture; Cysts and solid masses in the solid organs.
15. How to risk stratify cystic lesions in the kidneys, possible HCCs in the liver, characterize adrenal masses.
16. Lymphadenopathy- locations, definitions, differential diagnosis.
17. Abscess, fluid collections, hemorrhage
18. Learn to recognize closed loop obstruction, types of hernias, and bowel ischemia
19. Describe how to manage incidental findings in the solid abdominal organs and what resources guide these decisions
20. Be able to quickly recognize emergent and pertinent findings
21. Describe how to analyze and diagnose focal liver lesions on CT including: hemangioma, adenoma, focal nodular hyperplasia hepatocellular carcinoma, fibrolamellar hepatocellular carcinoma hypervascular and hypovascular metastatic disease
22. Describe how to analyze and diagnose diffuse liver disease on CT including: Fatty infiltration, hepatitis, hemochromatosis, cirrhosis
23. Describe how to analyze and diagnose focal pancreatic lesions on CT including: pancreatic adenocarcinoma; cystic pancreatic neoplasms; islet cell tumor.

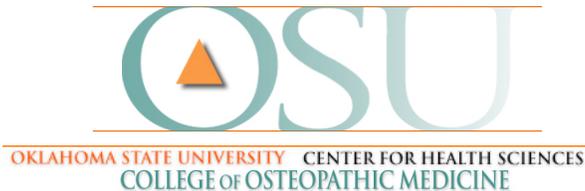


---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

24. Describe the analysis, differentiation of and diagnosis of adrenal lesions, including: adrenal adenomas, myelipomas; pheochromocytoma; adrenocortiocarcinoma and metastatic disease
25. Describe common conditions affecting the spleen, and their diagnosis.
26. Characterize cystic renal lesions using the Bosniak classification
27. Describe and accurately report the findings pertinent to a vascular surgeon for each of the following: AAA- pre treatment; CT angiography of the abdomen and pelvis; AAA – post endograft therapy
28. Define hypovascular and hypervascular tumors, list types, describe how this impacts diagnosis.
29. List the indications and uses of intravenous iodinated contrast material
30. Prescribe the correct steroid pre-medication protocol for IV contrast
31. Discuss contrast reactions
32. Describe what occurs in a contrast reaction
33. Describe specific measures indicated in the treatment of contrast reactions
34. Describe how and when to use the oral pre-medication protocol for IV contrast, and how to handle emergent IV contrast enhanced CTs in the patient with an allergy history
35. Describe the screening process used for identifying patients with high risk of renal insufficiency, to determine who needs a pre-CT/MRI creatinine/GFR checked
36. Prescribe the correct oral and intravenous steroid prep in the management of a history of contrast reactions
37. Recognize common image artifacts
38. Know how to check any scans that require monitoring or additional views.
39. Describe the indications for obtaining delayed images.  
Explain when and why multiphase protocols are used in the solid abdominal organs
40. Discuss the basic principles of CT angiography and the basic protocols of 3D reformatting
41. Describe how a CTA scan is acquired (planes, slice thickness, timing)
42. Describe how a CTA is interpreted: what slice thickness, which series to look for aneurysm, stenosis
43. Describe the methods used to create 3D reformats
44. Define centerline reformat, curved planar reformats and when each is used
45. Describe how a virtual colonoscopy is performed, including patient prep, CT technique, methods of interpretation. Be able to discuss the role of CT colonography with referring clinicians.



---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

*Technical Skills:* The resident should be able to:

1. List/discuss the indications for CT-guided chest, abdomen, and pelvic drains/aspirations
2. List/discuss the indications for CT-guided chest, abdomen, and pelvic biopsies
3. Describe the medications and labs which are pertinent to know about, and check or stop prior to a CT guided intervention
4. Accurately work up a request for a CT guided intervention
5. Approve the case, in conjunction with the attending
6. Write the pre-procedure note
7. Perform the consent and examine the patient
8. Perform percutaneous biopsies and drainages under the supervision of the attending radiologist.

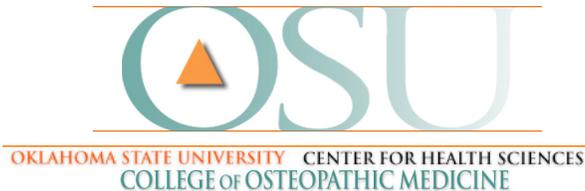
*Decision-Making and Value Judgment Skills:* The resident should be able to:

1. Make decisions about when to alert house staff to the immediacy of a condition that is apparent on the imaging study.
2. Determine when to request that a repeat examination is needed because of technical inadequacy.
3. Determine which cases require the immediate assistance of attending radiologist.
4. Demonstrate a high degree of accuracy in interpreting and dictating cases, identifying consistently those cases with which assistance is needed.
5. Consult, with confidence, with primary care physicians and surgeons in regard to most chest imaging procedures.

### **BODY IMAGING: Fluoroscopy and IVU Section**

*Knowledge Based Objectives:* The resident should be able to:

1. Discuss the proper clinical and radiologic indications for the following studies:
  - i. Barium swallow
  - ii. Upper GI series
  - iii. BE
  - iv. ACBE
  - v. SBFT
  - vi. Enteroclysis



---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

- vii. ERCP
  - viii. Fistulograms
  - ix. IVU
  - x. Cystogram
  - xi. Voiding cystourethrogram
  - xii. HSG.
2. State the physiologic properties, proper concentrations and proper indications for the use of the following contrast material:
    - i. Barium
    - ii. Water soluble contrast media
    - iii. Non-ionic intravenous contrast media
  3. Discuss the following information about Glucagon/Hyoscyamine (Levsin)
    - i. Proper indications and dosages used in GI radiology
    - ii. Physiologic effects
    - iii. Side effects
    - iv. Contraindications
  4. List the high risk factors for allergic reaction to intravenous contrast media: understand the pathophysiology of contrast reactions.
  5. State the prophylaxis, assessment and treatment for allergic reactions to contrast media.
  6. Recognize the normal radiographic appearance of structures of the GI/GU tract.
  7. Given an appropriate radiograph, demonstrate a basic knowledge of radiographic abnormalities of the GI/GU tract.
  8. Demonstrate review and/or retention of knowledge requirements set forth for the first rotation.
  9. Describe and/or discuss GI/GU tract pathology in specific detail.
  10. Assist with preparation and presentation of GI/GU noon resident conferences.
  11. Demonstrate continued knowledge of requirements for previous rotations.
  12. Discuss, with increased understanding, GI/GU tract pathology.
  13. Integrate knowledge of all radiological imaging modalities for evaluation of GI/GU pathology so that the most appropriate study will be done and studies will be done in the proper sequence.
  14. State the indications for a defacography study.
  15. Demonstrate continued increase in knowledge in the areas listed in the previous rotations.

*Technical Skills:* The resident should be able to:



---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

1. Demonstrate basic knowledge of the equipment to be used during fluoroscopy, including proper KV techniques for the various procedures, radiation safety features of the machines, and proper radiation safety techniques.
2. Demonstrate fluoroscopy techniques for performing the following procedures:
  - i. Barium swallow
  - ii. UGI
  - iii. BE
  - iv. ACBE
  - v. SBFT
  - vi. Enteroclysis
  - vii. ERCP
  - viii. Fistulogram
  - ix. IVU
  - x. Cystogram
  - xi. Voiding cystourethrogram
  - xii. HSG.
3. Demonstrate knowledge of proper KV techniques, patient positioning, and type of after-films that should be taken for the procedures listed in #2 above.
4. Demonstrate initial development of fluoroscopic skills by identifying the more common abnormalities during the performance of the studies.
5. Demonstrate further development of the technical skills of performing the GI/GU studies listed in the first rotation.
6. Demonstrate improved skill for tube placement, technical performance and interpretation of enteroclysis procedures. What other modalities are used to evaluate for small bowel pathology?
7. Given a fluoroscopic examination, demonstrate the ability to identify the abnormality at fluoroscopy and modify the technique or change the patient's position to take more diagnostic fluoroscopic spot films.
8. Demonstrate the ability to perform efficiently through decreasing fluoroscopic time needed to perform a study without compromising diagnostic acumen.
9. Demonstrate the technical skills and interpret the results of a defacography study.
10. Demonstrate ability to perform all skills listed in previous rotations at the competence level associated with a beginning practitioner in radiology.

*Decision Making and Value Judgment Skills:* The resident should be able to:



744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

1. Review history of the patient for whom a procedure has been ordered and determine the appropriateness of the study requested.
2. Communicate with the referring physician about any recommendations for change in the type of procedure to be performed.
3. Communicate with the technologist about any special or additional views that should be obtained to demonstrate the pathology identified.
4. Read and dictate the studies performed, under the supervision of attending radiologist.
5. Communicate to the referring physician on the day of the exam any significant abnormalities identified on the examination and document in the report.
6. Demonstrate an enhanced ability to perform decision-making and valuing requirements listed under previous rotations.
7. Evaluate and integrate data from other studies (CT, MRI, ultrasound and nuclear medicine) of the GI/GU tract to make recommendations to the referring physician about more appropriate or additional diagnostic studies needed for evaluation of the patient's abnormality.
8. Demonstrate improvement in decision-making skills listed in the previous rotations.
9. Read and dictate studies with minimal supervision of attending radiologist.
10. Demonstrate ability to perform all skills listed in previous rotations at the competence level associated with a beginning practitioner in radiology.

### **BODY IMAGING: Ultrasound Section**

*Knowledge Based Objectives:* The resident should be able to:

1. Discuss thoroughly the ultrasound procedures and findings in:
  - i. Gallbladder/biliary tree ultrasound (cholelithiasis/cholecystitis)
  - ii. Renal ultrasound (obstruction/renal failure/renal artery stenosis)
  - iii. Pelvic ultrasound (ectopic pregnancy)
  - iv. Cranial ultrasound (intracranial hemorrhage-neonatal head ultrasound)
  - v. Duplex Doppler (venous thrombosis of extremities/arterial disease extremities)
2. Discuss the basic ultrasound physics and instrumentation, especially related to equipment operation and the specifications for various probes.
3. Describe, from observation, the technique used to perform each of the routinely performed procedures.
4. Demonstrate thorough knowledge of the ultrasound procedure through performing or assisting the sonographer with performance of the following Studies:




---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

- i. Liver/biliary tree (biliary obstruction/tumors)
- ii. Pancreas (acute and chronic inflammatory process/tumors)
- iii. Renal (transplant rejection/Doppler, tumors and inflammatory processes)
- iv. Pelvis (uterine leiomyoma/ovarian neoplastic and non-neoplastic diseases)
- v. Cranial ultrasound (hydrocephalus/cerebral ischemia and infarction)
- vi. Duplex Doppler (duplex sonography of carotids and abdominal duplex)
5. Given the appropriate sonograms, identify and discuss significant characteristics of the pathologies listed in #1 above.
6. Discuss all aspects of ultrasound imaging, including indications, pathology, and correlative studies used for each examination.

*Technical Skills:* The resident should be able to:

1. Review histories of patients to be examined each day to determine the relevance of the study to clinical symptoms.
2. Record a pertinent history of the patient on the ultrasound worksheet.
3. Advise the technologist about special views or specific parameters of the study that require special attention.
4. Assist with the preparation and presentation of a noon ultrasound conference.
5. Review all scans as they are performed for significant findings that require prompt attention.
6. Assist with preparation/presentation of cases for an ultrasound/imaging conference.
7. Review and dictate with attending radiologist all scans performed.

*Decision-Making and Value Judgment Skills:* The resident should be able to:

1. Given an ultrasound case, make a preliminary review of the images and advise the technologists when additional views or repeat views are needed.
2. Make decisions in regard to notification of the referring physician if attending radiologist is not available for consultation.
3. Read and/or dictate images under the supervision of attending radiologist.
4. Make preliminary decisions on all matters of image interpretation and consultation and recognize the need to obtain immediate assistance in situations that require the expertise the attending radiologist.

**PEDIATRIC RADIOLOGY - Rotation 1**



---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

*Knowledge Based Objectives:* At the end of the rotation, the resident should be able to:

1. Identify normal/abnormal airways on chest radiograph of the infant or older child.
2. Identify abnormalities associated with congenital heart disease on the chest radiograph of the infant/older child.
3. Identify normal vs. abnormal skeletal structures (esp. extremities on a bone survey).
4. Describe the proper procedure for fluoroscopy of an infant/older child.
5. Establish bone age on the basis of radiographic findings.

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

1. Recognize limitations in personal knowledge and skills, being careful to not make decisions beyond the level of personal competence.

*Decision-Making and Value Judgment Skills:* At the end of the rotation, the resident should be able to:

1. Make preliminary review of outpatient and pediatric ICU images and discuss findings with attending radiologist, then dictate as directed.
2. Assist the technologist in preparation of the patient for fluoroscopic examination (e.g., enemas, etc.)
3. Assist with preparation and presentation of cases.
4. Sit in on all reading sessions with the attending radiologist, including pediatric ICU and occasionally neonatal ICU.

### **PEDIATRIC RADIOLOGY - Rotation 2**

*Knowledge Based Objectives:* At the end of the rotation, the resident should be able to:

1. Describe positioning techniques and technical factors leading to optimum chest, abdomen, GI and GU radiographs of the infant and older child.
2. Establish bone age on the basis of radiographic findings.
3. Add to knowledge base in chest radiology and congenital diseases of the heart through continued reading of images and case reviews.

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

1. Determine bone ages and dictate findings.
2. Perform fluoroscopic procedures with the assistance of attending radiologist.




---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

3. Dictate images (esp. chest, abdomen, GI, GU) with assistance of the radiologist.
4. Assist with preparation and presentation of cases.

*Decision-Making and Value Judgment Skills:* At the end of the rotation, the resident should be able to:

1. Review PICU and NICU images as they are done for completeness of study and for significant findings that require prompt attention and make decision in regard to notification of the referring physician if attending radiologist is not immediately available for consultation.
2. Recognize limitations in personal skill and knowledge, always making sure dictations and consultations are checked by attending radiologist.

### **PEDIATRIC RADIOLOGY - Rotation 3**

*Knowledge Based Objectives:* At the end of the rotation, the resident should be able to:

1. Identify normal vs. abnormal findings on skeletal, skull (and contents), and spine images.
2. Add to knowledge base in all areas of pediatric radiology through continued study, review of ACR cases and image reading.

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

1. Perform fluoroscopic exams except when complications are anticipated.
2. Review and dictate, under supervision of attending radiologist, pediatric outpatient and inpatient images and PICU and NICU images, making sure all work is checked by attending radiologist prior to final reporting.

*Decision-Making and Value Judgment Skills:* At the end of the rotation, the resident should be able to:

1. Make preliminary decisions on all matters of image interpretation and consultation, recognizing and obtaining assistance with situations that require the expertise of attending radiologist.

### **MAMMOGRAPHY**

*Knowledge Based Objectives:* The resident should be able to:

1. Given a mammogram, identify normal vs. abnormal anatomic structures.




---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

2. Discuss technical and physical factors unique to the production of a mammogram.
3. Make a preliminary review of mammogram images and advise the technologist on the need for additional films.
4. Be able to establish a plan for follow-up protocol for probably benign lesions.
5. Select cases for ultrasound examination.
6. Interpret ultrasound examinations.
7. Be aware of federal laws regarding MQSA, certification, etc.

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

1. Read and dictate mammograms after review by the attending radiologist.
2. Assist with and perform needle biopsies and localizations of breast masses and calcifications.
3. Select lesions appropriate for stereotactic core biopsy. Perform same with supervision.
4. Perform directed breast ultrasound and ultrasound guided biopsies with technologist's assistance.

*Decision-Making and Value Judgment Skills:* The resident should be able to:

1. Recognize limitations in personal skill and knowledge, always making sure decisions, dictations, and consultations are checked by attending radiologist.

### **NEURORADIOLOGY**

*Knowledge Based Objectives:* The resident should be able to:

1. Given normal neuro images, demonstrate a proficient knowledge of the anatomy of the head and neck, spine, and central nervous system.
2. Discuss the basic principles of CT and MRI physics.
3. Describe, in considerable detail, CT and MR imaging protocols.
4. Given an appropriate abnormal image, recognize basic neuropathology and give a differential diagnosis.
5. Given appropriate images, demonstrate a thorough knowledge of the vascular anatomy of the central nervous system.
6. Given appropriate neuroradiology images, develop an accurate differential diagnosis.
7. Demonstrate increased ability to recognize pathology and discuss a differential diagnosis.



---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

8. Discuss criteria for modifying studies, depending on the expected pathology or angiographic abnormalities.

*Technical Skills:* The resident should be able to:

1. Screen, prescribe, and supervise routine neuroimaging procedures.
2. Supervise and screen imaging patient sedations.
3. Demonstrate proficiency in performance and interpretation of cervical, thoracic and lumbar myelograms.
4. Demonstrate proficiency as an assistant angiographer for routine neuroangiography.
5. Dictate neuroimaging studies after review with attending radiologist.
6. Screen, prescribe, and supervise, with an increasing level of responsibility, most neuroimaging procedures.
7. Conduct, with guidance from the attending radiologist, pre-angiographic patient consultation and post procedure patient follow-up.
8. Perform with increasing levels of skill in myelography and angiography.
9. Demonstrate increasing ability to accept responsibility for performance and supervision of neuroradiologic procedures.

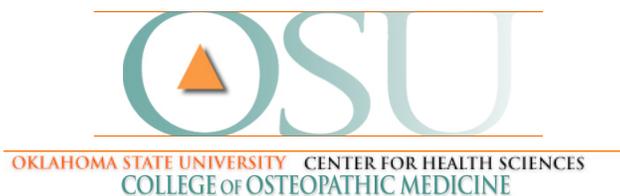
*Decision-Making and Value Judgment Skills:* The resident should be able to:

1. Interact with primary care physicians and neurologists in consultation when more common pathologies are at question.
2. Perform, in a responsible manner, pre-angiography patient consultations and post procedure patient follow-ups, identifying patient conditions that require specific action on the part of the angiography team.
3. Consult, with increasing confidence, with primary care physicians and neurologists in regard to most neuroimaging procedures.
4. Make decisions to modify a neuroangiographic procedure when unexpected pathology or angiographic abnormalities occur, then follow through with the performance and supervision of the procedure.
5. Make decisions based on patient conditions when consulting with the patient pre- or post procedure.

### **NUCLEAR MEDICINE**

*Knowledge Based Objectives:* The resident should be able to:

1. Demonstrate a thorough knowledge of the clinical indications, general procedures (including radiopharmaceutical and dose), and scintigraphic findings in:
  - i. Pulmonary (emboli) ventilation and perfusion imaging



---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

- ii. Hepatobiliary imaging and functional studies
  - iii. GI blood loss imaging
  - iv. Bone imaging
2. Discuss the basic physical principles of nuclear medicine imaging and instrumentation.
3. Identify the isotopes (including physical and chemical properties) that are used routinely in the compounding of radiopharmaceuticals for nuclear radiology procedures.
4. Demonstrate a thorough knowledge of the clinical indications, general procedures (including radiopharmaceutical and dose) and scintigraphic findings in:
  - i. Renal and urinary tract studies
  - ii. Liver/spleen imaging
  - iii. GI tract imaging and functional studies
  - iv. Thyroid imaging and functional studies
  - v. Brain imaging and functional studies
  - vi. Tumor (PET/CT) and abscess imaging
5. Identify and discuss indications for isotopes used for therapeutic purposes.
6. Describe the protocol for using I-131 for treatment of hyperthyroidism and thyroid malignancies, including protocol for hospitalization and monitoring of patients who have on monitoring more than 7mCi/h and are unable to follow guidelines for release. Patients need to be able to answer yes to all of the questions.
7. Identify normal and abnormal findings on all imaging and functional studies, other than nuclear cardiology studies.
8. Discuss all aspects of nuclear studies, including indications, pathologies, protocols, correlative studies, radiopharmaceuticals used for each study, and various parameters that might interfere with the results of the procedure.
9. Demonstrate a thorough knowledge of the clinical indications, general procedures, and findings in:
  - i. Myocardial perfusion studies (rest and stress)
  - ii. Myocardial infarct imaging
  - iii. Multigated acquisition imaging and function studies
10. Describe the radiopharmaceuticals used in cardiac nuclear studies, including the methods of red cell labeling, patient dosages, and physical properties of the isotopes.
11. Discuss patient conditions and patient monitoring requirements, particularly in relation to exercise and drug stress studies.
12. Process computer data obtained in each of the different cardiac studies.



---

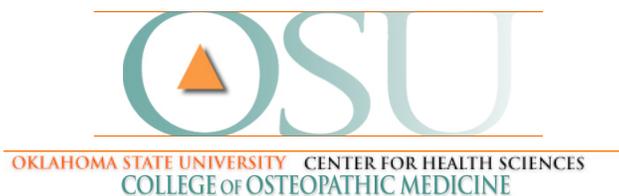
744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

13. Discuss the range of invasive and noninvasive tests, test characteristics, and the prognostic value of tests used to evaluate cardiac disease.
14. Discuss the following information regarding all radiopharmaceuticals used in nuclear radiology studies:
  - i. Production of isotopes
  - ii. Physical properties of isotopes
  - iii. Generation, elution and quality control
  - iv. Compounding of radiopharmaceuticals
  - v. Radiochemical quality control
  - vi. Biodistribution and mechanisms of localization.
15. Describe the procedures and rationale for instrument quality control in nuclear medicine.
16. Discuss rules and regulations that apply to the practice of nuclear radiology as outlined in 10CFR20 and other appropriate sources.
17. Describe the types of records that must be maintained in order to comply with federal/state guidelines for radiation safety and radioisotope receipt/use/disposal.
18. Demonstrate an in-depth understanding of the physics of nuclear radiology.

*Technical Skills:* The resident should be able to:

1. Recognize limitations in personal knowledge and skills, being careful to not make decisions beyond the level of personal competence.
2. Read and/or dictate images under the supervision of attending radiologist.
3. Assist with radioactive therapy treatments, making sure the consent form is completed properly and that the appropriate dose is administered, giving particular attention to radiation safety practices during the procedure.
4. Assist with preparation/presentation of cases for resident noon interesting case review.
5. Review and dictate with attending radiologist all scans performed.
6. Review cases.
7. Compound radiopharmaceuticals from kits and do appropriate quality control procedures.
8. Elute a generator and do appropriate quality control procedures.
9. Calculate and draw up patient doses.
10. Demonstrate appropriate use of a survey meter to monitor radioactivity spills or other sources.



---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

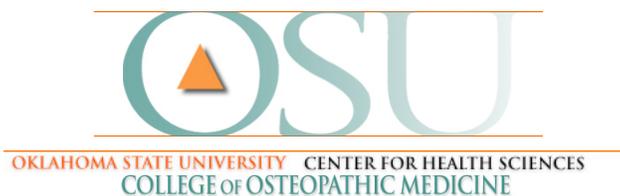
## Residency Syllabus

11. Perform a wipe test.
12. Perform quality control procedures on cameras, well/uptake probes, and dose calibrators.
13. Handle radioactive sources according to the established guidelines.

*Decision-Making and Value Judgment Skills:* The resident should be able to:

1. Review histories of patients to be imaged each day to determine the relevance of the study to clinical symptoms, to evaluate for contraindications to the study, and to advise technologists about special views or specific parameters of the study that require special attention.
2. Assist technologists in the determination of the radiopharmaceutical dosage when patient conditions do not fit the criteria of the standard dose.
3. Observe at least one of each of the different scans routinely performed, as well as all the infrequently ordered studies.
4. Make a preliminary review of the images and advise technologists when additional views or repeat views are needed.
5. Recognize limitations in personal skill and knowledge, always making sure dictations and attending radiologist checks consultations.
6. Review all scans as they are performed for significant findings that require prompt attention, and make decisions in regard to notification of the referring physician if attending radiologist is not available for consultation.
7. Make preliminary decisions on all matters of image interpretation and consultation, recognizing need for and obtaining assistance in situations that require the expertise of attending radiologist.
8. Comment on anatomical findings, scanning technique, and reasons for doing the study to students in such a way that the students will be able to develop an appreciation for the value of nuclear radiology procedures in patient management.
9. Select tests for evaluation of cardiac disease on the basis of patient condition and clinical symptoms.
10. Correlate the results from various tests with interpretation of nuclear cardiology exams.
11. Carry out the practice of nuclear radiology with due regard to quality control, quality assurance, and radiation safety for the patient and personnel.

### **TRAINING PROGRAM SUMMARY**




---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

### I. **PGY I**

Linked radiology internship in which 3 months out of the 12 months are designated radiology departmental rotations. During the rotations the intern will begin introduction to basic general radiology (plain radiographs) and begin to learn dictation skills and voice recognition. Orientation will occur for the department specifically with the RIS/PACS and voice recognition software. Interns are required when off-service rotations allow for attendance to weekly Physics lectures, weekly Book Club and monthly Journal Clubs.

Additional experience in the 3 months of rotation will include:

- A. Progression in interpretation and dictation to ultrasound, MRI, CT and fluoroscopy.
- B. Performing basic procedures such as ultrasound guided paracentesis and thoracentesis; fluoroscopy procedures; and potential simple CT guided procedures.

### II. **PGY II**

The first three to six months are designed for 3 week block rotations in the departments designated rotation assignments which include Ultrasound, Neuroradiology, Chest, Body, Musculoskeletal, Nuclear Medicine and Fluoroscopy. Mammography and Interventional will be introduced similarly in the last six months of the academic year. Weekend assigned shifts will begin to be assigned beginning three months after the start of the PGYII year and continue thereafter. The following below will occur during this academic year:

- A. Overall operation of department: processing of images, RIS, teaching file
- B. Roentgen technique (positioning)
- C. Roentgen anatomy including cross sectional anatomy
- D. Construction of radiographic equipment
- E. Fluoroscopic technique and practice (GI physiology; Use and abuse)
- F. Radiation physics (diagnostic radiology)
- G. Radiology pathology
- H. Basic science review
- I. Directed reading
- J. Imaging interpretation and rotation in all of the nine subspecialties with the exception of pediatrics.
- K. Journal Club, weekly conferences, and presentations




---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

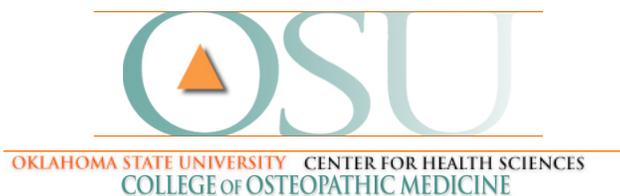
- L. Radiation safety and protection
- M. Resident evaluation conference on quarterly basis with documentation submitted at the end of each year.
- N. Teaching assignments including extern/intern teaching

### **III. PGY III**

- A. Fluoroscopic technique and practice, expanded
- B. Image interpretation, expanded
- C. Surgical correlation
- D. Radiological-Pathological correlation
- E. Continued routine rotations in all of the nine subspecialties that will now include pediatric radiology.
- F. Conferences
- G. Directed reading program continued
- H. Journal club, tumor conferences, other conferences
- I. Radiation safety and protection
- J. Resident evaluation conference on quarterly basis with documentation submitted at the end of each year
- K. Fulfill scientific exhibit requirement
- L. Physics Board exam.
- M. Teaching assignments including extern/intern teaching

### **IV. PGY IV**

- A. Conduct and reporting of procedures
- B. Radiation physics and biology review
- C. Staff consultations
- D. Radiological-Pathological correlation with oncological emphasis
- E. Directed and non-directed reading program
- F. Teaching assignments including extern/intern teaching
- G. Continued routine rotations in all of the nine subspecialties
- H. Fulfillment of exhibit requirement
- I. Staff review and critiques
- J. Journal Club
- K. Quality assurance (medical/legal)
- L. Submit progress reports on research projects
- M. Radiation safety and protection



---

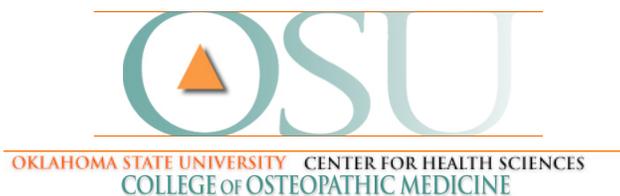
744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

- N. Resident evaluation conference on quarterly basis with documentation submitted at the end of each year.
- O. Written Boards
- P. Option for AIRP attendance.

### **V. PGY V**

- A. Conduct and reporting of procedures
- B. Radiation physics and biology review
- C. Staff consultations
- D. Radiological-Pathological correlation with oncological emphasis
- E. Directed and non-directed reading program
- F. Teaching assignments including extern/intern teaching
- G. Nuclear medicine responsibilities
- H. Continued routine rotations in all of the nine subspecialties
- I. Staff review and critiques
- J. Journal Club
- K. Quality assurance (medical/legal)
- L. Submit progress reports on research projects
- M. Radiation safety and protection
- N. Resident evaluation conference on quarterly basis with documentation submitted at the end of each year.
- O. Oral board examination
- P. AIRP attendance unless attended in PGY IV year.




---

744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

### READING SCHEDULE:

- Book Club: Weekly schedule – see separate attachment for year schedule
  - Fundamentals of Diagnostic Radiology by William E Brant MD and Clyde Helms MD. This book is paid for by Osteopathic Founders and given to the incoming residents. Book is also available in PDF format in the resident shared folder.
- RadPrimer assigned schedule for the PGY1-PGY3 years. This includes the Basic and Intermediate categories in all of the nine subspecialty area in addition to Physics and ACR Appropriateness Criteria. Supplemental weekly tests will be given through RadPrimer for all levels of residents.
- Reading specific assignments for each rotation include:
  - Neuroradiology
    - Neuroradiology: Radiology Requisites Series
  - Musculoskeletal
    - Musculoskeletal: Radiology Requisites Series
    - Musculoskeletal MRI by Clyde Helms, MD
    - Arthritis in Black & White
  - Vascular/Interventional
    - Interventional: Radiology Requisites Series
  - Cardiothoracic
    - Thoracic Radiology: Radiology Requisites Series
    - Thoracic Imaging: Pulmonary and Cardiovascular Radiology by Richard Webb, MD
    - Cardiac Imaging: Radiology Requisites Series
  - Breast Radiology
    - BIRADS 5 Lexicon Book
    - Breast Radiology: Radiology Requisites Series
    - Breast Imaging Companion by Gilda Cardenosa, MD
  - Abdominal (GI/GU)
    - Gastrointestinal Radiology: Radiology Requisites Series
    - Genitourinary Radiology: Radiology Requisites Series
    - Mayo Clinic GI Review
    - Fundamentals of Fluoroscopy by Houston and Davis
  - Pediatric Radiology
    - Fundamentals of Pediatric Radiology by Donnelly
    - Cleveland Clinic Pediatric Tutorial site:
      - <https://www.cchs.net/onlinelearning/cometvs10/pedrad/default.htm>
  - Ultrasonography
    - Ultrasound: Radiology Requisites Series



744 W. 9th Street Tulsa, OK 74127 | Phone: (918) 587-2561

## Residency Syllabus

- Nuclear Medicine
  - Nuclear Medicine: Radiology Requisites Series
  - Essentials of Nuclear Medicine Imaging by Mettler
- Physics Lecture series
  - Lecture schedule separately attached
  - The Essential Physics of Medical Imaging, Third Edition, 2011
  - Review of Radiologic Physics, 3rd Edition, 2009, by Walter Huda MD
- All books and many more supplemental subspecialty books are available in the Reading Room Library; Resident Shared drive in PDF format and Statdx.

### **DIDACTIC CURRICULUM**

- The nine subspecialty areas designated are further taught with didactics that are arranged primarily around the Book Club topic schedule. Didactics come in the form of Faculty or Resident lectures, Case (Film) Conference, Educational Media Series and routine AOCR distant learning lecture.
- Educational Media Series utilized currently:
  - CT is US video podcast lecture series
  - CME Video Series
    - Pediatric Musculoskeletal Imaging: Beyond the Basics
      - 33 lectures
    - Pediatric Radiology: Comprehensive Imaging
      - 112 lectures
    - UCSF Radiology Review: Comprehensive Imaging
      - 77 lectures
    - UCSF Neuro and Musculoskeletal Imaging
      - 34 lectures
    - Thoracic Radiology
      - 100 lectures
    - Neuroradiology Review by Johns Hopkins
      - 47 lectures
    - Atlas & Som: A Case Oriented Tutorial on Neuroradiology and Head and Neck Imaging
      - 25 lectures
    - Clinical Breast Imaging
      - 24 lectures
    - Breast Tomosynthesis & Screening Breast Ultrasound
      - 19 lectures