OVERVIEW

Medical students in the fourth year of training are refining their skills and knowledge base required to evaluate and treat patients. They should display competence in performing the history and physical, differentiate between normal and pathologic findings, present a case in an organized manner, develop a differential list, select appropriate diagnostic tests, and begin to develop cost effective management plans, which incorporate health education and referral (if necessary). With guidance from the preceptor, students should have the opportunity to independently evaluate patients and practice clinical problem solving.

This rotation should expose the student to various aspects of the management of patients in a radiology department. These experiences should include reading, lectures, seminars, and patient care management.

GOALS

The goals of the radiology rotation are to:

1) Provide the student with a fundamental knowledge base in radiology.

2) Introduce the student to basic procedures relevant to the practice of radiology.

3) Facilitate an understanding of the approach to clinical problem solving in radiology.

4) Promote the acquisition of simple basic skills for the diagnosis, management, and prevention of common simple emergencies.

5) Encourage the continued development of the student’s professional attitude and behavior.
LEARNING OBJECTIVES

Learning objectives for the radiology rotation relate to the following areas: a) cognitive knowledge; b) psychomotor skills; c) problem solving; and d) professional development.

Reading assignments are indicated by objective. Reference books are listed after the objectives. Refer to the reading list for the full citation of reference books. In the event that an objective does not list a reading assignment, students must independently supplement their reading.

By the end of the radiology rotation, the student is expected to have achieved, at a minimum, the following objectives through reading, conference attendance, observation, discussion, and hands-on clinical experience (the preceptor may choose to add objectives/requirements):

I. TOPICS (in alphabetical order)

1. Abdominal radiographs
   A. Describe the significance of a stepladder gas pattern.
   B. Identify ileus on plain abdominal film.
   C. Describe two ways to demonstrate free air in the abdomen on a radiograph.
   D. Analyze the appearance of a mechanical small bowel obstruction on a radiograph.

2. Chest radiographs
   A. Define cardiothoracic ratio.
   B. Describe lobar pneumonia.
   C. List the differential diagnosis of pleural effusion.
   D. Describe the radiographic findings of emphysema.
   E. Describe the radiographic findings consistent with a pulmonary embolism.
   F. Describe the radiographic findings of a pneumothorax.
      1) State the differential diagnosis of a pneumothorax.
      2) Define tension pneumothorax.
      3) Define the criteria for chest tube placement.
      4) Describe the radiographic appearance of a pneumothorax.
      5) Describe the treatment of a pneumothorax.
   G. State the indications and contraindications for chest radiographs.
   H. Identify the radiographic signs of congestive heart failure.
   I. List the five most common causes of pulmonary edema.
   J. Define atelectasis.
   K. Explain how atelectasis is diagnosed.
   L. Present treatment plans for atelectasis.
   M. List ten causes of pleural effusion.
   N. Describe ways to differentiate the causes of pleural effusion.
TOPICS (in alphabetical order) - Continued

3. **CT scans**
   A. Identify a subdural hematoma on CT.
   B. Describe the appearance of cerebral atrophy on CT.
   C. Describe a cerebral embolus.
   D. Identify the percentage of cerebral emboli visualized by CT.
   E. State other anatomic areas in which a CT scan may assist in a diagnosis.

4. **GI, lower – barium**
   A. Define diverticulosis.
   B. List the areas in the colon in which diverticulitis most commonly occurs.
   C. Describe an “apple core” defect and its significance.
   D. Describe the benefits (if any) of air contrast barium studies in the colon.
   E. State the indications and contraindications for barium colon studies.

5. **GI, upper – barium**
   A. Identify the three normal narrowings of the esophagus.
   B. Evaluate the appearance of gastritis on radiograph.
   C. Explain how a hiatal hernia is diagnosed radiographically.
   D. Evaluate the appearance of peptic ulcer disease on radiograph.
   E. State the indications and contraindications for upper GI barium studies.

6. **Intravenous pyelography**
   A. Define hydronephrosis.
   B. List the percentage of renal stones that calcify.
   C. Describe the method for visualizing a renal cyst.
   D. State the normal size of the kidney for the adult male and female.
   E. List the differential diagnosis of a delayed nephrogram phase on the IVP.
   F. State the indications and contraindications for intravenous pyelography.

7. **MRI scans**
   A. Explain why MRI visualizes brain stem lesions better than CT scans.
   B. Describe the appearance of multiple sclerosis on MRI.
   C. List other anatomic areas in which MRI is being used to assist in diagnosis.
TOPICS (in alphabetical order) - Continued

8. Nuclear medicine studies
   A. Describe the normal ejection fraction of the heart.
   B. Explain the purpose of a Hepatobiliary Scan.
   C. Explain the purpose of a Ventilation-Perfusion Scan.
   D. State the indications for thyroid scans.
   E. State the indications for renal scans and flow studies.

9. Skeletal radiographs
   A. Describe the appearance of a Colles fracture.
   B. List the type of force that causes a Colles fracture.
   C. Demonstrate the use of the Salter-Harris classification of fractures.
   D. Classify hip fractures.
   E. Define “nonunion of a fracture” and describe its consequences.

10. Ultrasound studies
    A. Describe the migration of the placenta during pregnancy.
    B. Define benign prostatic hypertrophy and evaluate its accuracy.
    C. Explain the easiest way to determine ascites.
    D. Describe the ultrasonography appearances of cholelithiasis.
    E. Identify the stages at which ultrasound is most accurate and least accurate in determining fetal age.

II. For the following emergency conditions (the preceptor may add to the list), the student will be able to select appropriate diagnostic tests:

1. Acute cerebrovascular accident
2. Acute cardiac arrest
3. Acute congestive heart failure
4. Acute respiratory failure – respiratory failure
5. Anaphylaxis
6. Aortic dissection
7. Coma
8. Diabetic ketoacidosis
9. Massive gastrointestinal bleeding
10. Myocardial infarction
11. Pulmonary embolism
12. Renal failure, acute and chronic
13. Sepsis
14. Shock
15. Status asthmaticus
16. Tension pneumothorax
III. The student will be able to recognize the following procedures (the preceptor may add to the list) and analyze the characteristics which make these procedures important:

1. Bone mineral density studies for the diagnosis and monitoring of osteoporosis.

2. CT images versus MRI images for neurologic diagnoses.

3. CT images versus MRI images for orthopedic diagnoses.

4. Nuclear medicine studies for evaluation of abdominal and musculoskeletal complaints.

5. Nuclear medicine studies versus ultrasound studies for the evaluation of abdominal complaints.

6. Ultrasound studies versus CT scans for evaluation of abdominal complaints.

IV. Other Service-Specific Learning Objectives

1. Angiography
   A. List the preparation necessary for an angiogram.
   B. Explain why blood work is/is not always necessary.
   C. List the laboratory tests needed prior to an angiogram.
   D. Describe Digital Subtraction Angiography (DSA) and explain why it is used.
   E. State current indications for angiography of the carotid arteries, coronary vessels, renal vessels, lower and upper extremities.

2. Computerized Tomography (CT) scans
   A. Describe the energy source utilized in CT to produce the images.
   B. Describe the potential harm to the patient associated with CT scans.
   C. Describe the patient preparation necessary for a CT scan of the head, chest, abdomen, or pelvis.

3. General diagnostic radiology (fluoroscopy, IVP, plain films, etc.)
   A. List the level of x-ray exposure to the patient for each of the following x-ray studies:
      1) Upper GI
      2) Barium colon
      3) Intravenous pyelogram
      4) PA and lateral chest
      5) Lumbar spine series
General diagnostic radiology (fluoroscopy, IVP, plain films, etc.) - Continued

B. Describe any potential harm to the patient associated with general x-ray studies.
C. List the patient preparation necessary for:
   1) Upper GI
   2) Barium colon
   3) Intravenous pyelogram
   4) PA and lateral chest
   5) Lumbar spine series
D. Describe tomography

4. **Magnetic Resonance Imaging (MRI)**
   A. Describe the energy sources used to develop an MRI image.
   B. Compare the patient safety of an MRI to a CT study.
   C. Explain the advantages of MRI over CT images, especially for the head and neck.

5. **Mammography** outline the recommended mammographic examination time table for a female by the American Cancer Society and the AOCR.
   A. Describe any potential harm to the patient associated with mammography.
   B. List the views needed to perform an adequate study.

6. **Nuclear medicine procedures**
   A. Describe 99mTc.
   B. Explain how a gamma camera utilizes radiation to produce an image.
   C. List the words for the acronym SPECT.

7. **Radiation therapy**
   A. Describe how irradiation destroys tumor cells.
   B. Compare the level of radiation delivered by a 1 MEV linear accelerator to a diagnostic chest x-ray.
   C. Given the description of a case, calculate the number of treatments necessary for a radiosensitive lung tumor.
   D. List the side effects of radiation therapy.

8. **Ultrasound examinations**
   Describe the ultrasound energy form.
   A. List the biological effects of exposure to ultrasound energy and their potential for harm to the patient.
   B. Describe the patient preparation necessary for an ultrasound examination.
VII. Required Reading

Students are expected to complete the required reading assignments by the end of the rotation. Readings are assigned by objective and are taken from the following sources:


X. Suggested Reference Books
