

Objectives* for Undergraduate Medical Imaging

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The numerical ranking in parenthesis following each learning objective represents the Bloom's Taxonomy "level".

1 = Knowledge; 2 = Comprehension; 3 = Application; 4 = Analysis; 5 = Synthesis; 6 = Evaluation

General

List clinical scenarios in which Radiology is particularly important in diagnosis, management, and / or delivery of patient care (1)

Physics Concepts & Modality Differences

- Define terms commonly used in radiology reports including: lucency, opacity, attenuation, Hounsfield units (HU), hyperechoic, hypoechoic, signal (1)
- Categorize different tissues from most to least opaque on x-ray including: bone, soft tissue, air, metal, and fat. (3)
- Compare and contrast the benefits and limitations of different radiologic modalities including: Plain film, CT, Ultrasound, MR, Nuclear medicine (4)

Radiation Safety

- List risks associated with radiation exposure (1)
- List two modalities with no proven risk to the fetus in a pregnant patient (1)
- Describe the impact of patient age on radiation sensitivity (2)
- Compare the relative radiation dose delivered by different imaging modalities and contrast these with annual rates of background radiation exposure (4)

Contrast Uses and Safety

- Distinguish between the different types of contrast used in imaging exams and the potential diagnostic benefits of each (4)
- Discuss the potential complications of intravenous contrast administration for CT and MR exams and identify predisposing risk factors (2)
- Describe different methods for reducing the risk of contrast nephropathy (2)
- Summarize risks and contraindications unique to MR examinations (2)
- Describe the specific circumstances in which a multiphase CT ("with and without contrast") may be useful and list reasons why this type of scan is not performed routinely (2)
- Discuss the use of iodinated and gadolinium contrast in pregnant patients (2)

Orientation to the Radiology Department

- Describe the procedure for ordering a radiologic exam at your institution (2)
- Summarize the categories of critical information that must be included on an imaging exam requisition (2)
- State the difference between a preliminary or "wet" read and the final radiologic report (1)
- Predict types of imaging findings that would be reported directly to the ordering physician versus those which would appear only in the transcribed radiologic report (4)

Chest Imaging

- Employ a systematic search pattern for interpreting chest x-rays (3)
- Recognize normal anatomic structures of the chest on imaging exams and become familiar with the range of normal appearances (1)
- Identify the different CXR views and describe when they are helpful, as well as the limitations of each (1)
- List different types of pathologies that can produce an “opacity” on chest x-ray (1)
- Identify consolidation on CXR and formulate a differential diagnosis for the appearance (1)
- Discuss CXR findings that may help characterize a lung opacity as atelectasis (2)
- Recognize a pleural effusion at CXR on supine, upright, and decubitus films (1)
- Describe signs of a pneumothorax at CXR (2)
- Differentiate between pulmonary vascular congestion, interstitial pulmonary edema, and alveolar edema on CXR (3)
- Discuss the criteria for diagnosis of cardiomegaly on CXR (2)
- Compare the conspicuity of chest “masses” on CXR and CT (4)
- Recognize the correct positioning of feeding tubes, venous lines and endotracheal tubes on chest x-ray, and likewise recognize incorrect positioning (1)
- List several clinical scenarios in which imaging of the chest can be used to guide procedures (1)
- Contrast the accuracy of a V/Q scan and PE protocol CT for diagnosis of pulmonary embolism (2)
- Construct the appropriate imaging algorithm for common diagnostic scenarios including: suspected pneumonia, suspected pulmonary embolism, solitary pulmonary nodule, lung cancer staging, screening for metastasis, suspected aortic dissection (5)

Abdominal Imaging

- Use a systematic search pattern for interpreting an abdominal plain film (3) Recognize abdominal organs on cross sectional imaging studies (1)
- Recognize the correct and incorrect positioning of feeding tubes (1)
- Discuss the role of abdominal ultrasound in the assessment of an acute trauma patient (2)
- Review criteria for performing CT in trauma patient (2)
- Describe what a patient experiences during a gastrointestinal fluoroscopic procedure (2)
- Recognize free intra-abdominal air on plain film and describe how patient positioning may affect sensitivity for its detection (1)
- Differentiate between dilated small bowel and large bowel on plain film (4)
- Identify clinical scenarios where abdominal imaging might be used to guide procedures (1)
- Describe what occurs during a gastric emptying study (2)
- Describe clinical scenarios where GI endoscopy would be more appropriate than a fluoroscopic radiologic procedure (2)
- Construct the appropriate imaging algorithm for common diagnostic scenarios including: renal colic, suspected appendicitis, hematuria, right upper quadrant pain, pancreatitis, suspected small bowel obstruction, suspected diverticulitis, pelvic pain in a woman (5)

Musculoskeletal Radiology

- Identify and name the major parts of the following bones on x-ray: Humerus, radius, ulna, carpal bones, metacarpals and phalanges, femur, fibula, tibia, tarsal bones, calcaneus, metatarsals, vertebrae, ribs, pelvis, clavicles and scapulae (1)
- Differentiate between the metaphysis, diaphysis, and epiphysis of a long bone on x-ray (2)
- Use proper terminology when describing a fracture (3)
- Explain the significance of intra-articular extension or physeal involvement of a fracture (2)
- Recognize a non-displaced fracture on x-ray (1)
- Explain the importance of multiple x-ray views in fracture diagnosis (2) Identify an elbow joint effusion on x-ray (1)
- Differentiate between anterior and posterior dislocation of the shoulder on x-ray (2)
- Describe clinical scenarios where image guided musculoskeletal procedures may be beneficial (2)
- List common clinical indications for a bone scan (1)
- Recall tumor types that may be associated with a false negative bone scan (1)
- Discriminate between the general types of injuries best evaluated by plain film, CT, or MR (4)
- Construct the appropriate imaging algorithm for common diagnostic scenarios including: chronic joint pain or suspected arthritis, chronic back pain, acute back pain, trauma, neck trauma, occult hip fracture, suspected osteomyelitis, screening for metastatic disease (5)

Vascular and Interventional Radiology

- Explain what takes place during an imaging guided biopsy in terms a patient would understand (2)
- Relate indications for placement of an IVC filter (1)
- List laboratory studies that are often required prior to an interventional radiology procedure (1)
- List benefits and limitations of the following types of angiographic studies: CTA, MRA, conventional angiogram (1)
- Identify emergent clinical scenarios where image-guided procedures may be beneficial (1)
- Describe how different imaging modalities are used to guide procedures and list one or two clinical scenarios where each (ultrasonography, fluoroscopy, CT, MRI) is used (2)
- Describe the ultrasound findings of deep venous thrombosis (DVT) (2)
- Explain why ultrasound is a good modality for assessing vascular structures (2)
- List diagnostic and therapeutic procedures that are commonly performed with ultrasound guidance (1)
- Construct the appropriate imaging algorithm for common diagnostic scenarios including: Suspected aortic aneurysm, peripheral vascular disease, renal artery stenosis, carotid stenosis, GI bleed, bowel ischemia (5)

Women's Imaging

- Explain how a mammogram is performed in terms a patient would understand (2)
- Differentiate between CC and MLO positing on a mammogram (2)
- Explain the rationale for breast compression in mammography (2)
- Compare the role of screening mammography vs. diagnostic mammography (4)
- List the indications for a diagnostic mammogram (1)
- Summarize the risks and benefits of screening mammography (2)
- Discuss current recommendations for screening mammography (2)
- Describe the utility of ultrasound in the work-up of a breast mass (2)
- List potential indications for breast MR (1)
- Name the most common indication for a hysterosalpingogram (1)
- Explain the advantages of transvaginal ultrasonography compared to a transabdominal pelvic ultrasound (2)
- Schedule fetal ultrasounds at the appropriate diagnostic intervals (3)
- Estimate the accuracy of ultrasound for pregnancy dating (2)
- Describe the limitations of ultrasound for prenatal diagnosis (2)
- Construct the appropriate imaging algorithm for common diagnostic scenarios including: First trimester vaginal bleeding, post menopausal vaginal bleeding, female pelvic pain, staging of gynecologic malignancies (5)

Neuroradiology

- Identify normal anatomic structures of the head and neck, brain, and spine on imaging exams and compare the degree of anatomic detail between CT and MR (1)
- Recognize normal age related changes in the brain at imaging
- Describe the strengths, weaknesses and limitations of CT vs. MRI in the evaluation of patient's with central neurologic symptoms and diseases (1)
- Recognize abnormal spinal-laminar alignment of the cervical spine at x-ray (1)
- List some indications for contrast enhanced MRI and CT (1)
- Recognize imaging signs of increased intracranial pressure (1)
- Discriminate between a subdural and epidural hematoma at CT (4)
- Describe imaging signs of a subarachnoid hemorrhage (2)
- Name a therapeutic use of nuclear medicine (1)
- Construct the appropriate imaging algorithm for common diagnostic scenarios including: suspected stroke, suspected subarachnoid hemorrhage, head trauma, spine trauma, facial trauma, metastatic disease to the CNS, seizures, dementia, brain tumor follow up, sinus disease (5)

Pediatric Radiology

- Discuss challenges specific to imaging children and how these may affect choice of imaging modality (2)
- Contrast normal anatomy on a chest x-ray of an infant compared to an adult (2)
- Recognize growth plates as a normal finding (1)
- Explain the significance of physeal involvement of a fracture (2)
- List types of injuries that should raise suspicion for non-accidental trauma (1)
- Describe the process of and indications for performing a voiding cystourethrogram (VCUG) (1)
- Construct the appropriate imaging algorithm for common diagnostic scenarios including: Suspected pyloric stenosis, intussusception, vomiting, suspected testicular torsion, and joint pain or limping (5)