

MUSCULOSKELETAL RADIOLOGY CURRICULUM

Goals and Objectives: Musculoskeletal

It is anticipated that the resident will have rotations totaling at least 4 weeks during each academic year. When a resident has additional time in MSK, either at their request or at the recommendation of the staff, the goals and objectives of Rotation IV will apply, but may be tailored to the education needs and goals of the resident in consultation with the MSK Staff.

The six Core Competencies will be evaluated during all musculoskeletal rotations. The residents are expected to progress in these competencies as training progresses. PGY2 residents will be introduced to the competency milestones and demonstrate incorporation of these principles into daily work. As residency proceeds, the upper level PGY4-5 residents should be able to model these competencies for medical students and junior residents and work toward achieving the Level 4 ACGME Milestones. Detailed expectations for the Medical Knowledge and Patient Care Core Competencies are discussed in the specific training year rotations. The remaining four Core Competencies are addressed here with the same expectations, unless otherwise noted, for all training levels.

Practice-Based Learning and Improvement

Residents must be able to investigate and evaluate their patient care practices, appraise and assimilate scientific evidence, and improve their patient care practices. Residents are expected to:

- Apply knowledge of study designs and statistical methods to the appraisal of clinical studies and other information on the diagnostic effectiveness of plain films, CT, MRI, fluoroscopic procedures and ultrasound and their role in the clinical care of the patient
- Use information technology to manage information, access on-line medical information, and support their own education
- Facilitate the learning of students and other health care professionals (medical students, residents from other disciplines, and undergraduate students will periodically rotate through MSK)
- Locate, appraise, and assimilate evidence from scientific studies
- **Maintain a personal procedure log**
- Demonstrate knowledge and use of medical informatics in patient care and education

Assessment

- Global ratings by faculty
- 360 degree assessment by Core supervising technologist
- Evidence of accomplishments in the learning portfolio
- RadExam
- Univ of Florida Call Simulation (R1 and R2)

Interpersonal and Communication Skills

Residents must be able to demonstrate interpersonal and communication skills that result in effective information exchange with technologists, referring physicians, and other medical personnel. Residents are expected to:

- Work professionally and effectively with other health care professionals, including technologists, secretaries, schedulers, nurses, students, residents, and physicians
- Interact effectively and sensitively with patients, and with family members of patients, by greeting them appropriately, introducing themselves and their role, explaining the procedure to be performed, allowing them an opportunity to ask questions, obtaining informed consent when indicated, and discussing results as indicated
- Communicate findings effectively with the referring clinicians
- Communicate and document the communication of critical findings with the appropriate medical personnel in a timely fashion
- Learn the ACR standards and guidelines for communication (acr.org).
- Provide direct communication to the referring physician when there is an urgent or unexpected finding and document this communication in the radiology report.

Assessment

- Global ratings by faculty
- 360 degree evaluation
- Evidence of accomplishments in the learning portfolio

Professionalism

Residents must demonstrate a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse patient and professional population. Residents are expected to:

- Demonstrate respect, compassion, and integrity
- Display appropriate grooming and dress habits
- Maintain an appropriate professional demeanor and bearing
- Demonstrate a commitment to excellence and on-going educational and professional development
- Demonstrate a commitment to ethical principles pertaining to provision or withholding of clinical care, confidentiality of patient information, and business practices
- Demonstrate sensitivity and responsiveness to patients' culture, age, gender, and disabilities
- Serve as a role model for other radiology residents, medical students, and residents in other specialties.

Assessment

- Global ratings by faculty
- 360 degree evaluation

- Attendance at rheumatology conferences with logs as necessary
- Evidence of accomplishments in the learning portfolio

Systems-Based Practice

Residents must demonstrate an awareness of and responsiveness to the larger context and system of health care and the ability to effectively call on system resources to provide care that is of optimal value. Residents are expected to:

- Understand how their professional practice affects other health care professionals, the health care organization and the larger society, and how these elements affect their own practice
- Assist referring clinicians in providing cost-effective health care
- Practice cost-effective health care and resource allocation that does not compromise quality of care
- Be prepared to evaluate the request for imaging as regards cost, effectiveness, and appropriateness, and to facilitate performance of an alternative study if indicated
- Know the charge for routine examinations including MR of the knee, x-ray of the spine, total body bone scan, and CT of the pelvis
- Begin to become familiar with ACR Appropriateness Criteria as it applies to MSK radiology (<http://www.acr.org>)

Assessment

- Global ratings by faculty
- 360 degree evaluation
- Evidence of accomplishments in the learning portfolio

FIRST YEAR ROTATIONS

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

1. Discuss basic bone physiology.
2. Describe the radiographic manifestations that allow for distinction between different forms of arthritis.
3. Describe the radiographic signs that are used to characterize a tumor of bone.
4. Describe fractures and fracture healing (normal and abnormal).
5. State the indications for Computed Tomography, MRI and bone scans.
6. Describe the imaging protocols for MRI of infection and describe the usefulness of each sequence.

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

1. Identify, with a high level of accuracy, most types of fractures.
2. Recognize the commonly used radiographic projections in musculoskeletal radiology.
3. Identify normal musculoskeletal structures and some of the normal variants.
4. Perform hip, knee and shoulder aspirations and therapeutic injections.
5. Consistently dictate reports that are clear, accurate and actionable.

Decision-Making/Value Judgment Skills: At the end of the rotation 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, plain film, or nuclear imaging.
2. Given a radiograph of a healing fracture, determine the stage of bone healing and identify complications, if present.

Patient Care Competency

Residents must be able to provide patient care that is compassionate, appropriate, and effective for the diagnosis and treatment of health problems.

- Communicate effectively
- Demonstrate caring and respectful behaviors when interacting with patients and their families.
- Gather essential and accurate medical and radiologic history pertinent to the procedure for which the patient is scheduled or for the examination that the patient has had.

- Communicate with the technologists about additional views/sequences/parameters needed to demonstrate pathology.
- Learn to perform hip, knee and shoulder basic diagnostic and therapeutic procedures.
- Work with health care professionals, including those from other disciplines, to provide patient-focused care.

Assessment

- Global ratings by faculty (a consensus MedHub evaluation)
- 360 degree review from Technologists
- Evidence of accomplishments in the learning portfolio

Medical Knowledge Competency

Residents must demonstrate incorporation of practice-based learning and self-learning and apply this knowledge to patient care. During this rotation, residents are expected to:

- Learn the normal musculoskeletal plain film anatomy
- Establish a search pattern to interpret plain radiographs and CTs of the musculoskeletal system
- Learn the radiographic manifestations of common disease entities, specifically trauma, arthritis, bone tumors and infection.
- Evaluate orthopedic follow-up imaging and discuss the imaging findings of post-operative orthopedic hardware complications.
- Demonstrate knowledge of levels of ionizing radiation related to specific imaging modalities and procedures techniques to minimize radiation dose to the patient.
- Be knowledgeable of the indications and uses of contrast media in MSK imaging.
- Know how to obtain consent for contrast by demonstrating knowledge of:
 1. when to use contrast and the different types
 2. how to manage the spectrum of contrast reactions should they occur
 3. how to appropriately administer the contrast agent

Assessment

- Global ratings by faculty (a consensus MedHub evaluation)
- End of rotation oral exam
- RadExam
- Univ of Florida Call Simulation Exam
- Evidence of accomplishments in the learning portfolio

SECOND YEAR ROTATIONS

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

1. Demonstrate competence in the objectives from the first year rotation.
2. Describe patterns of internal derangement of the joints and associated findings on MR, CT and arthrography. This would include primarily the knee and shoulder.
3. Discuss imaging features of infection on XR, CT and MRI.
4. State the radiographic features that differentiate aggressive and nonaggressive bone tumors.
5. Name and describe clinical/pathological/radiological features of metabolic bone diseases.
6. Name and describe clinical/pathological/radiological features of congenital and acquired bone pathologies.
7. Identify common complications of arthroplasty.

Technical Skills: By the end of the rotation the resident should be able to:

1. Given an appropriate radiograph, identify the following categories of bone pathology:
 - a. inflammatory process
 - b. bone tumors
 - c. congenital and acquired diseases
 - d. metabolic diseases
2. Given a radiograph demonstrating bone pathology listed in #1 above and pertinent clinical/pathological information, identify common pathologies in each category.
3. Demonstrate increasing skill in quality and quantity of dictation of musculoskeletal images.
4. Aspirate a hip, knee, or shoulder without assistance
5. Begin ultrasound evaluation of common musculoskeletal complaints

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

1. Given a patient with a musculoskeletal pathology, review radiographs and clinical history, then make a decision about the appropriateness of nuclear medicine, CT, and/or MR imaging.

Patient Care

Residents must be able to provide patient care that is compassionate, appropriate, and effective for the diagnosis and treatment of health problems. Residents are expected to:

- Communicate effectively and demonstrate caring and respectful behaviors when interacting with patients and their families.
- Gather essential and accurate medical and radiologic history pertinent to the procedure for which the patient is scheduled or for the examination that the patient has had.
- Maintain proficiency in MSK procedures done under fluoroscopic guidance.
- Work with health care professionals, including those from other disciplines, to provide patient-focused care.
- Recognize the indications, contraindications, risks, benefits and alternatives of the various MSK studies and procedures.
- Know the indications for and uses of intravenous iodinated contrast material and gadolinium.
- Be able to properly manage a contrast reaction.

Assessment

- Global ratings by faculty (a consensus MedHub evaluation)
- 360 degree review including Supervising Technologists
- Evidence of accomplishments in the learning portfolio

Medical Knowledge

Residents must demonstrate knowledge about established and evolving biomedical, clinical, and cognate sciences and the application of this knowledge to patient care. During this rotation, residents are expected to:

- Learn the normal musculoskeletal plain film, MR, and ultrasound anatomy
- Learn to interpret plain radiographs, CTs, MRIs, and ultrasound of the musculoskeletal system
- Maintain proficiency performing and interpreting MSK fluoroscopic studies
- Learn the radiographic manifestations of common disease entities seen in the above studies
- Be able to protocol MSK CT and MRI examinations. Be familiar with routine MRI protocols for imaging of the most frequently imaged joints
Apply knowledge of basic MRI (principles, artifacts and their correction, and parameter manipulation) to the practice of MRI by observing studies being performed.

Assessment

- Global ratings by faculty (a consensus MedHub evaluation)
- End of rotation oral exam
- RadExam
- Univ of Florida Call Simulation Exam
- Evidence of accomplishments in the learning portfolio

THIRD YEAR ROTATIONS

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

1. Demonstrate competence in the objectives from the first and second year rotations.
2. Describe patterns of internal derangement of the joints and associated findings on MR, CT and arthrography. At this stage in training, this includes the wrist, elbow, hips and ankle in addition to the knee and shoulder.
3. Discuss pertinent positive and negative findings for bone and soft tissue tumors on cross sectional imaging

Technical Skills: By the end of the rotation the resident should be able to:

1. Protocol routine MR examinations including:
 - knee
 - shoulder
 - foot/ankle
 - hand/wrist
 - pelvis/hips
 - soft tissue tumor and infection
2. Demonstrate increasing skill in quality and quantity of dictation of musculoskeletal images.
3. Learn to create MPR and 3D reconstructions of CT data sets with special attention to CT of the fractured pelvis and acetabulum.
4. Maintain proficiency in fluoroscopic guided procedures.

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

Given imaging studies of a patient, discuss the findings and clinical significance clearly and concisely, offer an opinion regarding diagnosis, and suggest appropriate additional imaging if needed.

Patient Care

Residents must be able to provide patient care that is compassionate, appropriate, and effective for the diagnosis and treatment of health problems. Residents are expected to:

- Communicate effectively and demonstrate caring and respectful behaviors when interacting with patients and their families.
- Gather essential and accurate medical and radiologic history pertinent to the procedure for which the patient is scheduled or for the examination that the patient has had.
- Maintain proficiency performing and interpreting MSK fluoroscopic procedures.

- Take Responsibility for all MSK procedures include pre-procedural patient management. This includes review of the patient's history, pre-procedure laboratory values, and imaging studies.
- Obtain informed consent following a discussion with the patient and/or family or representative about the risks, benefits and alternatives of the procedure.
- Write a brief pre-procedure note in the patient record.
- Following the procedure and prior to discharge, evaluate all outpatients and document appropriately in the patient record.
- Identify any complication, discuss it with the MSK attending and document it in the patient record.
- Work with health care professionals, including those from other disciplines, to provide patient-focused care.

Assessment

- Global ratings by faculty (a consensus MedHub evaluation)
- 360 degree review with Core Supervising Technologists' input
- Evidence of accomplishments in the learning portfolio

Medical Knowledge

Residents must demonstrate knowledge about established and evolving biomedical, clinical, and cognate sciences and the application of this knowledge to patient care. During this rotation, residents are expected to:

- Build proficiency and confidence in image interpretation, guiding clinical management and performing MSK image-guided procedures.
- Act as the primary consultant for radiographic and CT evaluation of MSK pathology and for planning of MSK imaging to solve a particular problem.
- Attend Rheumatology conferences and be prepared to discuss recent cases, as well as using the information from conference to tailor patient exams.

Assessment

- Global ratings by faculty (a consensus MedHub evaluation)
- End of rotation oral exam
- RadExam
- ABR Core Exam
- Evidence of accomplishments in the learning portfolio

FOURTH YEAR ROTATIONS

During the final rotations in musculoskeletal radiology, the resident will be expected to function as a junior-fellow/staff. This includes managing workflow throughout the day, responding to consults, completing a higher volume of imaging studies with well-crafted dictations and serving as the first point of contact for junior radiology resident questions. Prior to this rotation, the resident should have background knowledge on a wide spectrum of musculoskeletal anatomy and pathology.

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

1. Describe patterns of internal derangement of the joints and associated findings on XR, US, MR, CT, and arthrography. The full spectrum of anatomy and pathology.
2. Perform and interpret basic musculoskeletal US exams such as cyst evaluation/aspiration and acute tendon rupture.
3. Identify, name, and differentiate between various forms of arthritis.
4. Identify, name, and describe clinical/pathological/radiological features of congenital and acquired bone pathologies.
5. Identify, name, and describe clinical/pathological/radiological features of metabolic bone diseases.

Technical Skills: By the end of the rotation the resident should be able to:

1. Demonstrate increasing skill in quality and quantity of dictation of musculoskeletal images.
2. Maintain proficiency in performing and interpreting fluoroscopic guided procedures.
3. US and CT guided procedures may be incorporated to prepare the graduate for future career and fellowship needs.

Decision-Making/Value Judgment Skills:

1. Given imaging studies of a patient, discuss the findings and clinical significance clearly and concisely, offer an opinion regarding diagnosis, and suggest appropriate additional imaging if needed.

Patient Care

Residents must be able to provide patient care that is compassionate, appropriate, and effective for the diagnosis and treatment of health problems. Residents are expected to:

- Communicate effectively and demonstrate caring and respectful behaviors when interacting with patients and their families.
- Gather essential and accurate medical and radiologic history pertinent to the procedure for which the patient is scheduled or for the examination that the patient has had.

- Confirm that the MSK imaging study requested is appropriate. If necessary, suggest alternative studies to the referring physician.
- Maintain proficiency in performing and interpreting fluoroscopic-guided procedures.
- Take Responsibility for all MSK procedures include preprocedural patient management. This includes review of the patient's history, pre-procedure laboratory values, and imaging studies.
- Obtain informed consent following a discussion with the patient and/or family or representative about the risks, benefits and alternatives of the procedure.
- Write a brief pre-procedure note in the patient record.
- Following the procedure and prior to discharge, evaluate all outpatients and document appropriately in the patient record.
- Identify any complication, discuss it with the MSK attending and document it in the patient record.
- Work with health care professionals, including those from other disciplines, to provide patient-focused care.

Assessment

- Global ratings by faculty (a consensus MedHub evaluation)
- 360 degree review with Core Supervising Technologists' input
- Evidence of accomplishments in the learning portfolio

Medical Knowledge

Residents must demonstrate knowledge about established and evolving biomedical, clinical, and cognate sciences and the application of this knowledge to patient care. During this rotation, residents are expected to:

- Learn the normal musculoskeletal plain film, MR, and ultrasound anatomy
- learn to interpret plain radiographs, CTs, MRIs, and ultrasound of the musculoskeletal system
- Learn to interpret MSK fluoroscopic studies
- Learn the radiographic manifestations of common disease entities seen in the above studies
- Be able to protocol and supervise routine and advanced imaging studies.
- Attend Rheumatology conferences and be prepared to discuss recent cases, as well as using the information from conference to tailor patient exams.

Assessment

- Global ratings by faculty (a consensus MedHub evaluation)
- End of rotation oral exam
- RadExam
- Evidence of accomplishments in the learning portfolio