

## Musculoskeletal Radiology Fellowship Curriculum

**Contributors: Corrie M. Yablon, MD, Lynne Steinbach, MD, Mark J. Kransdorf, MD, Brian J. Petersen, MD, Kambiz Motamedi, MD, Stephanie Bernard, MD**

### **Overall Program Organization: Educational Goals and Objectives**

The MSK radiology fellowship program has integrated our goals and objectives within the six competencies established by the ACGME:

- Patient Care
- Medical Knowledge
- Practice-Based Learning & Improvements
- Interpersonal & Communication Skills
- Professionalism
- System-Based Practice

Responsibilities:

- a. Protocoling, monitoring and interpreting CT and MR imaging studies under faculty supervision.
- b. Protocoling and performing patient procedures, including arthrography, therapeutic and diagnostic injections, ultrasound, and CT guided biopsies under faculty supervision.
- c. Performing diagnostic MSK ultrasound examinations and presenting the findings to the attending for review.
- d. Preparing interdisciplinary conferences.
- e. Consulting with referring physicians.
- e. Effectively communicating study results by timely signing of reports and appropriate direct communication.

### **Core Competencies**

#### **1. Patient Care**

***Skills:***

- a. Gather essential and accurate information about patient history for musculoskeletal imaging studies, including operative notes, comparison previous examinations (including outside studies), pertinent labs, pathology reports and clinic notes, etc.
- b. Develop appropriate differential diagnoses and management recommendations that addresses the clinical questions and relevant clinical, labs, and prior imaging studies.
- c. Protocol and monitor imaging studies to ensure that exams are performed appropriately and safely.
- d. Plan and execute image-guided biopsies of bone and soft tissue masses using established orthopedic limb-sparing techniques.
- e. Perform appropriate diagnostic-quality US examinations.
- f. Obtain informed consent; explain procedure, risks and benefits to patient in lay terms, in a clear and concise fashion.
- g. Develop rapport, trust, and ethical relationships with patients and families.

**Education:**

- a. Prepare and present differential diagnosis and management plan for cases based on a synthesis of available clinical data, radiological findings and laboratory data to supervising faculty for assessment and feedback.
- b. Observe and then execute informed consent.
- c. Observe and then perform diagnostic US examinations
- d. Actively participate in journal reviews to determine effectiveness of diagnostic imaging for specific diagnostic indications.
- e. Prepare and present radiological cases to other members of the healthcare team.

**Assessment:**

Global faculty evaluation of performance regarding skills listed above.

**2. Medical Knowledge**

**Skills:**

- a. Demonstrate knowledge of radiation physics, including the radiation doses of different musculoskeletal examinations and the ALARA principle (As Low As Reasonably Achievable) of minimizing lifetime patient radiation exposure.
- b. Demonstrate knowledge of the normal radiographic, CT, US and MRI anatomy of the musculoskeletal system.
- c. Appropriately protocol CT and MR imaging examinations recognizing the uses and limitations of the available imaging sequences and the necessary modifications requires for optimal results in patients with indwelling orthopedic hardware.
- d. Recognize the potential complications of both CT and MR contrast agents, techniques to minimize these risks and alternative methods of imaging when contrast is contraindicated.
- e. Create a personalized, cost effective, imaging plan for the appropriate evaluation of patients with musculoskeletal disorders to include, as appropriate, radiographs, nuclear medicine studies (including PET), CT, MR and/or ultrasound.
- f. Identify, describe, and classify (when appropriate) musculoskeletal disorders to include:
  - Cellulitis, osteomyelitis, and septic arthritis.
  - Common fractures of the axial and appendicular skeleton (including, mechanisms of injury and potential complications).
  - Orthopedic appliances and hardware used to fixate these fractures, as well as their complications.
  - Bone and soft tissue tumors (using the WHO classification system), both for initial presentation and assessment of recurrent and metastatic disease.
  - Osteonecrosis.
  - Metabolic bone disease.
  - Arthropathies (degenerative, inflammatory and crystal).
  - Systemic disorders to include hematopoietic and storage diseases.
  - Abnormalities of the knee, shoulder, foot, ankle, hand, wrist, hip and pelvis.
  - Disorders of the spine (including disc pathology using the ASNR nomenclature).

**Education:**

- a. Complete a year-long didactic lecture series encompassing the topics listed in paragraph 2f.
- b. Participate in weekly educational conferences (i.e.: tumor board, interesting case conference,

- c. Participate in a weekly journal club.
- d. Prepare and present didactic lectures and case conferences for residents and/or staff.
- e. Use the attached list for supplemental reading (Addendum).

**Assessment:**

Global assessment by faculty during diagnostic interpretation.

**3. Interpersonal and Communication Skills**

**Skills:**

- a. Create clear, concise and informative radiological reports.
- b. Provide clear, direct communication to referring physicians or clinic personnel when interpretation reveals an urgent or unexpected finding. Document this communication in the written report (time, date, method of contact, person to whom result communicated). (Demonstrate compliance with urgent notifications departmental policy.)
- c. Demonstrate timely and effective, respectful communication with physicians, nurses, technologists, and other members of the healthcare team.
- d. Demonstrate timely and respectful telephone skills.
- e. Demonstrate effective collaboration with interprofessional health care team.

**Education:**

- a. Participate as an active member of the radiology team by communicating in person or on the phone or by email with members of the health care team.
- b. Serve as a contact person for technologists with questions about protocols, stat reads, or image quality issues.
- c. Dictate radiological reports.
- d. Complete required departmental education.
- e. Coordinate interdisciplinary conferences.

**Assessment:**

- a. Review of trainee's written radiological reports and direct feedback by faculty members.
- b. Direct observation of trainee's verbal communication skills by faculty members.

**4. Professionalism**

**Skills:**

- a. Demonstrate positive work habits, including punctuality and professional appearance.
- b. Perform responsibilities at the highest level.
- c. Demonstrate ability to perform self-assessment of knowledge and to pursue continuous active learning.
- d. Function as an effective team member, including identifying section needs and contributing help where needed (e.g. reading cases, interacting with patients and staff, preparing support materials).
- e. Demonstrate respectful behavior to peers, staff, patients, and technologists.
- f. Dictate cases and correct transcribed dictations in a timely and accurate fashion, including use of recommended report templates.
- g. Request permission in advance from section chief regarding requests for time away from the clinical work day.

**Education:**

- a. Completion of web-based self-directed learning and assessment program on human subject research guidelines.
- b. Discuss conflicts of interest and ethics of conducting research during section research meetings.

**Assessment:**

- a. Direct faculty observation of trainee in clinical setting.

**5. Practice-Based Learning and Improvement**

**Skills:**

- a. Perform practice-based improvement in cognitive knowledge, observational skill, synthesis of clinical/laboratory/radiological data, and formulation of impression.
- b. Demonstrate a knowledge and application of principles of evidence-based medicine to daily practice.
- c. Use multiple sources, including, but not limited to, information technology, journal articles, etc., to support patient care decisions.
- d. Demonstrate an ability to assess the quality of various information sources, including peer reviewed journals, non-reviewed journals, web sources (e.g.: Wikipedia), etc.
- e. Participate in daily QA by identifying suboptimal images or studies.

**Education:**

- a. Participate in critical assessment of the literature through journal club, clinical conferences, and independent learning.
- b. Teach residents (case review in reading room, readout of wet reads, cross sectional review, case conferences), other health care professionals (through multidisciplinary conferences), with graduated supervision and feedback from supervising faculty.
- c. Active participation in departmental quality assurance/ quality improvement program.

**Assessment:**

- a. Global evaluation by musculoskeletal imaging faculty.
- b. Self-assessment using Case Review: Musculoskeletal Imaging textbook or ACR Learning File.

**6. Systems Based Practice**

**Skills:**

- a. Demonstrate knowledge of appropriateness criteria for various musculoskeletal imaging studies.
- b. Demonstrate ability to design effective management plans based upon knowledge of best practices.

**Education:**

- a. Review the American College of Radiology Appropriateness Criteria to develop knowledge of the evidence-based indications for musculoskeletal imaging procedures.
- b. Attendance and active participation in departmental and multidisciplinary conferences where there is discussion of the imaging evaluation of, as well as the most appropriate and cost-effective methods for diagnosing, specific musculoskeletal disorders.

***Assessment:***

- a. Global evaluation by musculoskeletal imaging faculty.
- b. Multidisciplinary conference attendance.