

# Musculoskeletal Radiology Milestones

The Accreditation Council for Graduate Medical Education



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## Musculoskeletal Radiology Milestones

The Milestones are designed only for use in evaluation of fellows in the context of their participation in ACGME-accredited residency or fellowship programs. The Milestones provide a framework for the assessment of the development of the fellow in key dimensions of the elements of physician competence in a specialty or subspecialty. They neither represent the entirety of the dimensions of the six domains of physician competency, nor are they designed to be relevant in any other context.

#### **Musculoskeletal Radiology Milestones**

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American Board of Radiology

ACGME Review Committee for Radiology

#### **Understanding Milestone Levels and Reporting**

This document presents the Milestones, which programs use in a semi-annual review of fellow performance, and then report to the ACGME. Milestones are knowledge, skills, attitudes, and other attributes for each of the ACGME Competencies organized in a developmental framework. The narrative descriptions are targets for fellow performance throughout their educational program.

Milestones are arranged into levels. Tracking from Level 1 to Level 5 is synonymous with moving from novice to expert fellow in the specialty or subspecialty. For each reporting period, the Clinical Competency Committee will review the completed evaluations to select the milestone levels that best describe each learner's current performance, abilities, and attributes for each subcompetency.

These levels *do not* correspond with post-graduate year of education. Depending on previous experience, a junior fellow may achieve higher levels early in his/her educational program just as a senior fellow may be at a lower level later in his/her educational program. There is no predetermined timing for a fellow to attain any particular level. Fellows may also regress in achievement of their milestones. This may happen for many reasons, such as over scoring in a previous review, a disjointed experience in a particular procedure, or a significant act by the fellow.

Selection of a level implies the fellow substantially demonstrates the milestones in that level, as well as those in lower levels (see the diagram on page vi).

#### **Additional Notes**

Level 4 is designed as a graduation *goal* but *does not* represent a graduation *requirement*. Making decisions about readiness for graduation and unsupervised practice is the purview of the program director. Furthermore, Milestones 2.0 include revisions and changes that preclude using Milestones as a sole assessment in high-stakes decisions (i.e., determination of eligibility for certification or credentialing). Level 5 is designed to represent an expert fellow whose achievements in a subcompetency are greater than the expectation. Milestones are primarily designed for formative, developmental purposes to support continuous quality improvement for individual learners, education programs, and the specialty. The ACGME and its partners will continue to evaluate and perform research on the Milestones to assess their impact and value.

Examples are provided for some milestones within this document. Please note: the examples are not the required element or outcome; they are provided as a way to share the intent of the element.

Some milestone descriptions include statements about performing independently. These activities must occur in conformity to ACGME supervision guidelines as described in the Program Requirements, as well as to institutional and program policies. For example, a fellow who performs a procedure independently must, at a minimum, be supervised through oversight.

A Supplemental Guide is also available to provide the intent of each subcompetency, examples for each level, assessment methods or tools, and other available resources. The Supplemental Guide, like examples contained within the Milestones, is designed only to assist the program director and Clinical Competency Committee, and is not meant to demonstrate any required element or outcome.

Supplemental Guides and other resources are available on the Milestones page of each specialty section of the ACGME website. On <a href="https://www.acgme.org">www.acgme.org</a>, choose the applicable specialty under the "Specialties" menu, then select the "Milestones" link in the lower navigation bar.

The diagram below presents an example set of milestones for one subcompetency in the same format as the ACGME Report Worksheet. For each reporting period, a fellow's performance on the milestones for each subcompetency will be indicated by selecting the level of milestones that best describes that fellow's performance in relation to those milestones.

Patient Care 3: Musculoskeletal Radiology Reporting				
Level 1	Level 2	Level 3	Level 4	Level 5
Generates musculoskeletal radiology reports with appropriate elements for coding	Efficiently generates clear and concise musculoskeletal radiology reports which do not require substantive correction	Efficiently generates clear and concise musculoskeletal radiology reports which rarely require correction	Generates tailored musculoskeletal radiology reports meeting the needs of the care provider	Develops novel reporting classification system or reporting template that improves patient care
Describes lexicons and structured reporting	Uses lexicons and structured reporting that do not require substantive correction	Uses lexicons and structured reporting which rarely require correction	Proficiently uses lexicons and structured reporting to provide accurate and timely reports which do not require correction	
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Comments:				Completed Level 1
Selecting a responsible middle of a level in milestones in that levels have been a demonstrated.	nplies that level and in lower	between levels in		es

Patient Care 1: Consultant				
Level 1	Level 2	Level 3	Level 4	Level 5
Independently recommends appropriate imaging of common general conditions	Independently recommends appropriate imaging of common musculoskeletal conditions (e.g., osteomyelitis, trauma, metastatic disease)	With some supervision, recommends appropriate imaging of uncommon musculoskeletal conditions (e.g., primary bone tumors, postoperative complications)	Independently recommends appropriate imaging of uncommon musculoskeletal conditions	Operates at the level of expert subspecialty consultant in practice
Gathers essential patient information	With supervision, synthesizes the image findings and complete clinical picture to provide differential diagnoses or next clinical step for common musculoskeletal conditions	With supervision, synthesizes the image findings and complete clinical picture to provide differential diagnoses or next clinical step for uncommon musculoskeletal conditions	Independently synthesizes the image findings and complete clinical picture to provide differential diagnoses or next clinical step for uncommon musculoskeletal conditions	Serves as a consultant for other specialties
Comments:  Not Yet Completed Level 1 Not Yet Assessable				

Patient Care 2: Diagnostic and Therapeutic Procedures					
Level 1	Level 2	Level 3	Level 4	Level 5	
Describes the indications and contra-indications to performing diagnostic and therapeutic procedures and obtains informed consent	Safely executes basic and advanced diagnostic and therapeutic procedures; is sensitive to pain management, with supervision	Plans and safely executes basic and advanced diagnostic and therapeutic procedures; is sensitive to pain management, with supervision	Independently plans and safely executes basic and advanced diagnostic and therapeutic procedures; is sensitive to pain management	Teaches peers and/or develops novel diagnostic or therapeutic procedures and techniques	
Recognizes potential post-procedural complications	With supervision, manages common intra- procedural and post- procedural complications	With supervision, anticipates and manages potential post-procedural complications	Independently anticipates and manages potential post- procedural complications		
Comments:  Not Yet Completed Level 1  Not Yet Assessable					

Patient Care 3: Musculoskeletal Radiology Reporting				
Level 1	Level 2	Level 3	Level 4	Level 5
Generates musculoskeletal radiology reports with appropriate elements for coding	Efficiently generates clear and concise musculoskeletal radiology reports that do not require substantive correction	Efficiently generates clear and concise musculoskeletal radiology reports that rarely require correction	Generates tailored musculoskeletal radiology reports meeting the needs of the care provider	Develops novel reporting classification system or reporting template that improves patient care
Describes lexicons and structured reporting	Uses lexicons and structured reporting that do not require substantive correction	Uses lexicons and structured reporting that rarely require correction	Proficiently uses lexicons and structured reporting to provide accurate and timely reports that do not require correction	
Comments:				
Not Yet Completed Level 1 Not Yet Assessable				

Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates basic knowledge of musculoskeletal anatomy	Demonstrates basic knowledge of biomechanics and application to injury patterns	Demonstrates advanced knowledge of anatomy and biomechanics and its application to injury patterns and radiographic findings	Teaches detailed anatomy and basic biomechanics and application to mechanisms of injury	Advances knowledge of musculoskeletal conditions through research and presentation at local, national, and international meetings
Demonstrates basic knowledge of bone physiology	Recognizes differences between normal variants and pathology	Distinguishes clinically relevant from benign incidental findings (e.g., non-ossifying fibroma or bone island)	Teaches bone physiology; understands drug- and treatment-induced changes in bone	

Medical Knowledge 2: Image Interpretation – Diagnosis					
Level 1	Level 2	Level 3	Level 4	Level 5	
Recognizes normal appearance of tissues, anatomy, and common artifacts on all modalities	Demonstrates knowledge of usual imaging presentations and injury patterns of common musculoskeletal diseases and post-operative findings of common procedures (e.g., sports injuries, trauma, tumor, infection, arthritides)	Recognizes subtle findings and integrates imaging information leading to the appropriate diagnosis, with additional imaging as needed and clinical management in complex cases, including immediate and delayed complications	Defines more advanced imaging findings, such as post-operative appearance (e.g., post-tumor resection and treatment changes, anterior cruciate ligament (ACL) revision)	Conducts research on cross-sectional imaging, and presents findings at local, national, and/or international meetings	
Comments:  Not Yet Completed Level 1 Not Yet Assessable					

Medical Knowledge 3: Protocols					
Level 1	Level 2	Level 3	Level 4	Level 5	
Demonstrates basic knowledge of image acquisition (magnetic resonance (MR) pulse sequences, physics, basic computer tomography (CT) physics, radiographs, ultrasounds)	Demonstrates basic knowledge of protocoling advanced musculoskeletal MR, CT, and ultrasound, as well as less commonly obtained radiographic views and utilization of contrast material, when appropriate	Demonstrates advanced knowledge of protocoling advanced musculoskeletal MR, CT, and ultrasound, as well as less commonly obtained radiographic views, and tailors protocols as needed	Provides feedback to technical staff members and other learners regarding image acquisition and optimization in complex cases	Designs or optimizes protocols tailored to specific imaging conditions	
Comments:  Not Yet Completed Level 1  Not Yet Assessable					

Systems-Based Practice 1: Patient Safety				
Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates knowledge of common patient safety events	Identifies system factors that lead to patient safety events	Participates in analysis of patient safety events (simulated or actual)	Conducts analysis of patient safety events and offers error prevention strategies (simulated or actual)	Actively engages teams and processes to modify systems to prevent patient safety events
Demonstrates knowledge of how to report patient safety events	Reports patient safety events through institutional reporting systems (simulated or actual)	Participates in disclosure of patient safety events to patients and families (simulated or actual)	Discloses patient safety events to patients and families (simulated or actual)	Role models or mentors others in the disclosure of patient safety events
Comments:  Not Yet Completed Level 1				

Systems-Based Practice 2: Quality Improvement					
Level 1	Level 2	Level 3	Level 4	Level 5	
Demonstrates knowledge of basic quality improvement methodologies and metrics	Describes local quality improvement initiatives	Participates in local quality improvement initiatives	Demonstrates the skills required to identify, develop, implement, and analyze a quality improvement project	Creates, implements, and assesses quality improvement initiatives at the institutional or community level	
Comments:			Not Yet C	ompleted Level 1	

Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates knowledge of care coordination in radiology imaging/procedures	Coordinates care of patients in routine radiology imaging/procedures effectively using the roles of interprofessional teams	Coordinates care of patients in complex radiology imaging/procedures effectively using the roles of interprofessional teams	Role models effective coordination of patient-centered care among different disciplines and specialties	Analyzes the process of care coordination and leads in the design and implementation of improvements
Identifies key elements for safe and effective transitions of care and hand-offs	Performs safe and effective transitions of care/hand-offs in routine clinical situations	Performs safe and effective transitions of care/hand-offs in complex clinical situations	Role models safe and effective transitions of care/hand-offs	Improves quality of transitions of care to optimize patient outcomes

Level 1	Level 2	Level 3	Level 4	Level 5
Identifies key components of the complex health care system (e.g., hospital, finance, personnel, technology)	Describes how components of a complex health care system are interrelated, and how this impacts patient care	Discusses how individual practice affects the broader system (e.g., length of stay, readmission rates, clinical efficiency)	Manages various components of the complex health care system to provide efficient and effective patient care and transition of care	Advocates for or leads systems change that enhances high-value, efficient, and effective patient care and transition of care
Describes the mechanisms for reimbursement, including types of payors	States relative cost of common procedures	Describes the technical and professional components of imaging costs	Describes the radiology revenue cycle and measurements of productivity (e.g., relative value units)	Participates in health policy advocacy activities
Comments:  Not Yet Completed Level 1				

Systems-Based Practice 5: Contrast Agent Safety					
Level 1	Level 2	Level 3	Level 4	Level 5	
Demonstrates knowledge of contrast reactions	Recognizes contrast reactions (simulated or actual)	Manages contrast reactions, with supervision (simulated or actual)	Independently manages contrast reactions (simulated or actual)	Leads educational experience in simulation laboratory for contrast reaction	
Comments:			Not Yet C	ompleted Level 1	

Systems-Based Practice	6: Radiation Safety			
Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates knowledge of the mechanisms of radiation injury and the ALARA ("as low as reasonably achievable") concept	Accesses resources to determine exam-specific average radiation dose information	Communicates the relative risk of examspecific radiation exposure to patients and practitioners	Applies principles of ALARA in daily practice	Creates, implements, and assesses radiation safety initiatives at the institutional level
Comments:			Not Yet C	ompleted Level 1

Systems-Based Practice	7: Magnetic Resonance (M	IR) Safety		
Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates knowledge of the risks of magnetic resonance imaging (MRI), including safety zones and pre-MR screening	Accesses resources to determine the safety of implanted devices and retained foreign bodies	Communicates MR safety, including implants and retained foreign bodies, to patients and practitioners	Applies principles of MR safety to daily practice	Creates, implements, and assesses MR safety initiatives at the institutional level
Comments:			Not Yet C	ompleted Level 1

Systems-Based Practice Level 1	8: Informatics Level 2	Level 3	Level 4	Level 5
Demonstrates familiarity with information systems, including the electronic health record (EHR), radiology information system, and picture archiving system	Demonstrates familiarity with information standards in radiology and describes their roles	Describes approaches to capture and integrate data from radiology examinations into medical decision making	Applies knowledge of information systems, standards, and data to support radiology initiatives, as appropriate	Participates in operational and strategic information systems meetings; applies informatics knowledge to help guide direction and operation of the radiology department
Comments:			Not Yet C	completed Level 1

Practice-Based Learning	and Improvement 1: Evide	ence-Based and Informed F	Practice	
Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates how to access and use available evidence to determine the best imaging examination for a routine patient/diagnosis	Articulates clinical questions and elicits patient preferences and values to guide evidence-based imaging	Locates and applies the best available evidence, integrated with patient preferences and values, to the care of complex patients	Critically appraises conflicting evidence to guide care, tailored to the individual patient	Coaches others to critically appraise and apply evidence for complex patients; and/or participates in the development of guidelines
Comments:			Not Yet C	Completed Level 1

Level 1	Level 2	Level 3	Level 4	Level 5
Accepts responsibility for professional development by establishing goals	Is receptive to performance data and feedback to adjust goals  Analyzes and reflects on	Episodically seeks performance data and feedback, with humility and adaptability  Analyzes, reflects on, and	Consistently seeks performance data and feedback with humility and adaptability  Analyzes effectiveness	Coaches other learners to consistently seek performance data and feedback  Coaches others on
contribute to gap(s) between expectations and actual performance	factors that contribute to gap(s) between expectations and actual performance	institutes behavioral change(s) to narrow the gap(s) between expectations and actual performance and develops a learning plan	of behavioral changes where appropriate, considers alternatives in narrowing the gap(s) between expectations and actual performance, and improves the learning plan	reflective practice

Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates knowledge of expectations for professional behavior and describes how to appropriately report professional lapses	Demonstrates insight into professional behavior in routine situations and takes responsibility for one's own professionalism lapses	Demonstrates professional behavior in complex or stressful situations	Recognizes situations that may trigger professionalism lapses and intervenes to prevent lapses in oneself and others	Coaches others when their behavior fails to meet professional expectations
Demonstrates knowledge of ethical principles	Analyzes straightforward situations using ethical principles	Recognizes need to seek help to manage and resolve complex ethical situations	Recognizes and uses appropriate resources for managing and resolving ethical dilemmas as needed	Identifies and seeks to address system-level factors that induce or exacerbate ethical problems or impede their resolution

Professionalism 2: Acco	untability/Conscientiousne	ess		
Level 1	Level 2	Level 3	Level 4	Level 5
Responds promptly to requests or reminders to complete tasks and responsibilities	Performs tasks and responsibilities in a timely manner to ensure the needs of patients, teams, and systems are met in routine situations	Performs tasks and responsibilities in a timely manner to ensure the needs of patients, teams, and systems are met in complex or stressful situations	Recognizes and raises awareness of situations that may impact others' ability to complete tasks and responsibilities in a timely manner	Takes ownership of system outcomes
Comments:			Not Yet C	ompleted Level 1

Professionalism 3: Self-	Awareness and Help-Seekii	ng			
Level 1	Level 2	Level 3	Level 4	Level 5	
Recognizes status of personal and professional well-being, with assistance, and is aware of available resources	Independently recognizes status of personal and professional well-being using available resources when appropriate	With assistance, proposes a plan to optimize personal and professional well-being	Independently develops a plan to optimize personal and professional well-being	Coaches others when emotional responses or limitations in knowledge/skills do not meet professional expectations	
With assistance, recognizes limits in the knowledge/skills of self or team	Independently recognizes limits in the knowledge/skills of oneself or the team and demonstrates appropriate help-seeking behaviors	With assistance, proposes a plan to remediate or improve limits in the knowledge/skills of oneself or the team	Independently develops a plan to remediate or improve limits in the knowledge/skills of oneself or the team		
Comments:	Comments:  Not Yet Completed Level 1				

This subcompetency is not intended to evaluate a fellow's well-being, but to ensure each fellow has the fundamental knowledge of factors that impact well-being, the mechanisms by which those factors impact well-being, and available resources and tools to improve well-being.

Interpersonal and Comm	nunication Skills 1: Patient-	and Family-Centered Com	munication	
Level 1	Level 2	Level 3	Level 4	Level 5
Accurately communicates one's own role within the health care system	Identifies barriers to effective communication (e.g., language, health literacy)	Identifies biases that hinder effective communication	Actively minimizes communication barriers	Coaches other learners to minimize communication barriers
Identifies the need to adjust communication strategies based on assessment of patient's /patient's family's expectations and understanding of their health status and treatment options	Organizes and initiates communication with the patient/patient's family by clarifying expectations and verifying understanding of the clinical situation	With guidance, sensitively and compassionately delivers medical information, elicits patient goals and preferences, and acknowledges uncertainty and conflict	Independently, uses shared decision making to align patient goals, and preferences with treatment options to make a personalized care plan	Coaches other learners in shared decision making
Comments:			Not Yet C	ompleted Level 1

Interpersonal and Comm	nunication Skills 2: Interpro	fessional and Team Comm	unication	
Level 1	Level 2	Level 3	Level 4	Level 5
Respectfully receives a consultation request	With supervision, responds to a consultation request and employs necessary members of the radiology team	Independently responds to a consultation request and employs necessary members of the radiology team	Independently responds and coordinates care with different members of the health care team to optimize patient care	Models flexible communication strategies that value input from all health care team members, resolving conflict when needed
Demonstrates knowledge of the institutional and national communication guidelines	Communicates emergent findings according to institutional or national guidelines	Communicates non- emergent findings where failure to act may adversely affect patient outcome	Communicates findings and management options (as appropriate) that are tailored to the referring provider	Coaches other learners in tailored communications to referring providers
Comments:  Not Yet Completed Level 1				

·	nunication Skills 3: Commu			
Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates knowledge of institutional communications policies	Communicates appropriately as required by institutional policy	Communicates systems concerns in a respectful manner	Communicates clear and constructive suggestions to improve systems	Facilitates dialogue regarding systems issues among larger community stakeholders (institution, health care system, field)
Comments:			Not Yet C	completed Level 1