

Nuclear Radiology Milestones

The Accreditation Council for Graduate Medical Education



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Nuclear 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.

Nuclear Radiology Milestones Work Group

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American Board of Radiology

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 resident/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 resident 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.

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 www.acgme.org, 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.

	2: Coordination and Trans			
Level 1 Demonstrates knowledge of care coordination	Level 2 Coordinates care of patients in routine clinical situations effectively using the members of the interprofessional teams	Level 3 Coordinates care of patients in complex clinical situations effectively using the members of the interprofessional teams	Level 4 Coordinates care of patients in complex clinical situations 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 handoffs	Performs safe and effective transitions of care/handoffs in routine clinical situations	Performs safe and effective transitions of care/handoffs in complex clinical situations	Advocates for safe and effective transitions of care/handoffs within and across health care delivery systems	Improves quality of transitions of care within and across health care delivery systems to optimize patient outcomes
Comments:				
			Not Yet C	ompleted Level 1
Selecting a respo middle of a level i milestones in that levels have been demonstrated.	mplies that level and in lower	between levels in		s

Level 1	Level 2	Level 3	Level 4	Level 5
Selects protocols for	Tailors protocols for	Tailors protocols for	Teaches common,	Creates protocols for
common non-cardiac	common and hybrid non-	uncommon and hybrid	uncommon, and hybrid	emerging non-cardiac
examinations	cardiac examinations	non-cardiac examinations	non-cardiac examinations to junior learners	diagnostic applications
Makes efficient and accurate interpretations of common non-cardiac examinations	Makes efficient, accurate, and comprehensive interpretations of common and hybrid non-cardiac examinations, including secondary findings	Makes efficient, accurate, and comprehensive interpretations of uncommon and hybrid non-cardiac examinations, including secondary findings and subtle observations	Independently serves as a consultant to interdisciplinary clinical care teams	Leads interdisciplinary clinical care teams

Patient Care 2: Diagnostic Cardiac Examinations					
Level 1	Level 2	Level 3	Level 4	Level 5	
Describes and applies Appropriate Use Criteria for cardiac stress imaging, and describes protocols for cardiac examination	Ensures appropriateness and quality of cardiac planar and single-photon emission computed tomography (SPECT) or SPECT/CT examinations and recognizes adequacy of interpretation and reporting	Ensures appropriateness and quality of cardiac positron emission tomography (PET) or PET/CT examinations, and recognizes adequacy of interpretation and reporting	Independently serves as a consultant to multidisciplinary care teams to direct cardiac SPECT or SPECT/CT and/or PET or PET/CT examinations	Evaluates new paradigms for assessing cardiac disease with SPECT or SPECT/CT and/or PET or PET/CT examinations	
Comments:				Completed Level 1 Assessable	

Level 1	Level 2	Level 3	Level 4	Level 5
Knows indications and contraindications for radioiodine therapy for benign and malignant thyroid diseases	Evaluates, selects, and prepares patients for radioiodine therapy, including obtaining consent, and performs procedure	Selects and applies appropriate patient release criteria, and follows patient after radioiodine therapy	Plans and performs radioiodine therapy in complicated clinical situations (e.g., renal failure, mentally or physically challenged patients)	Acts as an expert consultant for radioiodine therapies
	Knows the indications and contraindications for routine parenteral radiopharmaceutical therapies	Evaluates, selects, and prepares patients for routine parenteral radiopharmaceutical therapies, including obtaining consent	Performs routine parenteral radiopharmaceutical therapies	Acts as an expert for emerging parenteral therapeutic radiopharmaceuticals

Medical Knowledge 1: Physics and Instrumentation					
Level 1	Level 2	Level 3	Level 4	Level 5	
Identifies instrumentation quality control requirements and recognizes potential sources of error	Demonstrates knowledge of routine instrumentation, including calibration and attenuation correction	Demonstrates knowledge of advanced instrumentation, including calibration, attenuation correction, and quantitation	Applies knowledge in use of advanced instrumentation, including calibration, attenuation correction, and quantitation	Teaches others about advanced instrumentation, including calibration, attenuation correction, quantitation, and dosimetry	
Comments:			Not Yet Co	ompleted Level 1	

Medical Knowledge 2: Ra	Medical Knowledge 2: Radiopharmaceuticals and Pharmaceuticals				
Level 1	Level 2	Level 3	Level 4	Level 5	
Demonstrates knowledge of diagnostic radiopharmaceuticals in routine practice	Applies knowledge of diagnostic radiopharmaceuticals in routine practice	Demonstrates knowledge of diagnostic radiopharmaceuticals in advanced practice	Applies knowledge of diagnostic radiopharmaceuticals in advanced practice	Functions independently as an integral member of multidisciplinary clinical care team or tumor board to identify and manage patients	
Demonstrates knowledge of radiopharmaceuticals for routine radiopharmaceutical therapies	Applies knowledge of radiopharmaceuticals for routine radiopharmaceutical therapies	Demonstrates knowledge of radiopharmaceuticals for complex radiopharmaceutical therapies	Applies knowledge of radiopharmaceuticals for complex radiopharmaceutical therapies		
Demonstrates knowledge of indications and contraindications of common pharmaceuticals in routine practice	Applies knowledge of indications and contraindications of, and alternatives to common pharmaceuticals in routine practice	Demonstrates knowledge of indications and contraindications of uncommon pharmaceuticals in advanced practice	Applies knowledge of indications and contraindications of, and alternatives to uncommon pharmaceuticals in advanced practice		
Comments:			Not Yet C Not Yet As	ompleted Level 1	

Medical Knowledge 3: Molecular Imaging and Radiotheranostics					
Level 1	Level 2	Level 3	Level 4	Level 5	
Demonstrates knowledge of molecular imaging findings in common diseases	Applies principles of molecular imaging and radiotheranostics in common diseases	Demonstrates knowledge of molecular imaging findings in complex diseases	Applies principles of molecular imaging and radiotheranostics in complex diseases	Independently integrates principles of advanced radiotheranostic concepts into clinical practice	
Comments:				Completed Level 1	

Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates knowledge of common patient safety events	Identifies system factors leading 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 mechanism for reporting 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 reporting and disclosure of patient safety events

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 skills required to identify, develop, implement, and analyze quality improvement projects	Creates, implements, and assesses quality improvement initiatives at 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 nuclear radiology imaging/procedures	Coordinates care of patients in routine nuclear radiology imaging/procedures effectively using interprofessional teams	Coordinates care of patients in complex nuclear radiology imaging/procedures effectively using interprofessional teams	Role models effective coordination of patient- centered care across different disciplines and specialties	Analyzes the process of care coordination and leads in the design and implementation of systematic 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 the process of quality of transitions of care/hand-offs to optimize patient outcomes
Demonstrates knowledge of population and community health needs and disparities	Identifies specific population and community health needs and disparities for local population	Identifies local resources available to meet needs of specific patient populations and community	Participates in adapting practice to provide for needs of specific populations (actual or simulated)	Leads innovations and advocates for populations and communities with health care disparities

Level 1	Level 2	Level 3	Level 4	Level 5
Identifies key components of complex health care systems (e.g., hospital, finance, personnel, technology)	Describes how components of complex health care systems are interconnected and impact patient care	Discusses how individual practice affects broader health care systems (e.g., length of stay, readmission rates, clinical efficiency)	Manages various components of complex health care systems to provide efficient and effective patient care	Advocates for or leads systems change to enhance high-value, efficient, and effective patient care
Describes mechanisms for reimbursement, including types of payors	States relative cost of common procedures in nuclear radiology	Describes 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

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

Systems-Based Practice 6: Regulatory Requirements				
Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates awareness of the Nuclear Regulatory Commission (NRC), pertinent state-specific agencies, and methods of accreditation	Knows basic NRC regulations and state- specific laws applying to radioactive materials use, storage and disposal, definition of authorized user, and components of written directives	Applies appropriate laws and regulations to daily clinical scenarios in nuclear radiology clinic/laboratory (e.g., receives packages, performs ambient surveys)	Demonstrates knowledge of rules and regulations required to function as medical director of nuclear radiology unit	Participates as a member of regulatory committee (e.g., Radiation Use Committee, Radiation Safety Committee)
Knows the purpose and functions of radiation safety program in nuclear radiology	Demonstrates knowledge of composition and function of Radiation Safety Committee and responsibilities of Radiation Safety Officer	Knows how to disclose reportable or recordable incidents	Demonstrates knowledge of radiation safety inspection processes (e.g., The Joint Commission, NRC, state)	Participates in radiation safety inspection team (e.g., The Joint Commission, NRC, state)
Comments: Not Yet Completed Level 1				

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

Practice-Based Learning and Improvement 2: Reflective Practice and Commitment to Professional Growth				
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 in order to adjust goals	Episodically seeks performance data and feedback with humility and adaptability	Consistently seeks performance data and feedback with humility and adaptability	Coaches other learners to consistently seek performance data and feedback
Identifies factors which contribute to gap(s) between expectations and actual performance	Analyzes and reflects on factors which contribute to gap(s) between expectations and actual performance	Analyzes, reflects on, and institutes behavioral change(s) to narrow gap(s) between expectations and actual performance	Analyzes effectiveness of behavioral changes as appropriate, and considers alternatives in narrowing gap(s) between expectations and actual performance	Coaches others on reflective practices
Actively seeks opportunities to improve performance	Designs and implements learning plan with prompting	Designs and implements learning plan independently	Uses performance data to measure effectiveness of learning plan and, when necessary, improves it	Facilitates design and implements learning plans for others
Comments: Not Yet Completed Level 1				

Professionalism 1: Profe	ssional Behavior and Ethic	cal Principles		
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 own professionalism lapses	Demonstrates professional behavior in complex or stressful situations	Recognizes situations that may trigger professionalism lapses and intervenes to prevent lapses in self and others	Coaches others when their behavior fails to meet professional expectations
Demonstrates knowledge of ethical principles underlying informed consent, surrogate decision making, advance directives, confidentiality, error disclosure, and stewardship of limited resources	Analyzes straightforward situations using ethical principles	Recognizes need to seek help in managing and resolving 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
Comments: Not Yet Completed Level 1				

Professionalism 2: Accountability/Conscientiousness					
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 that needs of patients, teams, and systems are met in routine situations	Performs tasks and responsibilities in a timely manner to ensure that 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:	Comments: Not Yet Completed Level 1				

Professionalism 3: Self-Awareness and Help-Seeking				
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, as 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
Recognizes limits in knowledge/skills of self or team, with assistance	Independently recognizes limits in knowledge/skills of self or team and demonstrates appropriate help-seeking behaviors	With assistance, proposes a plan to remediate or improve limits in knowledge/ skills of self or team	Independently develops a plan to remediate or improve limits in knowledge/skills of self or team	expectations
Comments: Not Yet Completed Level 1				

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

Level 1	Level 2	Level 3	Level 4	Level 5
Accurately communicates own role within the health care system	Identifies barriers to effective communication	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/family expectations and understanding of health status and treatment options	Organizes and initiates communication with patient/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 create a personalized care plan	Coaches other learners in shared decision making

Level 1	Level 2	Level 3	Level 4	Level 5
Respectfully receives a consultation request	Clearly and concisely responds to a consultation request	Checks understanding of recommendations when providing consultation	Coordinates recommendations from different members of the health care team to optimize patient care	Role models flexible communication strategies that value input from all health care team members, resolving conflict when needed
Demonstrates knowledge of 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, tailored to the referring provider	Coaches other learners in tailored communications to referring providers

Interpersonal and Communication Skills 3: Communication within Health Care Systems					
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	
Comments:	Comments: Not Yet Completed Level 1				