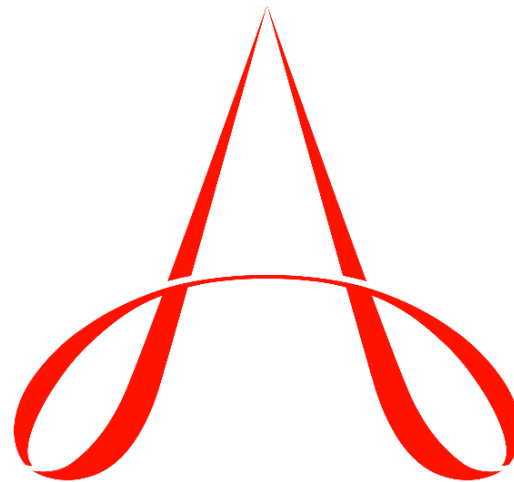# Neuroradiology Milestones

The Accreditation Council for Graduate Medical Education

ACGME

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Second Revision: May 2021
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Neuroradiology 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.

Neuroradiology Milestones Work Group

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American Board of Radiology

American Osteopathic Association

American Society of Neuroradiology

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.

Interpersonal and Communication Skills 2: Interprofessional and Team Communication

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 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) which are tailored to the referring provider	Coaches and teaches other learners in tailored communications to referring providers

Comments:

Not Yet Completed Level 1

Selecting a response box in the middle of a level implies that milestones in that level and in lower levels have been substantially demonstrated.

Selecting a response box on the line in between levels indicates that milestones in lower levels have been substantially demonstrated as well as **some** milestones in the higher level(s).

Patient Care 1: Reporting

Level 1	Level 2	Level 3	Level 4	Level 5
Generates reports with appropriate elements for coding	Efficiently generates clear, concise, and thoroughly proofread reports which do not require substantive correction	Efficiently generates clear, concise, and thoroughly proofread reports which rarely require correction	Generates tailored reports meeting the needs of the subspecialty care provider	Creates and revises templates to meet the needs of the subspecialty care provider
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	Serves as a role model for use of lexicons and structured reporting

Comments:

Not Yet Completed Level 1 ☐
Not Yet Assessable ☐

Patient Care 2: Consultant in Neuroradiology				
Level 1	Level 2	Level 3	Level 4	Level 5
Uses established evidence-based imaging guidelines, such as American College of Radiology (ACR) Appropriateness Criteria®	Integrates clinical data with imaging findings to develop a differential diagnosis; uses evidence-based imaging guidelines to recommend imaging of common neuroradiology conditions	Integrates clinical data with imaging findings to develop a differential diagnosis; uses evidence-based imaging guidelines to recommend imaging of complex neuroradiology conditions	Effectively provides independent consultation to subspecialists taking into consideration cost effectiveness, risks, and benefits	Serves as an expert neuroradiology resource for other providers
☐	☐	☐	☐	☐	☐	☐	☐	☐	

Comments:

Not Yet Completed Level 1 ☐
Not Yet Assessable ☐

Patient Care 3: Interpretation of Neuroimaging

Level 1	Level 2	Level 3	Level 4	Level 5
Identifies primary imaging findings in common conditions	Identifies secondary imaging findings, recognizes critical imaging findings, and formulates differential diagnoses	Prioritizes differential diagnoses and helps to guide management	Provides an accurate diagnosis with integration of clinical history	Demonstrates expertise at a level expected of a subspecialist, including for rare or unusual conditions
☐	☐	☐	☐	☐	☐	☐	☐	☐

Comments:

Not Yet Completed Level 1   ☐
Not Yet Assessable   ☐

Patient Care 4: Competence in Neuroradiology Procedures

Level 1	Level 2	Level 3	Level 4	Level 5
Performs pre-procedural work-up	Competently performs procedures, with direct supervision	Competently performs procedures, with indirect supervision	Competently performs procedures independently	Competently teaches procedural skills to others independently
Discusses indications, contraindications, and potential complications	Recognizes complications and enlists help	Manages complications, with supervision	Anticipates challenges and independently manages complications	Modifies procedures in anticipation of potential challenges or complications

Comments:

Not Yet Completed Level 1 ☐
Not Yet Assessable ☐

Medical Knowledge 1: Application of Neuroscience to Neuroradiology

Level 1	Level 2	Level 3	Level 4	Level 5
Discusses basic pathophysiology, anatomy, genetics of diseases, and treatment-related effects of the brain, neck, and spine	Applies knowledge of pathophysiology, anatomy, genetics of diseases, and treatment-related effects to image interpretation and management of common conditions	Applies knowledge of pathophysiology, anatomy, genetics of diseases, and treatment-related effects to image interpretation and management of uncommon conditions	Applies knowledge of pathophysiology, anatomy, genetics of diseases, and treatment-related effects to image interpretation and management of rare or unusual conditions	Teaches and advances the application of neuroscience to neuroradiology
☐	☐	☐	☐	☐	☐	☐	☐	☐

Comments:

Not Yet Completed Level 1   ☐
Not Yet Assessable   ☐

Medical Knowledge 2: Protocol Selection, Contrast Agent Selection/Dosing, and Image Optimization				
Level 1	Level 2	Level 3	Level 4	Level 5
Discusses protocols and contrast agent/dose	Selects protocols and contrast agent/dose for common exams	Selects protocols and contrast agent/dose for advanced exams	Independently tailors protocols to answer complex clinical questions	Teaches and/or develops imaging protocols
Discusses imaging technology and image acquisition	Demonstrates knowledge of image acquisition and processing, and recognizes common imaging artifacts and technical problems	Applies knowledge of image acquisition and processing and troubleshoots for imaging artifacts and technical problems	Proficiently optimizes image acquisition and processing in collaboration with the technologist/imaging team	Teaches and advances knowledge of image acquisition and processing

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

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)	Serves as a role model to 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 divisional, departmental, or institutional level
☐	☐	☐	☐	☐	☐	☐	☐	☐

Comments:

Not Yet Completed Level 1   ☐

Systems-Based Practice 3: System Navigation for Patient-Centered Care				
Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates knowledge of care coordination and transitions of care in imaging/procedures	Coordinates care of patients and transitions of care in routine imaging/procedures	Coordinates care of patients and transitions of care in complex imaging/procedures	Role models effective coordination of patient-centered care and transitions of care among different disciplines and specialties	Analyzes the process of care coordination or transitions of care and leads in the design and implementation of multidisciplinary process improvements

Comments:

Not Yet Completed Level 1 ☐

Systems-Based Practice 4: Physician Role in Health Care Systems

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	Advocates for or leads systems change that enhances high-value, efficient, and effective patient 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 revenue and finance activities

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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 safety and reactions	Recognizes contrast safety issues and reactions	Manages contrast safety concerns and reactions, with supervision	Independently manages contrast safety concerns and reactions	Serves as a role model and researches on or teaches contrast safety, including to referring providers
☐	☐	☐	☐	☐	☐	☐	☐	☐

Comments:

Not Yet Completed 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 exam-specific radiation exposure to patients and practitioners	Applies principles of ALARA in daily practice including for pediatric patients	Creates, implements, and assesses radiation safety initiatives at the divisional, departmental, or institutional level
▭	▭	▭	▭	▭	▭	▭	▭	▭

Comments:

Not Yet Completed Level 1   ▭

Systems-Based Practice 7: Magnetic Resonance (MR) 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-magnetic resonance (MR) screening	Accesses resources to determine the safety of implanted devices and retained foreign bodies	Discusses MR safety concerns, including implants and retained foreign bodies, with patients and practitioners	Independently applies principles of MR safety to daily practice	Creates, implements, and assesses MR safety initiatives at the divisional, departmental, or institutional level
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐				
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 the best imaging examination for a routine patient/diagnosis	Articulates clinical questions and elicits patient preferences and values in order 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 evidence-based care guidelines
☐	☐	☐	☐	☐	☐	☐	☐	☐

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	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 that contribute to gap(s) between expectations and actual performance	Analyzes and reflects on 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	Analyzes effectiveness of behavioral changes where appropriate and considers alternatives in narrowing the gap(s) between expectations and actual performance	Coaches others on self-assessment and effective behavioral changes
Actively seeks opportunities to improve performance	Designs and implements a learning plan, with prompting	Designs and implements a learning plan independently	Uses performance data to measure the effectiveness of the learning plan and, when necessary, improves it	Facilitates the design and implementation of learning plans for others

Comments:

Not Yet Completed Level 1

Professionalism 1: Professional Behavior and Ethical 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	Engages in professional development educational activities or coaches others when their behavior fails to meet professional expectations
Demonstrates knowledge of the 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 the needs of patients, teams, and systems are met in routine situations	Performs tasks and responsibilities in a timely manner to ensure that 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	Coaches and educates on professional accountability and managing performance gaps

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 when appropriate	With assistance, proposes a plan to optimize personal and professional well-being	Independently develops or modifies a plan to optimize personal and professional well-being	Engages in professional well-being educational activities or coaches others to optimize personal and professional well-being
Recognizes limits in the knowledge/skills of self or team, with assistance	Independently recognizes limits in the knowledge/skills of self or team and demonstrates appropriate help-seeking behaviors	With assistance, proposes a plan to remediate or improve limits in the knowledge/ skills of self or team	Independently develops a plan to remediate or improve limits in the knowledge/skills of self or team	Coaches and guides others when their emotional responses or limitations in knowledge/skills do not meet professional 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.

Interpersonal and Communication Skills 1: Patient- and Family-Centered Communication				
Level 1	Level 2	Level 3	Level 4	Level 5
Accurately communicates own role within the health care system Identifies the need to adjust communication strategies based on assessment of patient/family expectations and understanding of their health status and treatment options	Identifies barriers to effective communication (e.g., language, health literacy, cultural) Organizes and initiates communication with patient/family by clarifying expectations and verifying understanding of the clinical situation	Identifies biases that hinder effective communication With guidance, sensitively and compassionately delivers medical information, elicits patient goals and preferences, and acknowledges uncertainty and conflict	Actively improves communication barriers Independently, uses shared decision making to align patient goals, and preferences with treatment options to make a personalized care plan	Coaches other learners to improve communication barriers Coaches or teaches other learners in shared decision making
☐	☐	☐	☐	☐	☐	☐	☐	☐

Comments:

Not Yet Completed Level 1   ☐

Interpersonal and Communication Skills 2: Interprofessional and Team Communication				
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 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 and teaches other learners in tailored communications to referring providers

Comments:

Not Yet Completed Level 1 ☐

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, including the safeguarding patient information	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 (division, department, institution, health care system)
☐	☐	☐	☐	☐	☐	☐	☐	☐

Comments:

Not Yet Completed Level 1   ☐