Medical Microbiology Milestones
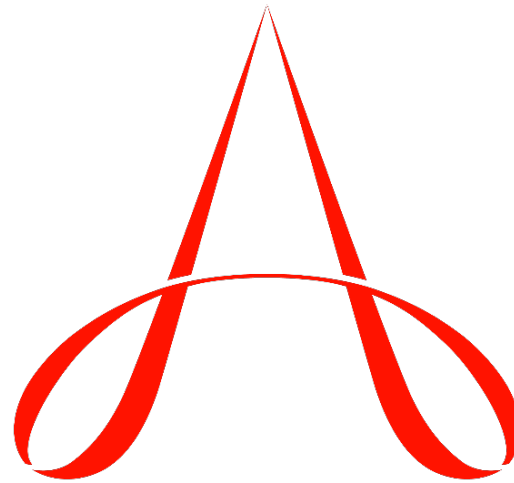
The Accreditation Council for Graduate Medical Education

ACGME

Second Revision: November 2020
First Revision: May 2014

Medical Microbiology 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 competency in a specialty or subspecialty. They neither represent the entirety of the dimensions of the six domains of physician competence, nor are they designed to be relevant in any other context.

Medical Microbiology Milestones Work Group

Karen Carroll, MD

Laura Edgar, CAE, EdD

Kate Hatlak, MSEd

Sixto Leal, MD

Clare McCormick-Baw, MD, PhD

Kenneth Muldrew, MD, MPH

Gary Procop, MD

Christi Wojewoda, MD

The ACGME would like to thank the following organizations for their continued support in the development of the Milestones:

American Board of Pathology

Review Committee for Pathology

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.

Additional resources are available in the Milestones section of the ACGME website. Follow the links under "What We Do" at www.acgme.org.

The diagram below presents an example set of milestones for one sub-competency 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.

Practice-Based Learning and Improvement 2: Commitment to Reflective Practice and Personal Growth				
Level 1	**Level 2**	**Level 3**	**Level 4**	**Level 5**
Establishes personal and professional goals, identifying gap(s) between goals and current performance	Demonstrates receptiveness to feedback, analyzing and reflecting on factors contributing to gap(s) between goals and current performance	Seeks feedback episodically, and institutes behavioral change(s) when necessary	Seeks feedback consistently, and sustains behavioral change as necessary	Role models consistently seeking performance data with adaptability and humility, and coaches others on reflective practice
	Designs and implements a learning plan, with prompting	Independently creates and implements an individualized learning plan	Uses performance data to measure the effectiveness of the learning plan and when necessary, improves it	Facilitates the design and implementing learning plans for others

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: Clinical Consultation				
Level 1	Level 2	Level 3	Level 4	Level 5
Describes the use of a consultation and lists available resources useful in consultation	For simple consultations, delineates the clinical question, obtains additional clinical information, accesses available resources, recommends next steps, and documents it, with assistance	For complex consultations, delineates the clinical question, obtains additional clinical information, applies relevant resources, and recommends next steps with assistance; manages simple consultations independently	Manages complex consultations independently	Recognized as an expert in providing comprehensive consultations
☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐

Comments:

Not Yet Completed Level 1 ☐

Not Yet Rotated ☐

Patient Care 2: Test Performance and Organism Identification				
Level 1	Level 2	Level 3	Level 4	Level 5
Observes and assists in the performance of common microbiology tests	Performs common microbiology tests and observes and assists in the performance of uncommon (i.e., esoteric) microbiology tests	Supervises and troubleshoots microbiology tests in all clinical scenarios	Teaches the features of microbiology testing, including the use, strengths, and limitations of the various methods of testing	Independently chooses the optimal test based on an analysis of test characteristics and patient population variables for any clinical scenario

Comments:

Not Yet Completed Level 1 ☐

Not Yet Rotated ☐

Patient Care 3: Test Interpretation and Reporting				
Level 1	Level 2	Level 3	Level 4	Level 5
Identifies common pre-analytic, analytic, and post-analytic issues that can affect results and interpretation of testing	Interprets and reports common microbiology tests with guidance	Independently interprets and reports common microbiology tests, and interprets and reports complex microbiology tests with guidance	Independently interprets and reports microbiology tests in all clinical scenarios	Develops procedures for test performance, interpretation, and reporting

Comments:

Not Yet Completed Level 1 ☐
Not Yet Rotated ☐

Medical Knowledge 1: Fundamental and Diagnostic Knowledge

Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates knowledge of microorganisms of all groups that are commonly encountered and their role in disease	Demonstrates knowledge of the methods required for detection/identification of commonly encountered microorganisms	Demonstrates knowledge of the methods required for detection/identification of novel pathogens and less commonly encountered microorganisms	Teaches the features of microorganism detection/identification for all groups of organisms	Consistently uses the literature or other means to investigate difficult to identify or novel pathogens
Demonstrates knowledge of common antibacterial agents	Demonstrates knowledge of guidelines regarding selection of antibacterial agents for testing	Demonstrates knowledge of antimicrobial agents for all groups of organisms	Demonstrates knowledge of guidelines regarding selection of all agents for testing	Demonstrates knowledge of pharmacokinetics and pharmacodynamics and clinical use of antimicrobials
Demonstrates knowledge of common resistance mechanisms in bacteria	Demonstrates knowledge in how to detect phenotypic and genotypic antimicrobial resistance mechanisms for bacteria	Demonstrates knowledge of resistance mechanisms for all pathogens	Demonstrates knowledge in how to detect phenotypic and genotypic antimicrobial resistance mechanisms for all pathogens	Contributes to the literature and/or guideline development regarding resistance detection

☐	☐	☐	☐	☐	☐	☐	☐	☐

Comments:

Not Yet Completed Level 1 ☐

Not Yet Rotated ☐

Medical Knowledge 2: Test Methodology				
Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates knowledge of basic test platforms and methodology	Demonstrates knowledge of complex test platforms and methodology	Demonstrates knowledge of the use and methods of outsourced microbiology tests	Demonstrates knowledge of the integration of different test methodology and platforms (e.g., testing algorithms)	Identifies optimal methodology for novel test development

Comments:

Not Yet Completed Level 1 ☐

Not Yet Rotated ☐

Medical Knowledge 3: Test Development and Validation/Verification				
Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates knowledge of the necessity of test validation/verification	Demonstrates knowledge of the essentials of test development and test validation/verification	Identifies requirements for test verification of a Food and Drug Administration (FDA)-approved test	Identifies requirements for test validation of a laboratory-developed test	Designs and implements a new laboratory-developed test
☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐

Comments:

Not Yet Completed Level 1   ☐
Not Yet Rotated   ☐

Medical Knowledge 4: Clinical Reasoning

Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates a basic framework for clinical reasoning	Demonstrates clinical reasoning to determine relevant information	Synthesizes information to inform clinical reasoning, with assistance	Independently synthesizes information to inform clinical reasoning in complex cases	Demonstrates intuitive approach to clinical reasoning for complex cases
Identifies resources to inform clinical reasoning	Selects relevant resources based on various scenarios to inform decisions	Seeks and integrates evidence-based information to inform diagnostic decision making in complex cases, with assistance	Independently seeks out, analyzes, and applies relevant original research to diagnostic decision making in complex clinical cases	Contributes to the literature or knowledge base that informs diagnostic decision making

Comments:

Not Yet Completed Level 1 ☐

Not Yet Rotated ☐

Systems-Based Practice 1: Patient Safety and Quality Improvement (QI)				
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 clinicians and/or patients and families (simulated or actual)	Discloses patient safety events to clinicians and/or patients and families, as appropriate (simulated or actual)	Role models or mentors others in the disclosure of patient safety events
Demonstrates knowledge of basic QI methodologies and metrics	Describes departmental and institutional QI initiatives	Participates in departmental and institutional QI initiatives	Demonstrates the skills required to identify, develop, implement, and analyze a QI project	Creates, implements, and assesses QI initiatives at the institutional or community level
☐	☐	☐	☐	☐	☐	☐	☐	☐

Comments:

Not Yet Completed Level 1   ☐

Systems-Based Practice 2: Systems Navigation for Patient-Centered Care

Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates knowledge of case coordination	Coordinates care of patients/specimens in routine cases effectively using interprofessional teams	Coordinates care of patients/specimens in complex cases effectively using interprofessional teams	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 situations	Performs safe and effective transitions of care/hand-offs in complex situations	Models and advocates for safe and effective transitions of care/hand-offs within and across health care delivery systems	Improves quality of transitions of care within and across health care delivery systems to optimize patient outcomes
Demonstrates knowledge of population and community health needs and disparities	Identifies pathology's role in population and community health needs and inequities for the local population	Identifies opportunities for pathology to participate in community and population health	Recommends and/or participates in changing and adapting practice to provide for the needs of communities and populations	Leads innovations and advocates for populations and communities with health care inequities

Comments:

Not Yet Completed Level 1 ☐

Systems-Based Practice 3: Physician Role in Health Care System

Level 1	Level 2	Level 3	Level 4	Level 5
Identifies key components of the complex health care system (e.g., hospital, skilled nursing facility, 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., test utilization, turnaround time)	Manages various components of the complex health care system to provide efficient and effective patient care and transitions of care	Advocates for or leads systems change that enhances high-value, efficient, and effective patient care and transitions of care
Describes basic health payment systems (e.g., government, private, public, uninsured care) and practice models	Documents testing detail and explains the impact of documentation on billing and reimbursement	Engages with clinicians and/or patients in shared decision making, such as use of preauthorization for complex testing	Practices and advocates for cost effective patient care with consideration of the limitations of each patient's payment model	Participates in health policy advocacy activities

☐		☐		☐		☐		☐	

Comments:

Not Yet Completed Level 1   ☐

Systems-Based Practice 4: Accreditation, Compliance, and Quality

Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates knowledge that laboratories must be accredited	Demonstrates knowledge of the components of laboratory accreditation and regulatory compliance (e.g., Clinical Laboratory Improvement Amendments and others), either through training or experience	Identifies the differences between accreditation and regulatory compliance; discusses the process for achieving accreditation and maintaining regulatory compliance	Participates in an internal or external laboratory inspection	Serves as a resource for accreditation at the regional or national level
Discusses the need for quality control and proficiency testing	Interprets quality data and charts and trends, including proficiency testing results, with assistance	Demonstrates knowledge of the components of a laboratory quality management plan	Reviews the quality management plan to identify areas for improvement	Creates and follows a comprehensive quality management plan
		Discusses implications of proficiency testing failures	Performs analysis and review of proficiency testing failures and recommends a course of action, with oversight	Formulates a response for proficiency testing failures

☐	☐	☐	☐	☐	☐	☐	☐	☐

Comments:

Not Yet Completed Level 1   ☐

Systems-Based Practice 5: Utilization				
Level 1	Level 2	Level 3	Level 4	Level 5
Identifies general microbiology work practices and workflow (e.g., specialized molecular testing, serology, and pre-analytics)	Explains rationale for optimizing utilization	Identifies opportunities to optimize utilization of pathology resources	Initiates efforts to optimize utilization	Completes a utilization review and implements change

Comments:

Not Yet Completed Level 1

Systems-Based Practice 6: Infection Prevention, Antimicrobial Stewardship, and Public Health

Level 1	Level 2	Level 3	Level 4	Level 5
Identifies the role of the microbiology laboratory in infection prevention	Attends infection prevention meetings and discusses initiatives to enhance infection prevention	Analyzes data and coordinates initiatives to support hospital infection prevention committee, with guidance	Independently analyzes data and coordinates initiatives to support hospital infection prevention committee	Leads an infection prevention initiative
Identifies the role of the microbiology laboratory in antimicrobial stewardship	Attends antimicrobial stewardship meetings and discusses the antimicrobial stewardship initiatives	Analyzes susceptibility data and coordinates initiatives to support antimicrobial stewardship, with guidance	Independently analyzes susceptibility data and coordinates initiatives to support antimicrobial stewardship	Independently analyzes susceptibility data and creates an antibiogram
Identifies the role and requirements of the microbiology laboratory in public health	Explains select agents and other agents of reportable diseases and means of their control, laboratory safety, and destruction	Employs resources to interface with public health officials/ departments, with guidance	Independently interfaces with public health officials/ departments	Leads a collaboration with public health to complete a project
☐ ☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐

Comments:

Not Yet Completed Level 1   ☐

Practice-Based Learning and Improvement 1: Evidence-Based Practice and Scholarship

Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates how to access and select applicable evidence	Identifies and applies the best available evidence to guide diagnostic work-up of simple cases	Identifies and applies the best available evidence to guide diagnostic work-up of complex cases	Critically appraises and applies evidence to guide care, even in the face of conflicting data	Teaches others to critically appraise and apply evidence for complex cases; and/or participates in the development of guidelines
Is aware of the need for patient privacy, autonomy, and consent as applied to clinical research	Develops knowledge of the basic principles of research (e.g., demographics, Institutional Review Board, human subjects), including how research is evaluated, explained to patients, and applied to patient care	Applies knowledge of the basic principles of research such as informed consent and research protocols to clinical practice, with supervision	Proactively and consistently applies knowledge of the basic principles of research such as informed consent and research protocols to clinical practice	Suggests improvements to research regulations and/or substantially contributes to the primary literature through basic, translational, or clinical research
☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐

Comments:

Not Yet Completed Level 1   ☐

Practice-Based Learning and Improvement 2: Reflective Practice and Commitment to Personal Growth				
Level 1	Level 2	Level 3	Level 4	Level 5
Accepts responsibility for personal and professional development by establishing goals	Demonstrates openness to receiving performance data and feedback in order to inform goals	Seeks performance data and feedback with humility	Actively and consistently seeks performance data and feedback with humility	Models seeking performance data and accepting feedback with humility
Identifies the gap(s) between expectations and actual performance	Analyzes and reflects on the factors which contribute to gap(s) between expectations and actual performance	Institutes behavioral change(s) to narrow the gap(s) between expectations and actual performance	Critically evaluates the effectiveness of behavioral changes in narrowing the gap(s) between expectations and actual performance	Coaches others in reflective practice
Actively seeks opportunities to improve	Designs and implements a learning plan, with assistance	Independently creates and implements a learning plan	Uses performance data to measure the effectiveness of the learning plan and improves it when necessary	Facilitates the design and implementing 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 the ethical principles underlying informed consent, surrogate decision making, advance directives, confidentiality, error disclosure, stewardship of limited resources, and related topics	Analyzes straightforward situations using ethical principles	Recognizes the need and uses relevant resources to seek help in managing and resolving complex ethical situations	Independently resolves and manages complex ethical situations	Identifies and seeks to address system-level factors that induce or exacerbate ethical problems or impede their resolution
Describes when and how to appropriately report professionalism lapses, including strategies for addressing common barriers; identifies and describes potential triggers for professionalism lapses	Demonstrates insight into professional behavior in routine situations; 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 self and others	Coaches others when their behavior fails to meet professional expectations

Comments:

Not Yet Completed Level 1 ☐

Professionalism 2: Accountability and Conscientiousness				
Level 1	Level 2	Level 3	Level 4	Level 5
Responds promptly to instructions, requests, or reminders to complete tasks and responsibilities	Takes ownership and performs tasks and responsibilities in a timely manner with attention to detail	Recognizes situations that may impact own ability to complete tasks and responsibilities in a timely manner and describes the impact on team	Anticipates and intervenes in situations that may impact others' ability to complete tasks and responsibilities in a timely manner	Takes ownership of system outcomes, and implements new strategies when necessary
☐	☐	☐	☐	☐	☐	☐	☐	☐

Comments:

Not Yet Completed Level 1   ☐

Professionalism 3: Self-Awareness and Help-Seeking				
Level 1	Level 2	Level 3	Level 4	Level 5
Recognizes limitations in the knowledge/skills/ behaviors of self or team, with assistance	Independently recognizes limitations in the knowledge/skills/ behaviors of self or team and seeks help when needed	Proposes and implements a plan to remediate or improve the knowledge/ skills/behaviors of self or team, with assistance	Independently develops and implements a plan to remediate or improve the knowledge/skills/ behaviors of self or team	Serves as a resource or consultant for developing a plan to remediate or improve the knowledge/ skills/behaviors
Recognizes status of personal and professional well-being, with assistance	Independently recognizes status of personal and professional well-being and seeks help when needed	Proposes and implements a plan to optimize personal and professional well-being, with assistance	Independently develops and implements a plan to optimize personal and professional well-being	Coaches others when responses or limitations in knowledge/skills do not meet professional expectations

Comments:

Not Yet Completed Level 1 ☐

Interpersonal and Communication Skills 1: Patient- and Family-Centered Communication

Level 1	Level 2	Level 3	Level 4	Level 5
Uses language and nonverbal behavior to demonstrate respect and establish rapport	Establishes a relationship in straightforward encounters using active listening and clear language	Sensitively and compassionately delivers medical information, with supervision	Independently, sensitively, and compassionately delivers medical information and acknowledges uncertainty and conflict	Mentors others in the sensitive and compassionate delivery of medical information
Identifies common barriers to effective communication (e.g., language, disability) while accurately communicating one's own role within the health care system	Identifies complex barriers to effective communication (e.g., health literacy, cultural)	When prompted, reflects on personal biases while attempting to minimize communication barriers	Independently recognizes personal biases while attempting to proactively minimize communication barriers	Models self-awareness while teaching a contextual approach to minimize communication barriers

☐	☐	☐	☐	☐	☐	☐	☐	☐	

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
Uses language that values all members of the health care team	Communicates information effectively with all health care team members	Uses active listening to adapt communication style to fit team needs	Coordinates recommendations from 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
Describes the utility of constructive feedback	Solicits feedback on performance as a member of the health care team	Integrates feedback from team members to improve communication	Communicates feedback and constructive criticism to superiors	Facilitates regular health care team-based feedback in complex situations
◯	◯	◯	◯	◯	◯	◯	◯	◯

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
Safeguards patient personal health information by communicating through appropriate means as required by institutional policy (e.g., patient safety reports, cell phone/pager usage)	Selects forms of communication based on context and urgency of the situation	Communicates while ensuring security of personal health information, with supervision	Independently communicates while ensuring security of personal health information	Guides departmental or institutional communication around policies and procedures regarding the security of personal health information
Identifies institutional and departmental structure for communication of issues	Respectfully communicates concerns about the system	Uses institutional structure to effectively communicate clear and constructive suggestions to improve the system	Initiates conversations on difficult subjects with appropriate stakeholders to improve the system	Facilitates dialogue regarding systems issues among larger community stakeholders (e.g., institution, health care system, field)

☐	☐	☐	☐	☐	☐	☐	☐	☐

Comments:

Not Yet Completed Level 1   ☐