

The Adult Cardiothoracic Anesthesiology Milestone Project

A Joint Initiative of

The Accreditation Council for Graduate Medical Education

The American Board of Anesthesiology



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The Milestones are designed only for use in evaluation of the fellow in the context of their participation in ACGME-accredited residency or fellowship programs. The Milestones provide a framework for 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 competency, nor are they designed to be relevant in any other context.

Adult Cardiothoracic Anesthesiology Milestones

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Milestone Reporting

This document presents Milestones designed for programs to use in semi-annual review of fellow performance and reporting to the ACGME. Milestones are knowledge, skills, attitudes, and other attributes for each of the ACGME competencies organized in a developmental framework from less to more advanced. They are descriptors and targets for fellow performance as a fellow moves from entry into fellowship through graduation. In the initial years of implementation, the Review Committee will examine Milestone performance data for each program's fellows as one element in the Next Accreditation System (NAS) to determine whether fellows overall are progressing.

For each period, review and reporting will involve selecting milestone levels that best describe a fellow's current performance and attributes. Milestones are arranged into numbered levels. Tracking from Level 1 to Level 5 is synonymous with moving from novice to expert in the subspecialty.

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

Level 1: The fellow demonstrates milestones expected of an incoming fellow.

Level 2: The fellow is advancing and demonstrates additional milestones, but is not yet performing at a mid-fellowship level.

Level 3: The fellow continues to advance and demonstrate additional milestones, consistently including the majority of milestones targeted for fellowship.

Level 4: The fellow has advanced so that he or she now substantially demonstrates the milestones targeted for fellowship. This level is designed as the graduation target.

Level 5: The fellow has advanced beyond performance targets set for fellowship and is demonstrating "aspirational" goals which might describe the performance of someone who has been in practice for several years. It is expected that only a few exceptional fellows will reach this level.

Additional Notes

Level 4 is designed as the graduation *target* and *does not* represent a graduation *requirement*. Making decisions about readiness for graduation is the purview of the fellowship program director. Study of Milestone performance data will be required before the ACGME and its partners will be able to determine whether milestones in the first four levels appropriately represent the developmental framework, and whether Milestone data are of sufficient quality to be used for high-stakes decisions.

Examples are provided with some milestones. Please note that 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 the ACGME supervision guidelines, as well as institutional and program policies. For example, a fellow who performs a procedure independently must, at a minimum, be supervised through oversight.

Answers to Frequently Asked Questions about Milestones are available on the Milestones web page:
<http://www.acgme.org/acgmeweb/Portals/0/MilestonesFAQ.pdf>.

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 sub-competency will be indicated by selecting the level of milestones that best describes that fellow's performance in relation to those milestones.

Medical Knowledge — Extracorporeal Circulation and Circulatory Assist Device Principles				
Level 1	Level 2	Level 3	Level 4	Level 5
Applies basic principles of standard cardiopulmonary bypass, with direct supervision Recognizes physiologic effects of intra-aortic balloon counterpulsation	Analyzes and applies principles of management of complex extracorporeal circulation, with direct supervision Analyzes and applies understanding of complex circulatory assist devices, with direct supervision	Analyzes and applies principles of management of complex extracorporeal circulation, with indirect supervision Analyzes and applies understanding of complex circulatory assist devices, with indirect supervision	Analyzes and applies principles of management of complex extracorporeal circulation, with conditional independence Analyzes and applies understanding of complex circulatory assist devices, with conditional independence	Recognition as an expert resource in extracorporeal circulation Recognition as an expert institutional resource for complex circulatory assist devices
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

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 — Peri-procedural Assessment and Management				
Level 1	Level 2	Level 3	Level 4	Level 5
<p>Performs pre-procedural assessment and optimization of common cardiothoracic disease, with direct supervision</p> <p>Safely manages transport of stable cardiothoracic patients, with indirect supervision</p> <p>Recognizes presence of early post-operative cardiopulmonary and hematologic complications</p>	<p>Performs pre-procedural assessment and optimization of complex and less common cardiothoracic disease, with direct supervision</p> <p>Safely manages transport of unstable cardiothoracic patients, with direct supervision</p> <p>Identifies and manages early post-operative cardiopulmonary and hematologic complications, with direct supervision</p>	<p>Performs pre-procedural assessment and optimization of complex and less common cardiothoracic disease, with indirect supervision</p> <p>Safely manages transport of unstable cardiothoracic patients, with indirect supervision</p> <p>Identifies and manages early post-operative cardiopulmonary and hematologic complications, with indirect supervision</p>	<p>Performs pre-procedural assessment and optimization of complex and less common cardiothoracic disease, with conditional independence</p> <p>Safely manages transport of unstable cardiothoracic patients, with conditional independence</p> <p>Identifies and manages early post-operative cardiopulmonary and hematologic complications, with conditional independence</p>	<p>Recognized as an expert resource in peri-procedural assessment and management</p> <p>Creates protocols and procedural guidelines for peri-procedural assessment and management</p>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Patient Care — Technical/Procedural Skills				
Level 1	Level 2	Level 3	Level 4	Level 5
<p>Independently obtains basic ultrasound images for cardiovascular monitoring, vascular access, and emergency evaluation</p> <p>Performs standard lung isolation techniques with fiberoptic bronchoscopic guidance</p> <p>Obtains vascular access in complex clinical situations, with conditional independence</p>	<p>Safely and accurately obtains images of the comprehensive peri-operative transesophageal echo (TEE) exam, with supervision</p> <p>Manages advanced lung isolation techniques with fiberoptic bronchoscopic guidance, with direct supervision</p> <p>Demonstrates vascular access expertise at a broad range of anatomic sites, with direct supervision</p>	<p>Safely and accurately obtains images of the comprehensive peri-operative TEE exam, independently</p> <p>Manages advanced lung isolation techniques with fiberoptic bronchoscopic guidance, with indirect supervision</p> <p>Demonstrates vascular access expertise at a broad range of anatomic sites, with indirect supervision</p>	<p>Obtains TEE images to guide surgical decision-making for assessment of complex anatomy and circulatory assist devices, with conditional independence</p> <p>Demonstrates expert application of fiberoptic bronchoscopy to assess anatomy distal to the carina and use of bronchoscopy for lung isolation and tracheo-bronchial toilet, with conditional independence</p> <p>Demonstrates vascular access expertise at a broad range of anatomic sites, with conditional independence</p>	<p>Recognized as an expert resource in peri-operative TEE image acquisition</p> <p>Recognized as an expert institutional resource for challenging vascular access problems</p>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Medical Knowledge — Extracorporeal Circulation and Circulatory Assist Device Principles				
Level 1	Level 2	Level 3	Level 4	Level 5
<p>Applies basic principles of standard cardiopulmonary bypass, with direct supervision</p> <p>Recognizes physiologic effects of intra-aortic balloon counterpulsation</p>	<p>Analyzes and applies principles of management of complex extracorporeal circulation, with direct supervision</p> <p>Analyzes and applies understanding of complex circulatory assist devices, with direct supervision</p>	<p>Analyzes and applies principles of management of complex extracorporeal circulation, with indirect supervision</p> <p>Analyzes and applies understanding of complex circulatory assist devices, with indirect supervision</p>	<p>Analyzes and applies principles of management of complex extracorporeal circulation, with conditional independence</p> <p>Analyzes and applies understanding of complex circulatory assist devices, with conditional independence</p>	<p>Recognized as an expert resource in extracorporeal circulation</p> <p>Recognized as an expert institutional resource for complex circulatory assist devices</p>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Medical Knowledge — Cardiovascular/Thoracic Imaging and Monitoring				
Level 1	Level 2	Level 3	Level 4	Level 5
<p>Applies basic principles and use of ultrasound for cardiovascular monitoring, vascular access, and emergency evaluation</p> <p>Interprets data from cardiopulmonary monitoring to guide routine clinical decision-making, with direct supervision</p>	<p>Meets educational requirements for National Board of Echocardiography (NBE) certification in basic peri-operative TEE</p> <p>Interprets data from cardiopulmonary monitoring to guide routine clinical decision-making, with indirect supervision</p>	<p>Applies TEE for complex clinical decision making during cardiothoracic surgery</p> <p>Integrates data from cardiopulmonary monitoring to guide advanced clinical decision-making, with indirect supervision</p>	<p>Meets all educational requirements for NBE certification in advanced peri-operative TEE</p> <p>Integrates data from cardiopulmonary monitoring to guide advanced clinical decision-making, with conditional independence</p>	<p>Recognized (through scholarship or education of others) as an expert resource in peri-operative TEE</p>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Medical Knowledge — Cardiovascular/Thoracic Pathophysiology and Pharmacology				
Level 1	Level 2	Level 3	Level 4	Level 5
<p>Interprets basic pharmacologic principles of anesthetic, vasoactive, inotropic, and pulmonary drugs to routine patient management</p> <p>Integrates knowledge of pathophysiology of common cardiopulmonary diseases into management of routine intra-thoracic procedures</p>	<p>Applies basic pharmacologic principles of anesthetic, vasoactive, inotropic, and pulmonary drugs to complex patient management</p> <p>Integrates knowledge of pathophysiology of cardiopulmonary diseases into management of complex intra-thoracic procedures</p>	<p>Applies advanced understanding of pharmacokinetics and pharmacodynamics of anesthetic, vasoactive, inotropic, and pulmonary drugs to complex patient management</p> <p>Integrates advanced knowledge of pathophysiology of cardiopulmonary diseases into management of complex intra-thoracic procedures</p>	<p>Expertly applies advanced understanding of pharmacokinetics and pharmacodynamics of anesthetic, vasoactive, inotropic, and pulmonary drugs to complex patient management</p> <p>Integrates advanced knowledge of pathophysiology of complex and less common cardiopulmonary disease into comprehensive management of complex intra-thoracic procedures</p>	<p>Recognized (through scholarship or education of others) as an expert resource in advanced understanding of pharmacokinetics and pharmacodynamics of anesthetic, vasoactive, inotropic, and pulmonary drugs to complex patient management</p>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Medical Knowledge — Diagnostic and Therapeutic Interventions				
Level 1	Level 2	Level 3	Level 4	Level 5
<p>Interprets information from common pre-operative cardiothoracic diagnostic studies</p> <p>Recognizes anesthetic implications of routine cardiothoracic therapeutic procedures</p>	<p>Interprets and integrates information from common pre-operative cardiothoracic diagnostic studies to guide anesthetic management</p> <p>Anticipates anesthetic implications of cardiothoracic therapeutic procedures</p>	<p>Interprets and integrates information from pre- and intra-operative advanced cardiothoracic diagnostic studies to anticipate procedural decision-making, and to guide anesthetic management</p> <p>Anticipates anesthetic implications of cardiothoracic therapeutic procedures, and assesses risks and benefits of different techniques</p>	<p>Interprets and integrates complex information from pre- and intra-operative advanced cardiothoracic diagnostic studies to anticipate and influence procedural decision-making, and to guide anesthetic management</p> <p>Anticipates anesthetic implications of complex and less common cardiothoracic therapeutic procedures, and assesses risks and benefits of different techniques in collaboration with interventional team</p>	<p>Recognized (through scholarship or education of others) as an expert resource in advanced understanding of complex cardiothoracic diagnostic studies, and/or in collaboration and influence on procedural planning and conduct</p>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Systems-based Practice — Interprofessional and Transitions of Care				
Level 1	Level 2	Level 3	Level 4	Level 5
<p>Requires direct supervision to effectively collaborate as a member of the interprofessional team within the health care system</p> <p>Requires direct supervision for effective transitions of care within the health care system</p>	<p>With indirect supervision, effectively collaborates as a member of an interprofessional care team during routine care within the health care system</p> <p>Requires direct supervision to effectively collaborate during complex clinical situations (e.g., emergencies) within the health care system</p> <p>With indirect supervision, manages transitions of care within the health care system</p>	<p>With indirect supervision, manages the interprofessional care team for all clinical situations within and between health care systems</p> <p>With direct supervision, coordinates transitions of care for all clinical situations within and between health care delivery systems</p>	<p>With conditional independence, leads the interprofessional care team for all clinical situations</p> <p>With conditional independence, coordinates transitions of care for all clinical situations</p>	<p>Develops methods to optimize and coordinate care throughout the continuum</p> <p>Serves as a role model and teacher in demonstrating effective methods for coordination of care during transitions across health care systems</p>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Systems-based Practice — Incorporation of Patient Safety and Quality Improvement into Clinical Practice				
Level 1	Level 2	Level 3	Level 4	Level 5
Needs prompting to consistently incorporate patient safety principles into clinical practice Needs prompting to incorporate principles of continuous quality improvement into clinical practice	Identifies common causes of clinical errors and medical device-related hazards and complications, and communicates them to faculty and staff members Reports near-misses and complications associated with clinical care using incident reporting system	Identifies opportunities and activities to optimize patient safety and quality of care, and initiates quality improvement processes to address them Collaborates with colleagues to identify ways to reduce the occurrence of near-misses and complications Participates in root cause analyses and sentinel event reviews	Substantially participates in a patient safety or quality improvement project Identifies opportunities to improve practice to optimize patient care Utilizes data about clinical practice to define opportunities to improve patient care	Leads a patient safety or quality improvement initiative
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Systems-based Practice — Understanding of Health Care Economics: Cost Awareness and Cost-benefit Analysis				
Level 1	Level 2	Level 3	Level 4	Level 5
Needs prompting to consider costs of medications, devices, tests, and procedures when making clinical decisions	Understands general concepts related to the economics of clinical practice, including to the costs of care, cost vs. charge relationships, and cost-benefit implications when selecting medications, devices, tests, and procedures	Consistently integrates cost awareness and cost-benefit analysis into clinical practice	Substantially contributes to programs to reduce costs and improve efficiency of clinical care Identifies opportunities to reduce total costs of care without compromising patient outcomes	Leads a team or teams to determine the most cost-effective strategies for all aspects of a procedure Substantially contributes to LEAN and other reengineering projects to improve clinical care and reduce costs
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Practice-based Learning and Improvement — Self-directed Learning and Scholarly Activity				
Level 1	Level 2	Level 3	Level 4	Level 5
<p>Completes assigned/recommended readings; reviews literature related to specific patient problems</p> <p>Participates in journal clubs, morbidity and mortality conferences, and other educational activities</p>	<p>Critically evaluates the scientific literature and understands limitations in addressing clinical issues</p> <p>Uses self-directed literature review to modify patient care</p>	<p>Independently integrates evidence-based practices into clinical care</p> <p>Participates in clinical research projects within the subspecialty</p> <p>Analyzes and modifies practice based on self-directed learning</p> <p>Identifies resources to facilitate critical appraisal of the literature (e.g., data analysis, statistics, and research design)</p>	<p>Participates in development of evidence-based clinical protocols and guidelines</p> <p>Identifies opportunities to improve personal clinical practices and learning from multiple sources</p>	<p>Participates in editorial reviews and other scholarly activities for peer-reviewed medical journals</p> <p>Participates in professional society and other activities to advance scholarship</p>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Practice-based Learning and Improvement — Education of Team Members and Other Health Care Providers				
Level 1	Level 2	Level 3	Level 4	Level 5
<p>Understands the value of disseminating educational information to medical students, residents, and other health care team members</p> <p>Communicates plans for care and their rationale to other health care providers, with prompting</p>	<p>With indirect supervision, effectively explains clinical decision making and its rationale to other members of the health care team</p> <p>Effectively presents relevant information at educational conferences</p>	<p>Seeks opportunities to provide thoughtful and relevant communication to other members of the health care team in the clinical setting and in presentations at educational conferences</p> <p>Coordinates conferences and case discussions</p>	<p>Actively promotes education of all team members and other providers regarding clinical practice and optimizing patient care</p> <p>Disseminates educational research through presentations and/or publications</p>	<p>Develops patient-oriented educational materials to optimize communication with patients and families</p> <p>Develops an educational curriculum for members of the health care team to optimize understanding of clinical issues and quality of care</p> <p>Serves as a role model for teaching and mentoring</p>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Professionalism — Commitment to Institution, Department, and Colleagues				
Level 1	Level 2	Level 3	Level 4	Level 5
<p>Complies with institutional policies and regulations, including duty hours</p> <p>Acts as a reliable and trustworthy team member (e.g., honest in all communications, volunteers to assist colleagues, when appropriate, to cover illnesses/absences)</p> <p>Completes requested evaluations (e.g., faculty member, program, peers, ACGME Resident Survey) in a timely manner</p> <p>Consistently attends and participates in divisional and departmental activities</p>	<p>Serves as a role model to other trainees on the importance of professionalism in clinical practice</p>	<p>Serves as a role model and responsible representative of the division/program/department</p> <p>Demonstrates an appreciation of the importance of effective communication at all levels</p> <p>Understands and disseminates the importance of respectful and culturally-sensitive interactions with colleagues</p>	<p>Participates in divisional, departmental, and institutional committees</p> <p>Serves as a resource to medical students and residents in addressing professional practice and its impact on well-being</p> <p>Supports colleagues after adverse clinical outcomes</p>	<p>Participates in regional or national committees; chairs institutional, regional, or national committees</p>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Professionalism — Receiving and Giving Feedback				
Level 1	Level 2	Level 3	Level 4	Level 5
Seeks constructive feedback from faculty members and colleagues	Provides constructive feedback in a tactful and supportive way to residents and medical students Accepts feedback from faculty members and incorporates suggestions into practice	Consistently seeks feedback from patients, family members, and other members of the care team (i.e., multisource feedback) Correlates feedback with self-reflection, and incorporates it into lifelong learning to enhance patient care	Provides constructive feedback in a tactful and supportive way to physician and non-physician members of the patient care team to enhance patient care	Effectively seeks and provides constructive feedback in challenging situations (e.g., when there is resistance, when there are adverse outcomes, or when an experienced practitioner is involved)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Professionalism — Responsibility to Maintain Personal, Emotional, Physical, and Mental Health				
Level 1	Level 2	Level 3	Level 4	Level 5
<p>Demonstrates basic professional responsibilities, such as reporting for work rested and prepared, with appropriate professional attire and grooming</p> <p>Demonstrates knowledge of basic requirements related to fatigue management, sleep deprivation, and principles of physician well-being</p> <p>Recognizes the need to balance patient, personal, institutional, and societal needs when providing health care</p>	<p>Demonstrates the ability to balance personal, institutional, and societal goals with professional responsibilities</p> <p>Identifies departmental and institutional resources available to address issues related to personal well-being in self and others</p>	<p>Reports concerns about the health or well-being of colleagues to a more experienced individual</p> <p>Reinforces to residents the importance of compliance with systems to prevent impairment</p> <p>Recognizes the impact of adverse patient outcomes on one’s personal well-being, and seeks assistance in addressing it</p>	<p>Teaches residents and students the need to balance patient, personal, institutional, and societal needs when providing health care</p> <p>Serves as a resource to medical students and residents in addressing professional practice and its impact on well-being</p>	<p>Serves as a resource for the development of organizational policies and procedures regarding professional responsibilities</p> <p>Assists with or leads intervention for suspected impaired colleagues</p> <p>Serves as a resource for colleagues returning from treatment for impairment</p> <p>Serves on institutional physician wellness committee</p>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Interpersonal and Communications Skills — Communication with Patients and Families				
Level 1	Level 2	Level 3	Level 4	Level 5
<p>Effectively communicates routine information in a respectful and culturally-sensitive manner</p> <p>Obtains informed consent/assent for routine procedures, using language appropriate to the patient's and family's level of understanding</p> <p>Recognizes situations where communication of information requires the assistance of another individual and asks for help</p> <p>Recognizes that institutional resources are available to assist with disclosure of medical errors</p>	<p>Effectively uses appropriate resources (e.g., translator, patient representative) to optimize communication</p> <p>Manages simple patient and family conflicts</p> <p>Identifies situations where patient and family conflicts exist, and appropriately seeks assistance with resolution</p>	<p>With minimal supervision, manages patient and family conflicts in complex situations (e.g., cultural factors, end-of-life issues, custodial issues), including in communication with persons of different socioeconomic and cultural backgrounds</p> <p>Understands the importance of disclosing medical errors or complications to patients and/or families</p> <p>Effectively participates in multidisciplinary communication</p> <p>Consults appropriate institutional resources (e.g., Risk Management, Bioethics Committee)</p>	<p>With conditional independence, manages patient and family conflicts in complex situations</p> <p>Discloses medical errors or complications to patients and/or families with indirect supervision</p>	<p>Consistently ensures effective communication and resolution of concerns occur with patients and/or families</p> <p>Independently manages patient and family conflicts in all situations</p> <p>With conditional independence, discloses medical errors or medical complications to patients and/or families</p> <p>Models cross-cultural communication and establishes therapeutic relationships with persons of diverse socioeconomic and cultural backgrounds</p>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				