

Organization of the Educational Milestones for Use in the Assessment of Educational Outcomes	INGRID PHILIBERT, PhD, MBA TIMOTHY BRIGHAM, MDIV, PhD LAURA EDGAR, EDD, CAE SUSAN SWING, PhD
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Editor's Note: The ACGME News and Views section of JGME includes data reports, updates, and perspectives from the ACGME and its review committees. The decision to publish the article is made by the ACGME.

The Supplement to the March 2014 issue of the *Journal of Graduate Medical Education* features the educational Milestones for 19 Accreditation Council for Graduate Medical Education (ACGME)-accredited specialties and the Transitional Year. These specialties will enter the Next Accreditation System (NAS) on July 1, 2014. Included with each set of Milestones is a description of their development, which also discusses the architecture of the Milestones, their envisioned use in resident evaluation and program improvement, and the pilot studies to date that have assessed the Milestones' psychometric properties and feasibility of implementation and use. A supplement to the March 2013 issue of the *Journal* featured the Milestones for the 7 specialties that entered the NAS on July 1, 2013, along with an introduction to the Milestones,¹ and a description of Milestone development for the first 7 specialties that also discussed their development and essential properties.²

The TABLE shows key data items for the educational Milestones for all accredited specialties and the Transitional Year. Columns in the TABLE show the organization of the Milestones, the number and type of Milestone sets for each specialty, information on the origin of the Milestones for the 4 cross-cutting competencies, and other relevant information such as whether the Milestones include suggestions for assessment.

The TABLE is intended as a reference for the first set of educational Milestones that will be reported as part of NAS reporting of educational outcomes. The aim is to show similarities and differences among these Milestone sets, and

to provide a historical reference for the initial Milestones developed by the educational community in each specialty.

Number of Milestones for Patient Care and Medical Knowledge

The Milestones in the TABLE show a variety of approaches to the initial Milestone sets. The number of subcompetencies for the 6 ACGME competencies (Patient Care/Technical Skills, Medical Knowledge, Systems-Based Practice [SBP], Practice-Based Learning and Improvement [PBLI], Professionalism [PROF], and Interpersonal and Communication Skills [ICS]) ranges from 10 for Allergy and Immunology, a specialty entered after completion of a prior residency and 12 for Diagnostic Radiology, to 41 for Orthopaedic Surgery. The number of Milestone sets for Patient Care/Technical Skills ranges from 2 for Diagnostic Radiology to 18 (Neurology); and the number for Medical Knowledge spans 1 (Anesthesiology, Emergency Medicine, Pediatrics, Physical Medicine and Rehabilitation, and Urology) to 16 for Orthopaedic Surgery. The number of Milestone sets for the 4 cross-cutting competencies SBP, PBLI, PROF, and ICS also varies considerably among specialties.

Milestone Organization

For many medical and hospital-based specialties the Milestone sets are organized around *Elements of Patient Care and the Physician's Role*, while for most surgical/procedural specialties the Milestone sets are organized by *Diagnoses, Disease Processes, and Technical/Procedural Skills*. Seven specialties (Medical Genetics, Neurology, Ophthalmology, Otolaryngology, Preventive Medicine, Psychiatry, and Surgery) opted for a hybrid approach that combines both *Elements of Patient Care and the Physician's Role* and *Diagnoses, Disease Processes, and Technical/Procedural Skills*. Two specialties (Internal Medicine and Pediatrics) organized their Milestone sets around the 6 competency domains, and either as part of the work of the Milestone working group or in a separate effort, mapped their specialty Milestones to Entrustable Professional Activities (EPAs).^{3,4}

For the procedural specialties that opted for Milestone sets organized around diagnoses, disease processes, and technical skills, the level of detail in this approach to Milestone organization may offer added clarity in terms of residents' acquisition of competence to perform common

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TABLE MILESTONE ORGANIZATION FOR ALL ACGME-ACCREDITED CORE SPECIALTIES AND THE TRANSITIONAL YEAR			
Specialty (Total No. of Milestones)	Milestone Organization	Milestone Distribution Across the 6 Competencies	Origin of Milestones for the 4 Cross-Cutting Competencies (PBLI, PROF, SBP, ICS)
Allergy and Immunology (10)	Elements of Patient Care and the Physician's Role. The 4 PC competencies represent the phases of PC: medical interviewing, diagnostic measures, management plans, and coordination of care.	4 PC, 1 MK, 2 PBLI, 1 PROF, 1 SBP, and 1 ICS. Notable: The Milestone sets reflect the specialized nature of A & I education, with entrants into A & I training having completed a prior residency program.	Adapted from the ACGME Expert Panel Set. The working group combined discrete Milestone sets developed by the ACGME Expert Panel into a single Milestone set for each of the 4 cross-cutting competencies.
Anesthesiology (25)	Elements of Patient Care and the Physician's Role. Although Milestone achievement is not strictly time based, Level 1 represents the expected performance at the end of the clinical base year.	10 PC, 1 MK, 4 PBLI, 2 SBP, 5 PROF, and 3 ICS. Notable: Professionalism subcompetencies include Commitment to Institution, Department, and Colleagues; Giving and Receiving Feedback; and Responsibility to Maintain Personal Emotional, Physical, and Mental Health.	Mixed Model. The subcompetencies for SBP, PBLI, PROF, and ICS include Milestone sets from the ACGME Expert Panel set, and sets developed by the working group.
Colon and Rectal Surgery (21)	Diagnoses, Disease Processes, and Technical/Procedural Skills. The Milestone sets incorporate coordinated PC and MK subcompetencies for the major disease categories in the specialty (eg, colonic neoplasia, Crohn disease, pelvic floor disease).	8 PC, 9 MK, 1 SBP, 1 PBLI, 1 PROF, 1 ICS. Notable: The Milestone sets reflect the specialized nature of Colon and Rectal Surgery education, with entrants into the specialty having completed a residency in surgery.	Developed by the Colon and Rectal Surgery Milestone Committee. The working group developed Milestone sets for SBP, PBLI, PROF, and ICS with an emphasis on a more global perspective on these competencies.
Dermatology (28)	Elements of Patient Care and the Physician's Role. The working group developed PC and MK subcompetencies that corresponded to the major subareas of dermatology as defined in the RRC's program requirements.	7 PC, 5 MK, 4 SBP, 4 PBLI, 3 PROF, and 5 ICS.	Mixed Model. The subcompetencies for SBP, PBLI, PROF, and ICS include Milestone sets from the ACGME Expert Panel set, sets adapted from other specialties, and Milestone sets developed by the working group.
Emergency Medicine (23)	Diagnoses, Disease Processes, and Technical/Procedural Skills. The Milestone sets are organized around the major components of emergency care. For the PC subcompetencies, Level 4 performance expected at graduation is aligned with American Board of Emergency Medicine certification standards. Milestone sets include suggestions for assessment; use of these assessments is not required.	14 PC, 1 MK, 3 SBP, 1 PBLI, 2 PROF, and 2 ICS. Notable: The PC competencies include (1) multitasking for emergency department management and (2) patient disposition.	Adapted from the ACGME Expert Panel Set.
Family Medicine (22)	Elements of Patient Care and the Physician's Role. The Milestone sets reflect the elements of acute, chronic, complex, and preventive care, and procedures performed by family physicians.	5 PC, 2 MK, 4 SBP, 3 PBLI, 4 PROF, and 4 ICS. Notable: The SBP subcompetencies include Milestone sets for Advocacy for Individual and Community Health, and Coordination of Team-Based Care.	Adapted from the ACGME Expert Panel Set.
Internal Medicine (22)	Elements of Patient Care and the Physician's Role, which are mapped to Entrustable Professional Activities. The Milestone sets are organized as EPAs, with Level 1 denoting the individual has critical deficiencies and is not allowed to practice the EPA, and Level 4 denoting readiness for unsupervised practice.	5 PC, 2 MK, 4 SBP, 4 PBLI, 4 PROF, and 3 ICS. Notable: Internal Medicine was the first specialty to develop educational Milestones, beginning its work in 2007, and developed an initial set of 142 educational Milestones.	Developed by the Milestone Working Group.
Medical Genetics (20)	Hybrid Approach: Combining Diagnoses, Disease Processes, and Technical/Procedural Skills and Elements of Patient Care/Physician's Role.	9 PC, 2 MK, 2 SBP, 2 PBLI, 3 PROF, and 2 ICS. Notable: The Milestone sets reflect the fact that residents enter medical genetics after completing a minimum of 2 years of training in an accredited residency.	Mixed Model. The Milestone sets for SBP, PBLI, PROF, and ICS include some Milestones from the ACGME Expert Panel set, and Milestone sets developed by the working group.
Neurological Surgery (24)	Diagnoses, Disease Processes, and Technical/Procedural Skills Domains in each of the 6 competencies are based on a neurosurgical "matrix" curriculum developed by the Society for Neurological Surgery, reflecting the written board examination topics and RRC case categories.	8 PC, 8 MK, 2 SBP, 2 PBLI, 2 PROF, and 2 ICS. Notable: Six matched PC and MK Milestone sets for major neurological surgery diagnoses and patient groups (eg, Treatment of Epilepsy and Movement Disorders, Vascular Neurosurgery).	Adapted from the ACGME Expert Panel Set.

TABLE CONTINUED

Specialty (Total No. of Milestones)	Milestone Organization	Milestone Distribution Across the 6 Competencies	Origin of Milestones for the 4 Cross-Cutting Competencies (PBLI, PROF, SBP, ICS)
Neurology (29)	Hybrid Approach: Combining Diagnoses, Disease Processes, and Technical/Procedural Skills and Elements of Patient Care/Physician's Role. The Milestone sets include 5 "global" domains (3 PC and 2 MK) that represent key components of neurology practice, 11 PC domains comprising major neurological disease categories, and 4 technical/procedural PC domains.	18 PC, 3 MK, 2 SBP, 2 PBLI, 2 PROF, and 2 ICS.	Adapted from the ACGME Expert Panel Set.
Nuclear Medicine (19)	Diagnoses, Disease Processes, and Technical/Procedural Skills.	5 PC, 7 MK, 2 SBP, 2 PBLI, 1 PROF, and 2 ICS. <i>Notable:</i> The Milestone sets reflect the fact that residents enter nuclear medicine after prior training in an accredited residency, and the years of prior training differ among entrants into the specialty.	Mixed Model. The subcompetencies for SBP, PBLI, PROF, and ICS include some Milestone sets from the ACGME Expert Panel set, and Milestone sets developed by the working group.
Obstetrics and Gynecology (28)	Diagnoses, Disease Processes, and Technical/Procedural Skills. The PC and MK Milestone sets reflect the structure of the ABOG Oral Examination, with Level 4 representing the knowledge, attitudes, and skills of a graduate who is ready to sit for the ABOG examination.	11 PC, 7 MK, 2 SBP, 2 PBLI, 3 PROF, and 3 ICS. <i>Notable:</i> The Milestone sets comprise 5 obstetrics subcompetencies, 9 gynecology subcompetencies, and 4 office practice subcompetencies.	Adapted from the ACGME Expert Panel Set.
Ophthalmology (24)	Hybrid Approach: Combining Diagnoses, Disease Processes, and Technical/Procedural Skills and Elements of Patient Care/Physician's Role. The PC subcompetencies are organized around the elements of patient care and the role of the physician. The MK subcompetencies include the key ophthalmology concepts and diagnoses (eg, Ophthalmic Pathology and Intraocular Tumors, Pediatric Ophthalmology and Strabismus).	8 PC, 2 MK, 3 SBP, 3 PBLI, 4 PROF, and 4 ICS. <i>Notable:</i> An appendix with added PC subcompetencies provides sufficient granularity for assessment of knowledge and skills; programs are not required to report data for these Milestone sets to the ACGME.	Adapted from the ACGME Expert Panel Set.
Orthopaedic Surgery (41)	Diagnoses, Disease Processes, and Technical/Procedural Skills. Sixteen matched PC/MK sets represent key Orthopaedic Surgery procedures, including anterior cruciate ligament injury, shaft fracture of the tibia/femur, and metastatic disease.	16 PC, 16 MK, 3 SBP, 2 PBLI, 2 PROF, and 2 ICS.	Adapted from the ACGME Expert Panel Set.
Otolaryngology (17)	Hybrid Approach: Combining Diagnoses, Disease Processes, and Technical/Procedural Skills and Elements of Patient Care/Physician's Role.	8 PC, 4 MK, 2 SBP, 1 PBLI, 1 PROF, and 1 ICS. <i>Notable:</i> In the PC and MK subcompetencies, each of the 6 subspecialty areas of Otolaryngology has 2 Milestone sets.	Mixed Model. The subcompetencies set for SBP, PBLI, PROF, and ICS include some Milestone sets from the ACGME Expert Panel set, and Milestone sets developed by the working group.
Pathology Anatomic and Clinical Pathology (27), Anatomic Pathology (26), Clinical Pathology (22)	Elements of Patient Care and the Physician's Role.	7 PC, 3 MK, 7 SBP, 2 PBLI, 6 PROF, and 2 ICS. Twenty-one Milestone sets apply to anatomic and clinical pathology, 5 sets apply to anatomic pathology, and 1 applies to clinical pathology.	Mixed Model. For PROF, the working group adapted the Milestone sets from the ACGME Expert Panel set; the Committee developed Milestone sets specific to Pathology for SBP, PBLI, and ICS.
Pediatrics (21)	Elements of Patient Care and the Physician's Role, which are mapped to Entrustable Professional Activities. The Pediatrics Milestones span the continuum from novice performance of early medical students to the expert performance expected of physician experts who are years into practice.	5 PC, 1 MK, 3 SBP, 4 PBLI, 6 PROF, and 2 ICS. <i>Notable:</i> The pediatrics community developed a total of 48 Milestone sets. To ease burden on programs, data for 21 Milestone sets are reported to the ACGME. The remaining 27 sets are used in curriculum formulation, resident assessment, and program improvement.	Mixed Model. The Milestone set for SBP, PBLI, PROF, and ICS include Milestone sets from the ACGME Expert Panel set, and Milestone sets developed by the working group, such as flexibility in adjusting to change with capacity to alter behavior, managing uncertainty, and demonstrating trustworthiness.

TABLE		CONTINUED	
Specialty (Total No. of Milestones)	Milestone Organization	Milestone Distribution Across the 6 Competencies	Origin of Milestones for the 4 Cross-Cutting Competencies (PBLI, PROF, SBP, ICS)
Physical Medicine and Rehabilitation (19)	Elements of Patient Care and the Physician's Role. The PC Milestones describe important psychiatric patient care tasks. The single MK Milestone set encompasses the application and synthesis of psychiatric knowledge.	7 PC, 1 MK, 3 SBP, 3 PBLI, 3 PROF, and 2 ICS. <i>Notable:</i> Nine MK subcompetencies that relate to common PM&R disorders are provided as an addendum for use in curriculum development. Data for these Milestone sets are not reported to the ACGME.	Mixed Model. The subcompetencies for SBP, PBLI, PROF, and ICS include some Milestone sets from the ACGME Expert Panel set, and sets developed by the working group.
Plastic Surgery (36)	Diagnoses, Disease Processes, and Technical/Procedural Skills. The PC and MK Milestone sets consist of 14 matched sets for the subcompetencies that represent the spectrum of plastic surgery practice, and that are consistent with the training requirements outlined by the American Board of Plastic Surgery and the Plastic Surgery RRC.	14 PC, 14 MK, 3 SBP, 2 PBLI, 2 PROF, and 1 ICS. <i>Notable:</i> A matrix with a blend of anatomic, functional, and esthetic factors was selected to organize the MK and PC Milestones.	Developed by the Plastic Surgery Milestone Committee. The Milestone Working Group developed Milestone sets for SBP, PBLI, PROF, and ICS that reflect specific elements in plastic surgery practice, such as elective esthetic surgery, practice management and marketing, and caring for underserved populations.
Preventive Medicine General Preventive Medicine (23), Occupational Medicine (26), Aerospace Medicine (27)	Hybrid Approach: Combining Diagnoses, Disease Processes, and Technical/Procedural Skills and Elements of Patient Care/Physician's Role. Sixteen Milestone sets are shared between General Preventive Medicine, Occupational Medicine, and Aerospace Medicine.	Shared Milestone Sets: 5 PC, 3 MK, 3 SBP, 1 PBLI, 2 PROF, and 2 ICS. <i>Milestone sets for SBP, PBLI, PROF, and ICS are the same for all 3 specialties. Total/unique added Milestones:</i> GPM: 12/7 PC, 3/0 MK; OM: 14/9 PC, 4/1 MK; AM: 15/10 PC, 4/1 MK.	Adapted from the ACGME Expert Panel Set.
Psychiatry (22)	Hybrid Approach: Combining Diagnoses, Disease Processes, and Technical/Procedural Skills and Elements of Patient Care/Physician's Role.	5 PC, 6 MK, 4 SBP, 3 PBLI, 2 PROF, and 2 ICS. <i>Notable:</i> Subcompetencies are disaggregated to emphasize specific behavioral components. Footnotes provide additional specific information to contextualize the Milestone sets for Psychiatry, as well as some references to other sources and published information.	Mixed Model. The subcompetencies for SBP, PBLI, PROF, and ICS include Milestone sets developed by the ACGME Expert Panel and sets adopted/adapted from other specialties.
Radiation Oncology (22)	Diagnoses, Disease Processes, and Technical/Procedural Skills. Milestone sets include suggestions for assessment; use of these assessments is not required.	11 PC, 2 MK, 3 SBP, 2 PBLI, 2 PROF, and 2 ICS. <i>Notable:</i> Nine of 11 PC Milestone sets are categorized according to disease type and site and 2 are procedural (brachytherapy and stereotactic radiosurgery/stereotactic body radiotherapy).	Adapted from the ACGME Expert Panel Set.
Diagnostic Radiology (12)	Elements of Patient Care and the Physician's Role. Milestone achievement expectations are linked to progression through the years of Diagnostic Radiology Training.	2 PC, 2 MK, 2 SBP, 3 PBLI, 1 PROF, and 2 ICS.	Mixed Model. The subcompetencies set for SBP, PBLI, PROF, and ICS include some Milestone sets from the ACGME Expert Panel set and sets developed by the working group.
Surgery (16)	Hybrid Approach: Combining Diagnoses, Disease Processes, and Technical/Procedural Skills and Elements of Patient Care/Physician's Role. The MK and PC Milestone sets reference the SCORE curriculum; familiarity with the SCORE categories "broad" and "focused" diseases/conditions and "essential-common," "essential-uncommon," and "complex" is helpful in resident assessment.	3 PC, 2 MK, 2 SBP, 3 PBLI, 3 PROF, and 3 ICS. The Milestone sets are based on 8 distinct domains of surgical practice: (1) care for diseases and conditions; (2) coordination of care; (3) performance of operations and procedures; (4) self-directed learning; (5) teaching; (6) improvement of care; (7) maintenance of physical and emotional health; and (8) performance of administrative tasks.	Adapted from the ACGME Expert Panel Set.

TABLE CONTINUED

Specialty (Total No. of Milestones)	Milestone Organization	Milestone Distribution Across the 6 Competencies	Origin of Milestones for the 4 Cross-Cutting Competencies (PBLI, PROF, SBP, ICS)
Thoracic Surgery (25)	Diagnoses, Disease Processes, and Technical/Procedural Skills. The PC and MK Milestone sets consist of 7 matched sets for the subcompetencies that represent the spectrum of Thoracic Surgery, as well as 2 added subcompetencies for MK and 1 for PC. The PC and MK Milestone sets use the curriculum developed by the American Board of Thoracic Surgery as anchors.	8 PC, 9 MK, 3 SBP, 2 PBLI, 2 PROF, and 1 ICS.	Adapted from the ACGME Expert Panel Set.
Transitional Year (23)	For all 5-level Milestone sets, Level 3 is designated as the target for successful completion of the TY year. Levels 4 and 5 reflect higher performance and an aspirational level. Milestone sets include suggestions for assessment; use of these assessments is not required.	7 PC, 2 MK, 3 SBP, 3 PBLI, 4 PROF, and 4 ICS.	Adapted from the ACGME Expert Panel Set. The Expert Panel's Milestone sets were significantly revised to make them consistent with the aims of a preparatory first year.
Urology (32)	Elements of Patient Care and the Physician's Role. Performance levels for medical knowledge are based on the national database of performance on the Urology In-Service Examination. Milestone sets include suggestions for assessment; use of these assessments is not required.	9 PC, 1 MK, 4 SBP, 7 PBLI, 6 PROF, and 5 ICS.	Mixed Model. The subcompetencies for SBP, PBLI, PROF, and ICS include some Milestone sets from the ACGME Expert Panel set, and sets developed by the working group.

Abbreviations: ACGME, Accreditation Council for Graduate Medical Education; PBLI, Practice Based-Learning and Improvement; PROF, Professionalism; SBP, Systems-Based Practice; ICS, Interpersonal and Communication Skills; PC, Patient Care; MK, Medical Knowledge; A & I: Allergy and Immunology; RRC, Residency Review Committee; EPA, Entrustable Professional Activity; ABOG, American Board of Obstetrics and Gynecology; PM&R, Physical Medicine and Rehabilitation; GPM, General Preventive Medicine; OM, Occupational Medicine; AM, Aerospace Medicine; SCORE, Surgical Council on Resident Education; TY, Transitional Year.

surgical operations and tasks. At the same time, the Milestone working groups using this approach acknowledged that their approach used a sampling methodology and does not encompass the breadth of practice in the specialty. In addition, the level of detail for this approach to Milestone organization may result in a greater assessment burden for programs and their Clinical Competency Committees (CCCs). Use of *Elements of Patient Care and the Physician's Role* and *Diagnoses, Disease Processes, and Technical/Procedural Skills* resulted in Milestone sets that appear to be superior in capturing the breadth of medical practice in the specialty, but often the individual Milestones are less likely to be around a specific set of clearly observable characteristics, and may be more open to interpretation about the level of performance that constitutes attainment of a given Milestone. This may result in added preparatory work for CCCs to ensure a common perspective on Milestone attainment to ensure consistent ratings across committee members, residents, and instances of CCC assessment. Use of EPAs in Milestone implementation introduces a meaningful way of organizing and integrating Milestones to correspond with higher-level tasks performed by residents.^{4,5}

Linkage to American Board of Medical Specialties Member Board Examination or Specialty Curricula

In 8 specialties, the Medical Knowledge and Patient Care/Clinical Skills subcompetencies were explicitly linked to key components of the American Board of Medical Specialties Member Board Examination (Emergency Medicine, Neurological Surgery, Obstetrics and Gynecology, Plastic Surgery, and Thoracic Surgery), the In-Training Examination (Urology), or to a validated curriculum developed by the specialty (Neurological Surgery, Surgery).

Milestone Sets for the 4 Cross-Cutting Subcompetencies

The Milestone sets for the cross-cutting Milestones for most specialties were adapted from a generic set of sample Milestones developed by an ACGME Expert Panel. The degree of adaptation varied among specialties and by the type of training program ("true" core program, educational program entered after completion of a prior residency [eg, Allergy and Immunology, Colon and Rectal Surgery, and Medical Genetics]), or a preparatory program (eg, the Transitional Year). Several specialties developed their own Milestones for SBP, PBLI, PROF, and ICS, and a few used a mixed model with some Milestone sets from the Expert

Panel and some developed by the Milestone Working Group.

Added Features

Seven Milestone working groups provided suggestions for tools and situations to assess the Milestones (Emergency Medicine, Plastic Surgery, Preventive Medicine, Radiation Oncology, Thoracic Surgery, the Transitional Year, and Urology); these assessments are not mandated. Three Milestone working groups developed specific examples for use in preparing CCC members for their role in Milestone scoring (Colon and Rectal Surgery, Nuclear Medicine, and Otolaryngology). One specialty, Psychiatry, offered ample footnotes to contextualize the specialty's educational Milestones as well as to offer references from the medical education literature. Four specialties developed additional Milestones to be used exclusively in resident assessment, remediation, or curriculum enrichment (Internal Medicine, Ophthalmology, Pediatrics, and Physical Medicine and Rehabilitation).

Conclusion

The goal of the educational Milestones is to assure that graduates of accredited programs have attained the knowledge and skills required for unsupervised practice in

their specialty, while for residents in training, the Milestones will enhance education and resident assessment and will contribute to a system that assures the safety and quality of care of patients cared for by residents.

The educational Milestones in the TABLE should be viewed as a starting point. This information will be useful given the envisioned evolution of the educational Milestones as additional information is gleaned from pilot projects, assessment studies, and the use of the Milestones by programs and the ACGME.

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