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Transition to Residency: Using Specialty-Specific Clinical Tracks and Advanced Competencies to Prepare Medical Students for Internship

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Abstract Recent discussions have sparked a debate about the purpose and function of the fourth year of medical school and the transition from undergraduate to graduate medical education. Our institution recently reformed our medical school curriculum into a three-part, competency-based curriculum that spans for 4 years, called Lead, Serve, Inspire (LSI). We present a novel way to structure the fourth year of medical school to better prepare our students for the next phase of their education in two ways, the development of Clinical Tracks and Advanced Competencies. The Clinical Tracks form individualized specialty-specific educational plans for students, preparing them to obtain the skills needed to be proficient interns in the specialty in which they hope to match. The Advanced Competencies are experiences that offer enhanced content that map to one of the Core Educational Objectives of the College of Medicine. They are often interdisciplinary and generalizable to multiple practice areas in both clinical and non-clinical activities. Ultimately, the goal of this revision is to create a competency-based, specialty-specific curriculum during the fourth year that will allow students to obtain the skills needed to function as interns on the first day of their postgraduate year 1 (PGY-1) of residency.

Keywords Undergraduate medical education · Graduate medical education · Milestones · Core educational competencies · Curricula · Entrustable professional activities

Introduction

The structure and purpose of the fourth year of medical school have been a topic of great debate with proposed options ranging from a pre-residency experience, to a generalist approach, to discussion of elimination of the fourth year entirely [1, 2]. Many have suggested organizing the fourth year so that students accomplish specialty-specific objectives that prepare them for their intended specialty [3–5]. With the recent implementation of the Accreditation Council for Graduate Medical Education (ACGME) Milestones Project [6] as a tool for competency-based assessment, the opportunity to optimize the transition from undergraduate medical education (UME) to graduate medical education (GME) exists. We present a description of a novel way to structure the fourth year of medical school to better align undergraduate and graduate medical education through the creation of specialty-specific Clinical Tracks and Advanced Competencies.

Background on Fourth Year of Medical School

Traditionally, the fourth year of medical school has had little structure and has mainly been used as a way for students to gain exposure to different specialties and clinical experiences. In fact, much of medical school curricular development has centered around the first 3 years, with the fourth year often

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neglected in terms of structure and goals [3, 7, 8]. While the idea of having a flexible fourth year provides ample opportunity for career exploration, gaps in education between medical school and residency have been identified. A survey of 30 program directors found that entering interns seem to be lacking in the areas of medical knowledge, professionalism, organization, and self-reflection [4]. More recently, with the development of the ACGME Milestones, it has been noted that starting interns often do not meet the level one milestones expected of a graduating medical student [9]. Weizberg et al. published data on a multi-institution study assessing postgraduate year 1 (PGY-1) Emergency Medicine residents during the first month of internship on nine level one milestones [10]. They found that less than 75% of residents met level one milestones when assessed by faculty, and that their self-assessment scores were higher than faculty assessment [10]. This study highlights the need for a more objective assessment of the skills of graduating medical students prior to the start of internship and emphasizes the importance of revising curricula to better prepare our students for the transition from undergraduate to graduate medical education.

The Alliance for Clinical Education (ACE) sponsored a panel discussion about the fourth year of medical school at the 2011 Association of American Medical Colleges (AAMC) meeting [3], concluding that the fourth year should serve as a way to prepare medical students for residency by using the ACGME Core Competencies and AAMC Entrustable Professional Activities (EPAs) to guide curricula [3]. From this discussion, they published a set of four recommendations to guide development of the fourth year curricula: (1) students should be objectively assessed and demonstrate competency in the six ACGME Core Competencies, (2) students should complete a capstone course that will prepare them to be interns by covering areas not covered by a typical medical school curriculum, (3) curricula should provide specialty-specific objectives to prepare students for their intended residency, and (4) medical schools should have a system for students to identify gaps in their knowledge to facilitate selection of clinical rotations to fill those gaps [3]. The authors emphasized the importance of a capstone course and sub-internship as well as having specialty-specific experiences available to better prepare graduating medical students for the roles and responsibilities they will have as interns.

In response to the identified gaps in knowledge at the transition between UME and GME in the literature and the strong call for a more competency-based medical school education, our institution recently reformed our curriculum. The product, *Lead*, *Serve*, *Inspire* (LSI) [11], is a three-part, competency-based curriculum that takes 4 years to complete. LSI uses the 13 EPAs as the framework to guide the curricular content and assessments. The AAMC developed this list of EPAs to facilitate the translation of clinical performance into competencies. Building on this concept, EPAs are units of professional practice, defined as tasks or responsibilities to be entrusted to the unsupervised execution by a trainee once he or she has attained sufficient specific competence. EPAs are independently executable, observable, and measurable. EPAs can be mapped to multiple milestones. Additionally, a learner must achieve an appropriate level of proficiency in the multiple competency domains that underlie the EPA before he or she can be entrusted to perform that activity [12].

The curricular content of LSI was determined by teams of basic scientists and clinicians and was designed to be delivered in multiple formats to emphasize active learning and highlight relevance to clinical applications and critical thinking skills. Objectives and subsequent assessments were designed based on the Institutional Core Educational Objectives (CEOs) and cover the six ACGME competency domains: Patient Care (PC), Medical Knowledge (MK), Practice-Based Learning (PBL), Interpersonal Communications (IC), System-Based Practice (SBP), and Professionalism (P). All objectives and assessments are paired and mapped back to the CEO's and are designed to provide clear evidence that the student is achieving and building upon knowledge, skills, and attitudes. Furthermore, direct observations are distributed throughout the curriculum and conducted by multiple observers in multiple settings [13]. LSI is divided into three parts: part one (*Clinical Foundations*) which includes years 1 and 2, part two (*Clinical Applications*) which includes year 3, and part three (*Advanced Clinical Management*) which includes year 4. Part one: *Clinical Foundations* focuses on building a foundation of knowledge, skills, and attitudes from the biomedical, behavioral, and clinical sciences that are needed to effectively function as a physician in clinical settings. Part two: *Clinical Applications* focuses on refining the knowledge, skills, and attitudes needed to effectively interpret and apply knowledge when working with individual patients and patient populations. Part three: *Advanced Management* allows further development as a physician through a curriculum that allows students to acquire the ability to effectively manage patients and healthcare systems and that allows for culminating student work intended to improve the practice of medicine.

The fourth year curriculum was designed to not only have a competency-based curriculum but also to build upon the concept that our learners should be preparing for the next phase of their education in a targeted fashion. As students enter this phase of the curriculum, they use a competency-based framework to ensure that they are working toward proficiency in the core EPAs as well as gaining specialty-specific skills necessary for success in their future residency. The year is comprised of required components as well as elective time that are structured based on the students' intended residency. All students are required to participate in Advanced Management in Hospital Based Care (AMHBC), an eight-week experience in an acute care setting that includes 4 weeks in Emergency

Medicine and 4 weeks in a mini-internship. In addition, they must complete Advanced Management in Relationship Centered Care (AMRCC), 8 weeks in the outpatient setting managing patients in ambulatory health systems and caring for patients with chronic conditions. Every student must also demonstrate achievement beyond the core competencies or CEOs in two ways: by developing a focused area of expertise in both a competency domain (Advanced Competency) and focused preparation for a clinical discipline (Clinical Track). Elective months are scheduled to meet the educational goals of the individual students.

Advanced Competencies

The Advanced Competencies are elective experiences that offer enhanced content that maps to one of the Core Educational Objectives. They are often interdisciplinary and generalizable to multiple practice areas in both clinical and non-clinical activities. Achieving an advanced certificate or similar recognition is encouraged, but not required of all of the courses (Table 1). Each Advanced Competency course description includes objectives and assessments that map to one main CEO that the course is designed to enhance.

Clinical Tracks

The Clinical Tracks provide the framework for individualized educational plans for students, preparing them to be skilled interns in the specialty of their choosing. Ultimately, the goal of the Clinical Tracks is to create a specialty-specific curriculum during the fourth year that will allow students to master the skills needed to function as interns beginning on day one of their PGY-1 year of residency. The Clinical Tracks provide both a set of guidelines for clinical rotations and experiences in which the students should enroll as well as competency-based assessments of the skills deemed essential for internship. Whenever possible, the students work toward selected ACGME Milestones expected of an incoming resident in their designated specialty within their tracks, with the goal of progressing to more advanced milestones as appropriate.

Developing the Clinical Tracks

The residency match data for years 2013–2015 for the College of Medicine were reviewed to determine the most common specialties into which our students match. Ultimately, ten Tracks were created for the inaugural year of the new curriculum (Table 2). Under the guidance of a core team of educational leaders in the College of Medicine, each Clinical Track was developed by a key faculty member in the individual clinical departments or divisions in collaboration with members from the affiliated residency programs. The components for each Clinical Track were defined with the ultimate goal of

establishing criteria for completion that are outcomes driven, measuring what is achieved by the student longitudinally, not necessarily what is taught in a discrete time-based rotation. Incorporation of assessment on at least a subset of selected milestones expected of an incoming intern for each specialty was strongly encouraged.

Given the variance in skills and knowledge required of incoming interns across the different disciplines, each Track established a range of components and assessments for this inaugural year of the curriculum (Table 3). For most, Track Directors selected a subset of specialty-specific ACGME Milestones for students to work toward during the fourth year. The necessary clinical rotations and experiences needed to provide the opportunities for students to learn these skills and be evaluated on them prior to graduation were determined. Most Clinical Tracks utilize the core required rotations of the fourth year, AMHBC, and AMRCC, as the basic building blocks for teaching and assessing the entry level milestones for their field. Electives or additional experiences were added to further support the development of the skills necessary to be successful in each particular field. Advanced topic courses, which are enhanced clinical experiences in a particular specialty, and capstone experiences are offered in some cases, and students may choose to align their Advanced Competency with their Clinical Track. The methods for milestone assessment and remediation, if needed, were decided by the department or division designing each track. The assessment methods used in the Clinical Tracks in Emergency Medicine (Table 4) and Family Medicine (Table 5) are offered as examples.

Discussion

The fourth year of medical school is an ideal time to assess students' performance on those skills necessary for entering residency, but little has been published regarding the use of the ACMGE Milestones for this purpose. In 2012, Santen et al. asked interns entering thirteen Emergency Medicine residency programs whether they were taught and assessed on the proposed level one milestones prior to starting internship. They found that medical schools were more likely to teach the milestones' content than specifically assess it [14]. Since then, some have started to use the ACGME Milestones to develop curricula in specialty-specific preparation electives or to evaluate student readiness for residency in capstone courses. Morgan et al. developed an Advanced Clinical Skills in Obstetrics and Gynecology elective for fourth year medical students with learning objectives mapped to the ACGME Milestones in Obstetrics and Gynecology [15]. The rotation was a four-week curriculum comprised of lectures, flipped classroom sessions, simulation training, cadaver dissections, and procedures. Students participating in the course

Table 1 List of the current Advanced Competency courses and the core competency each course is designed to enhance

Course	Core competency
Anatomy	Primary: Medical Knowledge and Skills
	Secondary: Interpersonal Communications
Biomedical Informatics	Primary: Systems-Based Practice
	Secondary: Medical Knowledge and Skills
Critical Care and Procedures	Primary: Medical Knowledge and Skills
	Secondary: Patient Care
DELTA (advocacy)	Primary: Systems-Based Practice
	Secondary: Practice-Based and Lifelong Learning
Emergency Preparedness and Disaster Management	Primary: Systems-Based Practice
	Secondary: Patient Care
Genetics	Primary: Medical Knowledge and Skills
Global Health	Primary: Interpersonal Communications
	Secondary: Systems-Based Practice
Health Literacy	Primary: Interpersonal Communications
	Secondary: Systems-Based Practice
Honors Ultrasound	Primary: Medical Knowledge and Skills
	Secondary: Patient Care
Hot Spotting—Team Care of Frequent Healthcare Consumers	Primary: Systems-Based Practice
Integrative Medicine	Primary: Patient Care
	Secondary: Systems-Based Practice, Practice-Based, and Lifelong Learning
Interdisciplinary Perspectives on Developmental Disabilities	Primary: Systems-Based Practice
Interprofessional Care for the Underserved Patient	Primary: Systems-Based Practice
	Secondary: Interpersonal Communications
Latino Health	Primary: Systems-Based Practice
	Secondary: Interpersonal Communications
Medical Administration	Primary: Systems-Based Practice
Medical Ethics	Primary: Systems-Based Practice
	Secondary: Interpersonal Communications, Patient Care
Pages to Bedside	Primary: Interpersonal Communications
	Secondary: Systems-Based Practice
Patient Experience	Primary: Interpersonal Communications
	Secondary: Systems-Based Practice
Professionalism and Humanism	Primary: Professionalism
	Secondary: Interpersonal Communications
Research	Primary: Medical Knowledge and Skills
Teaching in Medicine	Primary: Interpersonal Communications
	Secondary: Professionalism, Practice-Based, and Lifelong Learning
Ultrasound Immersion	Primary: Medical Knowledge and Skills
	Secondary: Patient Care

demonstrated an improvement in knowledge, confidence managing common paging scenarios, and surgical skills, but an objective assessment of performance on the milestones was not attempted. Clay et al. described the use of nine Transitional Year (TY) milestones to assess fourth year students after completing a four-week capstone course [16]. In this pilot study, selected milestones were integrated into existing course evaluations. They found the use of the TY milestones feasible in this setting, but noted challenges with the short time for assessment.

To our knowledge, no curricula have been published that focus on the development of advanced skills in the core

Table 2 Available Clinical Tracks with enrollment and final residency match of participants

Clinical Track	Students enrolled	Residency match of enrolled students (N)
Anesthesiology	8	Anesthesia (8)
Emergency Medicine	17	Emergency Medicine (14)
		Emergency Medicine/Internal Medicine (1)
		Emergency Medicine/Pediatrics (1)
		Family Medicine (1)
Family Medicine	16	Family Medicine (15)
		Obstetrics and Gynecology (1)
Internal Medicine	70	Dermatology (5)
		Diagnostic Radiology (1)
		Family Medicine (1)
		Internal Medicine (52)
		Internal Medicine/Pediatrics (5)
		Obstetrics and Gynecology (1)
		Ophthalmology (7)
		Pathology (2)
		Physical Medicine and Rehabilitation (3)
		Radiation Oncology (1)
Obstetrics and Gynecology	9	Family Medicine (1)
		Obstetrics and Gynecology (8)
Pediatrics	14	Family Medicine (1)
		Ophthalmology (1)
		Pediatrics (11)
		Pediatrics/Medical Genetics (1)
Psychiatry	9	Psychiatry (9)
Neurology	4	Neurology (4)
Radiology	5	Radiology (4)
		Urology (1)
Surgery/Surgical Subspecialties	33	General Surgery (16)
		Neurosurgery (2)
		Orthopedic Surgery (6)
		Otolaryngology (2)
		Physical Medicine and Rehabilitation (1)
		Plastic Surgery (1)
		Urology (5)

competencies like this part of our curriculum. A specialty-specific curriculum can not only foster acquisition of skills for students but can also be important for student mentorship and guidance in terms of rotation choice and career goals. Coates et al. published their creation of "colleges" in the fourth year curriculum. These colleges were comprised of faculty of similar specialties who were responsible for mentorship and oversight of course selection for groups of students. The medical students chose which college suited them based on their career goals. Feedback on this curricular change demonstrated that this change in the fourth year structure fostered improved mentorship, advisor satisfaction, and guidance for rotation choices and career goals from the medical student perspective [8].

The Advanced Competencies and Clinical Tracks in LSI provide a solid framework on which to build a smooth transition from UME to GME. These specialty-specific tracks will allow our graduates to develop a robust set of skills during medical school that will prepare them in a targeted fashion for residency. The longitudinal nature of the curriculum with the intertwining of basic fourth year rotations with specialty-specific electives allows students to experience and develop the needed skills in a variety of clinical settings. By using the ACGME Milestones to evaluate performance, we will be using a common language that can translate to readiness assessment at the start of residency. Finally, the Clinical Tracks provide multiple evaluation opportunities which may be more conducive to conducting a formal milestone assessment compared to a condensed rotation.

Table 3 Description of the ten Clinical Tracks offered with essential components and methods of assessment

Clinical Track	Essential track components		Methods of assessment for academic year 2015–2016		
	Required courses	Recommended courses (list provided to students)	Course completion	Milestone-based assessment	Clinical competency committee
Anesthesiology	X	X	X		
Emergency Medicine	X	X	X	X	
Family Medicine	X	X	X	X	X
Internal Medicine	X	X	X	X	X
Obstetrics and Gynecology (OB/GYN)	X	X	X	X	
Pediatrics	X	X	X	X	
Psychiatry	X	X	X	X	
Neurology	X	X	X	X	
Radiology	X	X	X	X	
Surgery/Surgical Subspecialties	X	X	X		

Barriers

During this first year of implementation, we did encounter some barriers to implementation of these tracks. The largest obstacle was faculty time for development of each of the tracks and subsequent assessment of the students. For GME programs, implementation of the ACGME Milestones and clinical competency committees has resulted in increased

Table 4 Methods of assessment in a milestone-based Clinical Track for Emergency Medicine

Milestone	AMHBC EM clerkship				Clinical track assessments			Other required experiences
	CPA	DOC	Simulation	Procedure lab	Direct observation	Procedure checklists	Comprehensive simulation	
PC-1 Emergency stabilization			x		x		x	
PC-2 History and physical exam	x	x			x		x	
PC-3 Diagnostic studies					x		x	
PC-4 Differential diagnosis					x		x	
PC-5 Pharmacotherapy					x		x	
PC-6 Reassessment					x		x	
PC-7 Disposition					x			
PC-8 Multi-tasking					x		x	
PC-9 Procedures						x		
PC-10 Airway				x		x		
PC-11 Anesthesia/pain							x	
PC-12 Ultrasound				x		x		
PC-13 Wound care				x		x	x	
PC-14 Vascular access				x		x		
MK Medical knowledge								[a]
SBP-1 Patient safety								[b]
SBP-2 Systems management					x			
SBP-3 Technology					x			
PBLI Performance improvement					x			[c]
PROF-1 Professional values	x				x			
PROF-2 Accountability					x			
ICS-1 Patient communication					x			
ICS-2 Team management					x		x	

AMHBC EM Advanced Management in Hospital Based Care Emergency Medicine, *CPA* Clinical Performance Assessment, *DOC* Direct Observation of Competence, *ICS* Interpersonal and Communication Skills, *PBLI* Practice-Based Learning and Improvement, *PC* Patient Care, *PROF* Professionalism, *SBP* Systems-Based Practice

[a] Passing score on United States Medical Licensing Exam and Emergency Medicine Advanced Clinical Exam

[b] Computer-Based Learning Modules

[c] Evidence-Based Medicine Assignment; Health Systems, Informatics, and Quality Assignment

Table 5 Methods of assessment in a milestone-based Clinical Track for Family Medicine

Milestone	AMRCC clerkship				Clinical track assessments					
	CPA	TBL	CBM	REF	CPA	DOC	CSL	POR	HSIQ	OSCE
PC-1 Cares for acutely ill or injured patients in urgent and emergent situation in and in all settings	x				x	x				x
PC-2 Cares for patients with chronic conditions	x				x					
PC-3 Partners with the patient, family, and community to improve health through disease prevention and health promotion					x	x				x
PC-4 Partners with the patient to address issues of ongoing signs and symptoms of health concerns that remain over time					x					
PC-5 Performs specialty—appropriate procedures to meet the health care needs of the individual patients, family, and community					x	x	x	x		
MK-1 Demonstrates medical knowledge of sufficient breadth and depth to practice family medicine			x		x					
MK-2 Applies critical thinking skills in patient care	x	x			x					
SBP-1 Provides cost-conscious medical care					x					
SBP-2 Emphasizes patient safety					x				x	
SBP-3 Advocates for individual and community health			x	x	x					
SBP-4 Coordinates team-based care					x					
PBLI-1 Locates, appraises, and assimilates evidence from scientific studies related to the patient's health problems				x	x				x	
PBLI-2 Demonstrates self-directed learning					x			x		
PBLI-3 Improves systems in which the physician provides care			x		x					
PROF-1 Completes a process of professionalization	x				x			x		
PROF-2 Demonstrates professional conduct and accountability	x				x					
PROF-3 Demonstrates humanism and cultural proficiency	x			x	x					
PROF-4 Maintains emotional, physical, and mental health and pursues continual personal and professional growth	x				x					
C-1 Develops meaningful, therapeutic relationships with patients and families	x				x					
C2 Communicates effectively with patient, families, and the public	x				x					
C-4 Utilizes technology to optimize communication	x				x		x			

AMRCC Advanced Management in Relationship Centered Care, *C* Communication, *CBM* Computer-Based Modules and Articulates, *CPA* Clinical Performance Assessment, *CSL* Clinical Skills Lab, *DOC* Direct Observation of Competence, *HSIQ* Health Systems, Informatics, and Quality, *MK* Medical Knowledge, *OSCE* Objective Structured Clinical Examination, *PBLI* Problem-Based Learning and Improvement, *PC* Patient Care, *POR* Portfolio includes Computer-Based Learning Modules, *PROF* Professionalism, *REF* Student-Written Self-reflections, *SBP* Systems-Based Practice, *TBL* Team-Based Learning

demand on faculty time for assessment of each resident or fellow. While likely ideal, the implementation of similar processes in the Clinical Tracks for medical students was deemed too resource intensive for most programs. As a result, not all of the Tracks have incorporated milestone-based assessments for this first year, and for those that did, the mode of assessing the milestones has varied. The diversity in the offerings in the Clinical Tracks has created a challenge for the program leadership to develop a tool for meaningful assessment of the curricula.

Future Goals

The Advanced Competencies and Clinical Tracks are in their infancy in our redesigned curriculum. As evaluation data from the first year of implementation becomes available, we will be better positioned to refine the current offerings and build upon our success. In the short term, we will move toward a common goal of milestone-based assessments in the few remaining Tracks that have not successfully incorporated this form of evaluation. We will need to assess sources of support needed for departments to be successful with this type of competency-based assessment. We will also look at expanding our Advanced Competencies in order to provide students with a variety of experiences that serves to further their knowledge and skills of the core clinical competencies. As we acquire evaluation data about the curriculum, we will begin to explore the most effective way to use the data we gather to bridge the transition from UME to GME. Options for application include a feed forward process where the milestone-based assessments from our Clinical Tracks can be communicated in a formative fashion to residency program directors after match or correlated with performance at the start of postgraduate training.

Conclusion

The ACGME Milestone Project provides an opportunity to improve the transition from UME to GME education. Our institution has created a novel fourth year medical student competency-based curriculum using specialty-specific Clinical Tracks and Advanced Competencies to better bridge this gap, so that graduating medical students are ready for internship on day one of their PGY-1 year. While this curricular development is a solid and innovative way to prepare our medical students, more work needs to be done in terms of evaluation of the curriculum to facilitate change, so that the program not only benefits student education but also provides meaningful feedback to future program directors.

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