

Using Transitional Year Milestones to Assess Graduating Medical Students' Skills During a Capstone Course

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ABSTRACT

Background Undergraduate medical education (UME) follows the lead of graduate medical education (GME) in moving to competency-based assessment. The means for and the timing of competency-based assessments in UME are unclear.

Objective We explored the feasibility of using the Accreditation Council for Graduate Medical Education Transitional Year (TY) Milestones to assess student performance during a mandatory, fourth-year capstone course.

Methods Our single institution, observational study involved 99 medical students who completed the course in the spring of 2014. Students' skills were assessed by self, peer, and faculty assessment for 6 existing course activities using the TY Milestones. Evaluation completion rates and mean scores were calculated.

Results Students' mean milestone levels ranged between 2.2 and 3.6 (on a 5-level scoring rubric). Level 3 is the performance expected at the completion of a TY. Students performed highest in breaking bad news and developing a quality improvement project, and lowest in developing a learning plan, working in interdisciplinary teams, and stabilizing acutely ill patients. Evaluation completion rates were low for some evaluations, and precluded use of the data for assessing student performance in the capstone course. Students were less likely to complete separate online evaluations. Faculty were less likely to complete evaluations when activities did not include dedicated time for evaluations.

Conclusions Assessment of student competence on 9 TY Milestones during a capstone course was useful, but achieving acceptable evaluation completion rates was challenging. Modifications are necessary if milestone scores from a capstone are intended to be used as a handoff between UME and GME.

Introduction

Graduate medical education (GME) in the United States has accelerated its transition to competency-based assessment with the adoption of milestones as part of the Accreditation Council for Graduate Medical Education (ACGME) new accreditation system.¹ Milestones are narrative descriptors of behaviors that progress from "critical deficiency," or novice performance, to performance in unsupervised practice. Milestones are based on 6 core competencies: patient care, medical knowledge, practice-based learning and improvement, systems-based practice, interpersonal and communication skills, and professionalism.¹

Undergraduate medical education (UME) also has embraced competency-based education and assessment² through the adoption of Core Entrustable Professional Activities for Entering Residency.³ The fourth year of medical school is an ideal time to assess students' performance; while this may add value to an academic year, this added value has been questioned by some.^{4,5} Using milestones to assess skills during the fourth year offers data on students' skills at the educational handoff from UME to GME.

To date, true baseline performance at matriculation into residency has not been established for graduating medical students.⁶ Using the milestones to delineate performance standards for graduating medical students would help clarify expectations of teaching and assessment for both faculty and students. Capstone or transition courses may provide an appropriate venue.^{7,8} In this article, we describe the use of ACGME Transitional Year (TY) Milestones⁹ to assess student performance in a capstone course.

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Editor's Note: The online version of this article contains an extended Table 1 with footnotes.

Methods

Participants and Setting

Participants were 99 Duke University medical students enrolled in the spring of 2014 in a 4-week capstone course required for graduation.

Curriculum

Our capstone course focuses on preparation for internship, including management of on-call issues, personal survival skills, and advanced topics relevant to internship, such as effective teaching and applied evidence-based medicine. The course utilizes a robust assessment strategy employing multirater formative and summative assessments.¹⁰

This study was determined to be exempt from review by our Institutional Review Board.

Logistics

TY Milestones were integrated into existing course evaluations to test the feasibility of using milestones in student assessment. TY Milestones were chosen because they are not specialty specific, and they have established performance standards for the end of the internship year. Nine of the 23 TY Milestones were chosen by comparing existing course activities and existing obligatory self, peer, or faculty assessment to specific milestones (TABLE 1). Some activities had a single assessment (self-assessment, faculty by direct observation, or peer by direct observation); others had combinations of the 3 assessments. Students and faculty completed evaluations within 48 hours of sessions using paper evaluations or an online survey tool (Qualtrics).

We reported the mean milestone level achieved by students and the percentage of students who achieved or exceeded a Level 3, as the ACGME expects that GME trainees achieve Level 3 by completion of the transitional year.¹

Feasibility data included the number of students who completed each activity, the number of evaluations collected, and the completion rate for milestone assessments.

Results

During the study period, 805 milestone assessments were completed. Mean student performance and completion rates are shown in TABLE 1. Students' mean scores on the 9 milestones ranged from 2.2 to 3.6, including self, peer, and faculty evaluations. More than 50% of students achieved or exceeded

Level 3 in breaking bad news and in developing a quality improvement project. Ascertained by faculty observations of student performance during simulation, students performed worse on self-assessment, working in interdisciplinary teams, and managing urgent/emergent conditions.

Low completion rates were a problem for some evaluations, and precluded the use of some of the data in assessing student performance in the capstone course. Student completion rates were lowest for assessments obtained using separate online evaluations, and highest for assessments obtained on paper during the small group exercise or online as part of mandatory assignments. Faculty completed assessments on paper immediately after a session. Faculty completion rates were lower when sessions did not include dedicated time for evaluation, and were lowest for the quality improvement project and simulation and highest for interprofessional collaboration.

Discussion

We assessed student performance for 9 TY Milestones during existing course activities with little additional faculty development, student education, or administrative infrastructure. Both evaluation completion rates and mean student performance varied across the 9 milestones.

While we were able to assess student performance during a 4-week capstone course, this pilot study demonstrated important limitations both with relevance and feasibility. First, we found it challenging to identify the target TY Milestone level for graduating students. Second, we recognized the need to modify our existing course assessments to accurately, consistently, and acceptably measure student competence.

The wide variation in student performance across the milestones raises several questions. Students may enter residency with higher performance on some milestones than others, suggesting a need to target curricular change in areas where students struggle the most (such as interprofessional teamwork) to improve their skills in this area prior to graduation. There may be a benefit in setting varied milestone expectations for student graduation and matriculation into internship. To set the minimum standard for graduation, we need data from multiple institutions.

As a result of the considerable variation in student performance within and across the milestones, we could not easily identify students who might benefit from remediation prior to residency. Redesigning our course model may allow for longitudinal assessment with multiple observations, as the current model of a

TABLE 1
Achieved Transitional Year Milestone Level for Students in Capstone 2014^a

Course Activity	TY Milestone(s) ⁹	Assessment	Self	Peer	Faculty
Plan a quality improvement project in a group of 3 and present it to peers and faculty	PBLI-3. Implements a quality improvement project	Checklist of expected elements of the project Direct observation by peers and faculty	Mean: 3.6 Level $\geq$ 3: 87% (n = 22)	Attempted to capture but completion rate was too low to report	
Break bad news to a standardized family member over a patient's 10-day hospital stay with 5 peers and faculty facilitator	ICS-1. Communicates effectively with patients, family, and the public as appropriate, across a broad range of socioeconomic and cultural backgrounds	Checklist of expected behaviors Direct observation by faculty and peers	Mean: 3.1 Level $\geq$ 3: 66% (n = 55)	Mean: 3.2 Level $\geq$ 3: 75% (n = 59)	
Develop a collaborative plan of care (with nurse, patient, physician) in low-fidelity simulation with a faculty observer (interprofessional collaboration)	ICS-3. Works effectively as a member or leader of a health care team or other professional group SBP-2. Works in interdisciplinary teams to enhance patient safety and improve patient care quality	Checklist of expected behaviors Direct observation by faculty	ICS-3: Mean: 2.2 Level $\geq$ 3: 32% (n = 62) SBP-2: Mean: 2.4 Level $\geq$ 3: 31% (n = 61)		
Stabilize 2 pediatrics and 2 adult patients using a high-fidelity simulator in groups of 4 with peer and faculty observation (high-fidelity simulation)	PC-5. Urgent and emergent medical conditions: recognizes urgent and emergent medical conditions and applies basic principles of triage and resuscitation	Checklist of expected behaviors Direct observation by peers and faculty	Mean: 2.9 Level $\geq$ 3: 45% (n = 55)	Mean: 2.9 Level $\geq$ 3: 67% (n = 119)	Mean: 2.4 Level $\geq$ 3: 13% (n = 15)
Identify appropriate diagnostic testing and therapy (using evidence-based medicine and cost-effective care) for video-recorded patient scenarios	PC-4. Management generates an appropriate diagnostic and therapeutic plan for assigned patients PBLI-2. Locates, appraises, and assimilates evidence from valid sources; identifies and performs appropriate learning activities; uses information technology to optimize learning SBP-3. Practices and advocates cost-effective, responsible care	Self-assessment using video-recorded faculty discussing how and why they pursued diagnostic and therapeutic interventions for different patients	PC-4: Mean: 2.8 Level $\geq$ 3: 56% (n = 89) PBLI-2: Mean: 2.8 Level $\geq$ 3: 54% (n = 89) SBP-3: Mean: 2.6 Level $\geq$ 3: 48% (n = 86)		
Create a learning plan for a capstone course based on performance in clerkships, in problem sets, and on boards	PBLI-1. Self-directed assessment and self-directed learning: identifies strengths, deficiencies, and limits in one's knowledge and expertise; sets learning and improvement goals	Review by course director with directed feedback to student	Mean: 2.6 Level $\geq$ 3: 63% (n = 92)		

Abbreviations: TY, transitional year; PBLI, practice-based learning and improvement; ICS, interpersonal and communication skills; SBP, systems-based practice; PC, patient care.

^a Mean milestone levels and percentages of students meeting or exceeding a Level 3 are included in the Table.

Note: An extended Table 1 with footnotes is available as online supplemental material.

TABLE 2

Proposed Course Activities Mapped to Transitional Year Milestones

Proposed Course Activity	TY Milestone(s) ⁹
Perform handoff during subinternship with resident and attending physician evaluation Write and critique a discharge summary for a patient during the subinternship	SBP-1. Coordinates patient care within various health care delivery settings ICS-2. Communicates effectively with physicians, other health professionals, and health-related agencies ICS-3. Works effectively as a member or leader of a health care team or other professional group ICS-4. Maintains comprehensive, timely, and legible medical records
Obtain informed consent from a standardized patient and perform a procedure (with an appropriate timeout); procedure should be relevant to intended field of practice	PC-7. Procedures: demonstrates understanding of indications/contraindications and the ability to perform common basic procedures
Develop a personal plan for resiliency, and practice aspects of this plan during a capstone course; as part of a capstone project, identify methods for seeking help in the residency to which the student has matched	PROF-4. Personal responsibility to maintain emotional, physical, and mental health

Abbreviations: TY, transitional year; SBP, systems-based practice; ICS, interpersonal and communication skills; PC, patient care; PROF, professionalism.

capstone course only allows a short window prior to graduation, leaving limited time for remediation.

One question that arose is whether medical schools have an obligation to share these data with the GME programs that receive their students. Ideally, sharing these outgoing assessments would facilitate the educational handoff to GME, thus benefiting a student for whom enhanced teaching and supervision would increase the likelihood of success in internship.

Our study demonstrated that it was difficult to assess 9 milestones over 4 weeks, and this prompted a redesign of our capstone course. We will need a longer course to assess performance on more than 9 milestones. Overlapping the course with subinternship activities will assess student competence during actual patient encounters. In order to achieve a high level of faculty commitment and proficiency with assessment, a small cohort of trained faculty who can commit greater time to the course will be needed. As a result, we will transition our course from a rotational format to a longitudinal format, in which students will complete a set of competency-based skills using the TY Milestones (as described by others for residency),¹¹ and additional TY Milestones will be assessed (TABLE 2).

Ten core faculty members who serve as capstone coaches will receive consistent faculty development on competency assessment, and will be required to commit to timely completion of evaluations. Each faculty member will be assigned a small group of students, allowing timely assessment and feedback to students over the entire fourth year, and each will follow up on student completion of exercises and evaluations,

thereby increasing student accountability. We plan to study coaches' inter- and intraobserver reliability.

Conclusion

A competency-based approach to assessment in a fourth-year capstone course using the TY Milestones identified variation in student performance within and across milestones, challenges with evaluation completion rates, and challenges with implementing milestone assessments during this 4-week course when remediation of low-performing students is no longer feasible. Future work is needed to further delineate performance expectations for graduating medical students to facilitate the handoff between medical school and internship.

References

1. Accreditation Council for Graduate Medical Education. Milestones. <http://www.acgme.org/acgmeweb/tabid/430/ProgramandInstitutionalAccreditation/NextAccreditationSystem/Milestones.aspx>. Accessed July 22, 2015.
2. Englander R, Cameron T, Ballard AJ, Dodge J, Bull J, Aschenbrener CA. Toward a common taxonomy of competency domains for the health professions and competencies for physicians. *Acad Med*. 2013;88(8):1088–1094.
3. Englander R, Aschenbrener CA, Call SA, Cleary L, Garrity M, Lindeman B, et al. Core entrustable professional activities for entering residency (updated).

- <http://www.mededportal.org/icollaborative/resource/887>. Accessed July 22, 2015.
4. Weinstein D. Ensuring an effective physician workforce for the United States: recommendations for reforming graduate medical education to meet the needs of the public. May 2011. [http://macyfoundation.org/docs/macy_pubs/JMF_GME_Conference2_Monograph\(2\).pdf](http://macyfoundation.org/docs/macy_pubs/JMF_GME_Conference2_Monograph(2).pdf). Accessed July 22, 2015.
 5. Lyss-Lerman P, Teherani A, Aagaard E, Loeser H, Cooke M, Harper GM. What training is needed in the fourth year of medical school? Views of residency program directors. *Acad Med*. 2009;84(7):823–829.
 6. Santen SA, Rademacher N, Heron SL, Khandelwal S, Hauff S, Hopson L. How competent are emergency medicine interns for level 1 milestones: who is responsible? *Acad Med*. 2013;20(7):736–739.
 7. Scicluna HA, Grimm MC, O'Sullivan AJ, Harris P, Pilotto LS, Jones PD, et al. Clinical capabilities of graduates of an outcomes-based integrated medical program. *BMC Med Educ*. 2012;12:23.
 8. Teo AR, Harleman E, O'Sullivan PS, Maa J. The key role of a transition course in preparing medical students for internship. *Acad Med*. 2011;86(7):860–865.
 9. Accreditation Council for Graduate Medical Education. Transitional year. <http://acgme.org/acgmeweb/tabid/153/ProgramandInstitutionalAccreditation/Hospital-BasedSpecialties/TransitionalYear.aspx>. Accessed July 22, 2015.
 10. Scicluna HA, Grimm MC, Jones PD, Pilotto LS, McNeil HP. Improving the transition from medical school to internship—evaluation of a preparation for internship course. *BMC Med Educ*. 2014;14:23.
 11. Yarris LM, Jones D, Kornegay JG, Hansen M. The milestones passport: a learner- centered application of the milestone framework to prompt real-time feedback in the emergency department. *J Grad Med Educ*. 2014;6(3):555–560.



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