

Using the ACGME Milestones as a Handover Tool From Medical School to Surgery Residency

Lauren M. Wancata, MD,* Helen Morgan, MD,^{†,‡} Gurjit Sandhu, PhD,^{*,‡} Sally Santen, MD,[§] and David T. Hughes, MD*

*Department of Surgery, University of Michigan, Ann Arbor, Michigan; [†]Department of Obstetrics and Gynecology, University of Michigan, Ann Arbor, Michigan; [‡]Learning Health Sciences, University of Michigan, Ann Arbor, Michigan; and [§]Department of Emergency Medicine, University of Michigan Medical School, Ann Arbor, Michigan

OBJECTIVE: To map current medical school assessments for graduating students to the Accreditation Council for Graduate Medical Education (ACGME) milestones in general surgery, and to pass forward individual performance metrics on level 1 milestones to receiving residency programs.

DESIGN: The study included 20 senior medical students who were accepted into surgery internship positions. Data from medical school performance assessments from the third-year surgery clerkship, fourth-year surgery rotations, fourth-year surgery boot camp, Clinical Competency Assessment Examination, and United States Medical Licensing Examination (USMLE) Step 1 and 2 examinations were used to map each student's competency assessments to the General Surgery Milestones based on a scoring system created and validated by independent assessors. This Milestones Assessment was then provided to each student's receiving program director.

SETTING: The study was conducted at the University of Michigan Medical School, in Ann Arbor, Michigan.

PARTICIPANTS: Fourth-year medical students entering into surgical internship.

RESULTS: Of 16 Accreditation Council for Graduate Medical Education (ACGME) General Surgery Milestones subcompetencies, 12 were able to be evaluated with current medical school assessments. Of the 20 students, 11 met criteria for all the level 1 milestones and 9 needed improvement in at least 1 domain.

CONCLUSIONS: It was feasible to use medical school assessments to feed forward information about senior medical students on 12 of the 16 General Surgery Milestones subcompetency domains. (J Surg Ed ■■■■-■■■■. © 2016 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: ACGME Milestones, graduate medical education, surgery residency, medical student performance evaluation

COMPETENCIES: Patient Care, Medical Knowledge, Systems-Based Practice, Interpersonal and Communication Skills

INTRODUCTION

The intent of medical education has been not only to educate students but also to prepare them for their respective residencies. Over the years, concerns have been noted by program directors regarding the preparedness of newly graduated students entering internship, noting a disconnect between the perceived skill and confidence level of students/residents compared to program directors' perceptions.^{1,2} With the development of Accreditation Council for Graduate Medical Education (ACGME) Milestones for each specialty, assessment of residents nationwide follows a set criteria, to ensure all residents are competent in the 6 core competencies.^{3,4}

Specifically, the Milestones are competency based, developmental outcomes that can be demonstrated progressively by residents and fellows from the beginning of their postgraduate education, through completion of residency to unsupervised practice.³ The core competencies include patient care, medical knowledge, professionalism, interpersonal and communication, practice-based learning and improvement, and system-based practice.³ Within the general surgery milestones project, there

Correspondence: Inquiries to Lauren M. Wancata, MD, Department of Surgery, University of Michigan, 1500 East Medical Center Drive, Ann Arbor, MI 48109; fax: (734) 936-5830; e-mail: lwancata@med.umich.edu

are 8 practice domains encompassing the 6 core competencies, with graded levels of competency.⁴ A competency level of 1 is “the resident is demonstrating milestones expected of an incoming resident,” indicating that these skills should be taught and theoretically assessed before medical school graduation.⁴

Although there is an established method to assess resident’s competency throughout their training with the Milestones, it is often unknown what the resident’s baseline proficiency is when they enter into residency.⁵ Studies have demonstrated the utility of medical school boot camps to prepare students for residency, but medical schools vary in whether these preparatory courses are offered and in the content of those courses.⁶⁻¹² The current standard to relay information regarding a student’s competency level when entering residency has been the medical student performance evaluation or “dean’s letter,” which can be generalized, lack detail, and may not be very useful to the program director as it relates to performance of clinical care.¹³⁻¹⁶ An additional concern is the lack of common performance language during the transition from undergraduate to graduate medical education. Although residents are evaluated by the Milestones, with their defined language and requirements, the evaluation of medical students remains individualized, defined by each institution and not directly focused on the competencies required in residencies.

With the recent identification of standard milestones for residents there is a significant gap in the communication between medical schools and the receiving residency programs. With this study we sought to determine if established medical school assessments could be used to develop a standardized method to evaluate and map student’s competency for residency based on the ACGME Milestones for General Surgery.

MATERIALS AND METHODS

After an exemption status was granted by the institutional review board of the University of Michigan, the authors used existing medical school performance assessments in the third-year surgery clerkship, fourth-year surgery rotations, fourth-year general surgery residency prep course (boot camp), and the Clinical Competency Assessment (CCA) Examination to create a Milestones scoring system for all graduating medical students matching into a surgical residency (general surgery, vascular surgery, cardiothoracic surgery, urology, plastic surgery, otolaryngology, or neurosurgery). The expected competency for graduating medical students was meeting level 1 for each milestone.

Creation of ACGME General Surgery Milestones Assessment for Graduation Medical Students

In this study, we used the metrics of a level 1 ACGME milestones competency as what would be expected of a

graduating medical student on day 1 of their internship in surgery. Components of the CCA, surgery clerkships and the fourth-year surgery boot camp were used to create a scoring system to map students to a milestones assessment at the end of their fourth year of medical school. For each competency and domain of the ACGME General Surgery Milestones students were given a score of -1: needs further improvement, 1: proficient for an incoming intern, +1: at a midyear intern level, or NA: not assessed. The scoring system for each assessment was evaluated and a standardized criterion for each score was developed based on the existing assessment data (Fig. 1). Validity evidence was collected by having 2 blinded scorers (authors L.W. and D.H.) score each of the students and when compared the results were identical.

Descriptions of Established Medical School Assessments Used in this Study

Clinical Competency Assessment

The CCA is a multistation summative assessment that is administered at the beginning of the fourth year of medical school. All students are required to pass the CCA to graduate. The goal of the examination is to ensure students are competent in the fundamental clinical examination skills necessary to provide excellent, effective, and safe patient care. There are multiple standardized patient-based stations covering a broad range of clinical situations in which the student must take a history, perform a physical examination, and complete a postencounter note or an oral case presentation. There is also a computer-based portion of the examination that includes stations on evidence based medicine, electrocardiogram, imaging, and critical values. Students are provided with individual scores for each station, domain scores for data gathering, communication, and clinical reasoning, and an overall score for the examination. Standard deviations were used in the milestones assessment, with scores more than 1 standard deviation above or below the mean being significant in subsequent scoring of the milestone’s domains.

Medical School Clerkship in General Surgery

All medical students are required to participate and complete the third-year clerkship in general surgery, which includes clinical responsibilities, scheduled lectures, an oral examination, and the SHELF examination. All medical students entering into a surgical specialty match are required to complete 2 subinternship rotations in the core surgical services during their fourth year. Assessment of the students in the clerkship and subinternships is completed by using a standard clinical assessment score (form is standardized and used by the whole institution) that scores students in patient care, medical knowledge, communication, professionalism, and overall assessment. Final grades included pass, high

pass, and honors for the students included in this study and these grades were used to assess milestones.

American College of Surgeons/Association of Program Directors in Surgery/Association of Surgical Education Resident Prep Curriculum (Surgery Boot Camp)

This is a 4-week course in which students attend lectures on various important topics related to surgical practice and skills required for residency. Included in this course is an operative anatomy week, open and laparoscopic skills teaching and testing, basic procedure teaching and testing, and a mock paging curriculum. During the procedural assessments, students are assessed on procedural skills with dedicated assessments of suturing and knot tying, laparoscopic procedures, central line placement, chest tube placement, management of shock, endotracheal tube placement,

cricothyroidotomy, and sterile setup for minor procedures. During mock paging, the students are required to respond to 13 mock paging scenarios regarding various clinical situations and are graded on their clinical assessment, interaction with the paging nurse, and overall management of the situation. The surgery boot camp is a long established elective in which most of students entering into surgery residency participate in. Each student's performance on technical skills and clinical knowledge was assessed and compared to the mean for the 20 students in this study. These scores were used in the Milestones Assessment.

Advanced Medical Therapeutics

Advanced medical therapeutics is a 1-month rotation during the fourth year that teaches management of a variety of diseases across specialties. Students are required to create a learning module on a disease process of their choosing. This

Needs further improvement	Proficient for an incoming intern	At a mid-year intern level	Not Assessed
-1	1	+1	NA

A score of a 1 represents a student who has the basic knowledge/skills represented in the milestones competencies and understands how their knowledge and skills can be utilized to provide patient care. They are at the level of a proficient incoming intern and would meet the lowest/basic requirements of Level 1 within the competency and practice domain of the general surgery milestones.

Competency

Patient care

Care for Diseases and Conditions

Data obtained from: M4 CCA – data gathering score

Score range

-: Greater than one SD below the mean CCA score

1: Pass all patient cases – falls within one SD of the mean

+: Greater than one SD above the mean CCA score

Care for Diseases and Conditions

Data obtained from: M4 CCA – clinical reasoning; M3/4 Clerkship; boot camp - mock paging

Score range

-: Greater than one SD below the mean for CCA score; mock pages fail 4 or more; Clerkship score pass

1: Passing scores on CCA – falls within one SD of the mean; Mock pages fail 2-3; Clerkship score high pass

+: Greater than one SD above the mean score on CCA; Mock pages fail 0-1; Clerkship score honors

Performance of Operations and Procedures

Data obtained from: Boot camp – skills (open and laparoscopic) session and procedures

Score range

-: Did not achieve bronze in >2 open and laparoscopic skills

1: Achieves bronze in all open and laparoscopic skills

+: Gold score in all open and laparoscopic skills

Medical Knowledge

Care of Diseases and Conditions

Data obtained from: CCA (Clinical reasoning); M3/4 clerkship; boot camp - mock paging

Score range

-: CCA score greater than one SD below the mean, Mock pages fail 4 or more; Clerkship score pass

1: Within one SD of the mean for CCA; Mock pages fail 2-3; clerkship score high pass

+: High score on CCA; Mock pages fail 0-1; clerkship score honors

Performance of Operations and Procedures

FIGURE 1A. Scoring rubric for General Surgery Milestones for medical students.

Data obtained from: Bootcamp operative anatomy week, skills assessment (open and laparoscopic)
 Score range
 -: Minor deficiencies noted during operative anatomy week, does not meet the pass criteria in the skills assessment
 1: Complete/Pass operative anatomy week, meets all pass criteria for the skills assessment
 +: Top score operative anatomy week, top scores in criteria for the skills assessment

System-Based Practice

Coordination of Care

Data obtained from: M4 Clerkship
 Score range
 -: Clerkship score pass
 1: Clerkship score high pass
 +: Clerkship score honors

Improvement of Care

Data obtained from: M4 Clerkship
 Score range
 -: Clerkship score pass
 1: Clerkship score high pass
 +: Clerkship score honors

Practiced-Based Learning and Improvement

Data obtained from: NA
 Score range: NA
 This is currently not addressed by the CCA, clerkships or boot camp

Self-Directed Learning

Data obtained from: Bootcamp; Advanced medical therapeutics project
 Score range
 1: Completion of boot camp and Advanced Medical Therapeutics Project
 Every student by the requirements of the boot camp curriculum and the medical school requirement they must complete an Advanced Medical Therapeutics Project is given the score of a 1 unless otherwise noted.

Improvement of Care

Data obtained from: NA
 Score range: NA
 Not currently assessed. Students are required to attend the weekly morbidity and mortality conference.

Professionalism

Care for Diseases and Conditions

Data obtained from: CCA (communication); M3/4 clerkship; boot camp - pages
 Score range
 -: Greater than one SD below the mean on CCA communication; clerkship score pass; communication concerns from mock pages
 1: Within one SD of the mean for CCA communication; Clerkship score high pass; no issues with mock page

FIGURE 1B. Continued.

learning module includes a hypothetical case scenario, written educational material focusing on the disease process with references from the medical literature and creation of a quiz that tests knowledge obtained from the module. Students then use these modules in an ongoing manner in future advanced medical therapeutics rotations. Each student is required to create a module which is then scored as a pass/fail for the rotation. All students receiving a pass also received a milestones ranking of 1 for this assessment under self-directed learning—practice-based learning and improvement.

RESULTS

Within this feasibility study, a standardized scoring system was created from the established medical school assessment data, which was available for each student. Of the 16 subcompetency and competency assessments within the General Surgery Milestones, 12 of 16 could be determined by the existing assessments.

ACGME Milestones that lacked an assessment during medical school included teaching (practice-based learning and improvement), improvement of care (practice-based

+: Top score CCA communication – top 20% (the CCA committee does recognize the top 20% in this category); Clerkship score honors

Maintenance of Physical and Emotional Health

Data obtained from: NA

Score range: NA

Not currently addressed in clerkships, boot camp or CCA. Some items are residency specific (duty hours) and/or further training provided by individual institutions.

Performance of Assignments and Administrative Tasks

Data obtained from: NA

Score range: NA

Not currently addressed in clerkships, boot camp or CCA. Items are residency specific and further evaluation to be provided by individual institutions.

Interpersonal and Communication Skills

Care for Diseases and Conditions

Data obtained from: CCA (communication); M3/4 clerkship

Score range

-: Greater than one SD below the mean in CCA Communication; Clerkship score pass

1: Within one SD of the mean for CCA communication; Clerkship score high pass

+: Top score CCA communication – 20% designation; Clerkship score honors

Coordination of Care

Data obtained from: M3/4 clerkship; Boot camp – mock pages

Score range

-: M3/4 clerkship score pass; any concern noted from responses to mock pages regarding communication

1: M3/4 clerkship score high pass

+: M3/4 clerkship score honors

Performance of Operations and Procedures

Data obtained from: CCA communication; M3/4 clerkship; boot camp – mock pages

Score range

-: Greater than one SD below the mean in CCA communication; M3/4 clerkship score pass; any concern noted from responses to mock pages

1: Within one SD of the mean for CCA communication; M3/4 clerkship score high pass

+: Top score CCA communication – 20% designation; M3/4 clerkship score honors

Note: CCA: Clinical Competency Assessment; SD: Standard deviation; M3: 3rd year medical student; M4: 4th year medical student

FIGURE 1C. Continued.

learning and improvement), maintenance of physical and emotional health (professionalism), performance of assignments, and administrative tasks (professionalism) (Fig. 2).

During the 2015 to 2016 academic year, 20 students matched into surgery internship programs (both categorical and preliminary positions). Of these 20 students, 11 students met a proficient (score of 1) or better (score of +1) level 1 criteria in all 16 domains; 9 students had at least 1 Milestone competency where improvement was needed (–1 milestones score); and 5 students had at least 1 Milestone competency in which they excelled (score of +1) (Table). This information was then provided to the student's future program director in the form of a letter that included individualized boot camp performance metrics and their Milestones Assessment (Fig. 2). This letter provided the future program director with a standardized, baseline evaluation of the student's competencies

at the end of medical school and thus that of an incoming intern.

DISCUSSION

The transition from medical school to residency is an important period of growth for any graduating medical student. Part of this transition is an imperative to ensure clinical competency on day 1 of internship to allow for appropriate and safe care for patients. As the ACMGE Milestones have become a standardized method to assess residents and monitor their development we sought to develop a milestones ranking for graduating medical students to determine if they are appropriately prepared to start residency. This also allows for a common assessment language and creates an evaluation continuum between

March 30, 2016

Dear Dr. ■■■

■■■ successfully completed the American College of Surgeons/Association of Program Directors in Surgery/Association of Surgical Education Resident Prep Curriculum elective from February 8th to March 4th, 2016 at the University of Michigan. The content of this four-week course included the components of the national resident prep curriculum as well as additional components specific to the University of Michigan.

■■■'s performance on the knowledge and skills assessments is demonstrated in Table 1. They achieved competence in the level one Accreditation Council for Graduate Medical Education (ACGME) General Surgery Milestones that were assessed in the course which are noted in detail in Table 2. Additional curricular content of the course including didactic and interactive sessions which did not have a dedicated assessment are outlined in the Appendix.

■■■ stood out for their laparoscopic technical skills. Their areas for development include their data gathering and critical thinking skills within the context of clinical care. We hope this information is helpful to you, and can be utilized as you build your incoming PGY1 resident's portfolio to determine when they are able to progress to indirect supervision within some of these domains.

Sincerely,

Skills and Knowledge Assessments

Skills Assessments		Student score	Average score
Open skills	Knot tying	18/18	16.3
	Suturing	15/18	13.35
Basic laparoscopic skills (UT Southwestern Videotrainer stations)	Block move	2/3	1.3
	Bean drop	3/3	1.55
	Checkerboard	3/3	2
	Running string	1/3	1.55
	Endo Stitch	2/3	2.45
Procedures	Chest tube placement	4/5	4
	Central line placement	4/5	4.6
	Cricothyroidotomy	4/5	4.2
	ETT placement	1/1	1
Knowledge Assessments		Student score	Average score
Mock paging	Chest pain, dyspnea, MI	1	1
	Nausea & vomiting	1	1
	Hypotension, hypovolemia, abdominal	1	0.9
	Transfusion reaction	0	0.5
	Fever	1	1
	Post-op pain	1	0.8
	Abdominal distension	1	0.9
	Acute alcohol	1	1
	Pulmonary embolism	1	1
	Electrolyte imbalance, hypoxia	1	1
	Patient pain	0	0.85
	Wound infection	1	0.95
	Mental status changes, hyponatremia	0	0.4
	Necrotizing soft tissue infection	1	0.85
Fundamental Use of Surgical Energy (FUSE) program	93%	91.4%	

FIGURE 2A. Example of letter to program director.

Curriculum content mapped to the ACGME General Surgery level one Milestones

ACGME Milestones							
Competency	Domain	Medical School Assessments					Milestones Ranking
		Clinical Rotations	Mock Paging	Procedural Skills	Boot Camp Curriculum	CCA	
Patient Care	Care for Diseases and Conditions (CDC)(PC1)					CCA	-1
	Care for Diseases and Conditions (CDC)(PC2)	Clinical rotation	Mock paging		Boot camp	CCA	-1
	Performance of Operations and Procedures (POP)(PC3)			Skills sessions	Boot camp		1
Medical Knowledge	Care for Disease and Conditions (CDC)(MK1)	Clinical rotation	Mock paging		Boot camp	CCA	-1
	Performance of Operations and Procedures (POP)(MK2)			Skills sessions	Boot camp operative anatomy week		1
Systems-based Practice	Coordination of Care (CC)(SBP1)	Clinical rotation			Boot camp		1
	Improvement of Care (IC)(SBP2)	Clinical rotation			Boot camp		1
Practice-based Learning and Improvement	Teaching (TCH) (PBL1)						NA
	Self-directed Learning (SDL) (PBL2)				Boot camp		1
	Improvement of Care (IC)(PBL3)						NA
Professionalism	Care for Diseases and Conditions (CDC)(PROF1)	Clinical rotation	Mock paging		Boot camp	CCA	1
	Maintenance of Physical and Emotional Health (MPEH) (PROF2)						NA
	Performance of Assignments and Administrative						NA
	Tasks (PAT)(PROF3)						
Interpersonal and Communication Skills	Care for Disease and Conditions (CDC)(ICS1)	Clinical rotation				CCA	1
	Coordination of Care (CC)(ICS2)	Clinical rotation	Mock paging		Boot camp	CCA	1
	Performance of Operations and Procedures (POP)(ICS3)	Clinical rotation		Skills sessions	Boot camp	CCA	1

FIGURE 2B. Continued.

Clinical Rotations

All medical students entering into the general surgery match are required to complete a clerkship in one of the core general surgery services during their third and fourth years. The student receives a standard clinical assessment score (form is standardized and utilized by the whole institution) that scores students by patient care, medical knowledge, communication, professionalism and overall assessment.

Mock Paging

During the M4 surgery boot camp students are required to respond to 13 mock pages regarding various clinical situations and are graded on their clinical assessment, interaction with the person paging and overall management of the situation.

Procedural Skills Assessments

As part of the M4 surgery boot camp students are assessed on procedural skills with dedicated assessments of: suturing and knot tying, laparoscopic procedures, central line placement, chest tube placement, management of shock, endotracheal tube placement, cricothyroidotomy, and sterile setup for minor procedures.

Boot Camp Curriculum

Surgery boot camp is a 4 week course in which students attend lectures on various important topics related to surgical practice and skills required for residency. Included in this course is required operative anatomy week, open and laparoscopic skills practice and testing, instruction on basic procedures, and mock paging.

CCA (Clinical Competency Exam)

Requirement during the fourth year of medical school and students are required to pass the exam in order to graduate. The goal of the exam is to ensure students are competent in the fundamental clinical exam skills necessary to provide excellent, effective and safe patient care. There are multiple patient- based exams covering a broad range of clinical situations in which the student must appropriately assess the patient (physical exam included) and after the patient encounter the student must complete a post- encounter assessment, questions and/or oral presentation regarding the patient. Students also undergo formal examination (computer based) on evidence based medicine, ECG, imaging and critical values. Students are provided with individual scores for each section, domain scores for data gathering, communication and clinical reasoning and an overall score for the exam.

Appendix: Description of the curriculum for the ACS/APDS/ASE Resident Prep Curriculum, University of Michigan

Additional objective-anchored interactive, hands-on content without dedicated assessment in the following domains was also successfully completed:

- Patient safety and quality improvement (1 hour)
- Ventilator management (2 hours)
- Basic ultrasound skills including FAST (4 hours)
- VAC, wound and ostomy care (6 hours)
- Endotracheal intubation with Anesthesia (6 hours)
- Energy devices and surgical stapling (2 hours)
- PEG/NGT/DHT placement and management and TPN (4 hours)
- Suturing Workshop (2 hours)
- Operative Patient Positioning (2 hours)
- Anatomy Review Procedures (2 hours)
- Blood transfusion and coagulation (2 hours)
- Developing your academic interests in surgery (2 hours)
- Emotional intelligence and conflict management (4 hours)
- Interactive case conference (8 hours)
- How to succeed in surgical residency (4 hours)
- Patient hand offs (1 hour)
- Radiology for interns (3 hours)
- Management of shock (1 hour)
- Surgical time out (2 hours)
- Operative anatomy (12 hours)
- Sterile setup for minor procedures (1 hour)
- Management of surgical fires (1 hour)

FIGURE 2C. Continued.

TABLE. Scoring Results of Students

		ACGME Milestones Ranking Results		
Competency	Domain	Milestones Ranking (Total Students 20)		
		-1 (# [%])	1 (# [%])	+1 (# [%])
Patient care	Care for diseases and conditions (CDC) (PC1)	5 (25%)	13 (65%)	2 (10%)
	Care for diseases and conditions (CDC) (PC2)	3 (15%)	15 (75%)	2 (10%)
	Performance of operations and procedures (POP) (PC3)	0 (0%)	16 (80%)	4 (20%)
Medical knowledge	Care for disease and conditions (CDC) (MK1)	3 (15%)	16 (80%)	1 (5%)
	Performance of operations and procedures (POP) (MK2)	0 (0%)	16 (80%)	4 (20%)
Systems-based practice	Coordination of care (CC) (SBP1)	4 (20%)	16 (80%)	0 (0%)
	Improvement of care (IC) (SBP2)	4 (20%)	16 (80%)	0 (0%)
Practice-based learning and improvement	Teaching (TCH) (PBL1)	NA	NA	NA
	Self-directed learning (SDL) (PBL2)	0 (0%)	20 (100%)	0 (0%)
	Improvement of care (IC) (PBL3)	NA	NA	NA
Professionalism	Care for diseases and conditions (CDC) (PROF1)	3 (15%)	16 (80%)	1 (5%)
	Maintenance of physical and emotional health (MPEH) (PROF2)	NA	NA	NA
	Performance of assignments and administrative tasks (PAT) (PROF3)	NA	NA	NA
Interpersonal and communication skills	Care for disease and conditions (CDC) (ICS1)	4 (20%)	14 (70%)	2 (10%)
	Coordination of care (CC) (ICS2)	2 (10%)	17 (85%)	1 (5%)
	Performance of operations and procedures (POP) (ICS3)	2 (10%)	15 (75%)	3 (15%)

undergraduate and graduate medical education. We have shown that data from pre-established medical school assessments can be used to determine a graduating medical student's performance of the ACGME Milestones. Each of the graduating students who matched into a surgery program can be assigned individualized milestones rankings, which demonstrated their strengths and weakness within the competency domains expected of a surgery intern at the start of surgery internship. As new interns, this performance information can be used to focus efforts on improvement or advancement in the appropriate competency area(s). Although there were sufficient data to complete most of the milestones assessments, there remain key areas that are unable to be assessed owing to lack of programs within the medical school curriculum evaluating these areas.

Many programs have used the often flexible fourth year of medical school to develop preparatory courses to build students' clinical skills within certain specialties. These residency preparatory courses (aka "boot camps") are often structured to educate and further improve student's clinical skills in knowledge, patient care and procedures. The value of these courses is that they improve a student's confidence in their clinical skills and been described in several studies.⁶⁻¹² The effect of preparatory courses have on the quality and safety of patient care has also been recognized by the American Board of Surgery and their Statement on Surgical Preresidency Prep Courses in that it encourages all students to complete the course before residency.¹⁷ These courses may also serve as a final assessment before the start of internship, particularly regarding clinical skills of patient

care, communication, technical skills, and systems-based practice. Within our own institution a standardized general surgery boot camp has been existence for many years and when evaluating where data was drawn to assess the milestones much of it was from the boot camp data as compared to traditional medical school curriculum. This fact highlights the importance of the course, especially in the fourth year of medical school, as students are transitioning their focus to their chosen career path. Not only does boot camp allow for additional education and honing of key clinical skills needed to assist in the transition from student to resident but completing it during the fourth year of medical school also allows for real time assessments of a student's preparedness. Specialty-specific boot camps during the fourth year is an ideal time to assess a student's performance prior to their internship. The boot camp also creates an opportunity that would otherwise be lost during the fourth year for such an assessment, as well as feedback to the students on areas where they are competent and areas where they need further improvement.

Although it is clear, the benefit of preparatory courses and boot camps, there still remains the valid concern of how are students being assessed after completion of these courses and a lack of standardization of the assessment.^{2,6} To address the problem of providing competency-based assessments of graduating students to their future program directors, Sozener et al.¹⁸ were able to develop standardized performance evaluation based on the Emergency Medicine Milestones. This information was then shared in the form of a medical student performance evaluation letter to each

program director of the graduating students.¹⁸ With the addition of our study using existing programs within each medical school and the Milestones evaluation, we were able to demonstrate a simple yet informative method to provide a standardized evaluation of a student's clinical skills and competency in surgery to their future program directors. By using the respective specialty's Milestones, students are ranked within a system that is used for the duration of their residency to evaluate and chart their growth into proficient, competent, and safe clinicians.

Our study has several limitations. First, this is only a single institution's experience. Although most all the competencies and domains were able to be mapped by using our existing programs, it is unknown what evaluative and preparatory resources other institutions have and their subsequent ability to map the Milestones. It is also unknown if our method of standardization is able to be applied to other schools as additional external validity testing was not performed. Also, we were not able to fully assess all the Milestones competencies owing to lack of data in the current medical school assessments. An additional limitation of our study was the use of data from existing assessments that was subsequently mapped to the existing Milestones. By not creating new assessments based on the specific Milestones assessments, there is inherent variability between the assessments and the potential for inaccuracies within our milestones assessment of students. Lastly, feedback from program directors is still pending as to the effect of this new Milestones assessment on how the incoming residents are trained.

We were able to evaluate most of the General Surgery Milestones assessments with existing programs at our institution, but key assessments were not able to be made in certain categories. Within the competency of practice-based learning and improvement, the domains of teaching and improvement in care as well as in the competency of professionalism and domains maintenance of physical and emotional health and performance of assignments and administrative tasks was not able to be evaluated. Although some of the assessments, such as assignments and administrative tasks, may be residency specific or have elements that are specific to residency, this still demonstrates an area in which students may not be receiving the preparation they need for residency. Knowledge and skills in teaching, improvements in care and physical and emotional health are key competencies not only for residents, but for the remainder of one's career. Being able to start imparting knowledge of these important skills in medical school helps to build the foundation for additional growth while in training. Although it is known that preparatory boot camps can help students to be more confident and prepared for residency, there remain areas in which medical schools are falling short when preparing students. These should be the additional area of focus when assisting students in the transition from the classroom to the wards.

With the use of the Milestones nationwide as a standardized method of assessing resident competencies and with the feasibility of translating the Milestones to medical students as we have demonstrated, it is also clear that medical school assessments would need to transform to meet the needs of these new assessments. By first identifying the gaps in assessments, we also have a starting place from which to improve. Fortunately, within medical education, there are established EPAs (entrustable professional activities) that define key areas in which all students should be competent before starting residency, that can be combined with Milestones to determine competencies all physicians should have as well as specialty specific competencies.^{1,19,20} These assessments also create a well-defined roadmap that can be used to transform the way we assess medical students to create assessments that not just based on each institution's assessments but also based on national metrics the students would be assessed by for the remainder of their training career. By continued focus and improvement in our medical education, we can help medical students to develop the skills and knowledge needed to become competent physicians even before receiving their medical degree.

CONCLUSIONS

By using existing programs within our institution and mapping assessment data to the General Surgery Milestones, we were able to develop and standardized assessment of our graduation students who matched into general surgery. The assessment of whether a student mapped to a level 1 Milestone (milestones expected of an incoming resident) was also shared with program directors. The Milestones assessment of graduating medical students not only provided program directors with a critical assessment of one's competency but also shed light on additional areas in which medical schools can work to further prepare their students for residency.

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