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Abstract

Background: Entrustable Professional Activities (EPAs) for medical students were designed to help prepare students for the clinical roles of residency training. To date, there have been no published studies examining resident confidence performing the EPAs across the first year of post-graduate training.

Objective: To examine self-reported confidence levels of first-year residents performing the 13 activities included in the *Core Entrustable Professional Activities for Entering Residency*.

Methods: Entering allopathic and osteopathic residents from seven residency programs were contacted at the start, and after 3, 6, and 12 months of training to complete an electronic survey self-assessing confidence performing EPAs.

Results: All 46 (100%) eligible residents completed surveys at the four study time points for the 13 EPAs, which resulted in 2,392 data points. Residents reported a high level of confidence performing four EPAs (i.e., 1, 5, 6, and 9) at baseline. Conversely, more than two-thirds of residents reported a lack of confidence performing four EPAs (i.e., 4, 8, 12, and 13) at baseline. A significant positive trend in confidence from baseline to 12 months was seen in almost all EPAs. However, more than 10% of residents reported not being confident performing EPAs 12 and 13 at twelve months.

Conclusions: Results revealed not all residents reported being confident performing EPAs at the beginning and end of the first year of training. Medical schools need to examine preparation of graduating students in the EPA areas. Residency programs need to assess entering resident competency to determine the need for increased initial supervision and remediation.

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Introduction

Entrustable Professional Activities (EPAs) are tasks or responsibilities that medical trainees are permitted to perform unsupervised once they have demonstrated sufficient competence. They are independently executable, observable, and measurable in process and outcome, and are therefore suitable for

entrustment decisions.¹ The use of EPAs in medical education was first recommended by Olle ten Cate in 2005.²

The Accreditation Council for Graduate Medical Education (ACGME) established six general competencies to describe the knowledge, skills, and attitudes a physician must demonstrate during

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training. EPAs have been developed to translate these competencies into clinical practice components and they have been adopted by graduate medical education programs. A number of studies have been conducted looking at the use of EPAs in graduate medical education at both the residency and fellowship training levels.³⁻¹⁰

In May 2014, the Association of American Medical Colleges (AAMC) published a document titled *Core Entrustable Professional Activities for Entering Residents*.¹¹ The document extended the concept of EPAs to undergraduate medical education. These EPAs for medical students have been designed to help prepare them for the clinical roles of residency training. To date, there have been no published studies examining the EPAs as a tool to help determine resident reported readiness for post-graduate training. A study was conducted to examine entering resident self-reported confidence performing EPAs and how these confidence levels change during the first year of training.

Method

An observational study was designed to evaluate entering residents' self-reported confidence performing the 13 EPAs (Table 1). The study was conducted during the 2015-2016 academic year. Eligible allopathic and osteopathic residents were surveyed from all of the residency programs that were part of a city-wide educational consortium that serves as the regional branch campus for an affiliated large public medical school. Primary data was collected using an electronic survey cross-sectionally administered at the beginning of residency training (baseline) and after 3, 6, and 12 months (Supplemental File). Non-responding residents were sent a reminder to complete the survey seven days following the initial email. If a resident still had not completed the survey after another seven days, a final reminder email was sent by the study's Principal Investigator (SC) soliciting participation. Demographic information was ascertained and linked to survey data for all participating residents.

Descriptive statistics were conducted with continuous data presented as means with standard deviations and categorical data as counts with percentages.

Survey responses on confidence levels performing the 13 EPAs were based on a 5-point rating scale, which was subsequently collapsed into a binary variable of Confident (i.e., *Confident, Very Confident*) and Not Confident (i.e., *Not at all Confident, Slightly Confident, Somewhat Confident*). The binary outcome for the 13 EPA items was then examined for time-dependent changes across the study year. Random effects logistic regression modeling was used to control for individual resident survey responses as well as the spatial power covariance structure to control for the extended time interval between the 6- and 12-month surveys. If random intercepts models did not explain a significant amount of outcome variability, a fixed effects logistic regression models was used. Statistical tests were two-sided, based on a 0.05 level of significance, and conducted using SAS 9.4 (Cary, NC). Institutional Review Board approval and a waiver of documented consent were obtained for the study.

Results

The survey instrument had a 100% response rate for all eligible residents (n=46) at each of the four survey time points. Characteristics of residents are presented in Table 2. At the beginning of residency training, there were no EPAs in which all residents reported being confident performing the activity (Table 3). Of the 598 (i.e., 46 residents x 13 EPA questions) baseline survey responses, 280 (47%) resident responses were Not Confident for an activity. EPAs 4, 8, 12, and 13 were activities with the lowest number of entering residents reporting confidence. EPAs 1, 5, 6, and 9 were activities with the highest number of entering residents reporting confidence. Across the study year, resident confidence significantly improved for each EPA, with the exception of EPA 1, which had an initially high number of residents reporting confidence at baseline. Given the relative size of the study, it was not deemed feasible to directly analyze associations of specific medical schools entering residents graduated from in relation to reported EPA confidence. Of note, every school represented in the study had at least one EPA area in which a resident reported not being Confident at baseline. Likewise, every specialty represented in

the study had at least one entering resident report not being Confident in at least one EPA area. Medical school type and resident gender were not associated with confidence when pooling EPA questions across all points (allopathic versus osteopathic OR: 1.51; 95% CI: 0.74, 3.05; males versus females: 1.64; 95% CI: 0.83, 3.26).

At the end of the first year of residency training, there were 5 EPAs in which all residents reported being Confident performing those activities. Of the 598 final survey EPA responses, there were 25(4%) below the Confident level. This included two residents who did not feel Confident completing three different EPAs, four residents who did not feel Confident completing two different EPAs, and eleven residents who did not feel Confident completing one EPA. Of the EPAs with the lowest levels of confidence at baseline, EPAs 4 and 8 improved with all residents reporting being Confident by the end of the year. EPAs 12 and 13 only improved to 85% and 89% of residents reporting being Confident by the end of the year.

Discussion

The AAMC established the 13 EPAs to describe tasks and responsibilities graduating medical students should be able to perform at the beginning of postgraduate training. The present study is one of the first to examine entering resident self-confidence performing the EPAs. Results revealed entering residents may not be confident performing all EPAs at the start of training. The study also provided the only published information on changes in resident confidence performing the EPAs across the first year of residency training. Results illustrated that reported confidence may be dynamic with a general positive progression.

The present study identified four activities that entering residents reported a high level of confidence performing at the start of residency training. These were performing a history and physical examination; documenting a clinical encounter; providing an oral presentation, and collaborating as a member of an inter-professional team. Conversely, only one-half of entering residents reported confidence performing five other activities at the start of training. These were

prioritizing a differential diagnosis; recommending and interpreting common diagnostic and screening tests; forming clinical questions and retrieving evidence to advance patient care; recognizing a patient requiring urgent or emergent care and initiating evaluation and management; and obtaining informed consent for tests and/or procedures. Less than one-third of residents reported confidence performing four other activities at the start of training. These include entering and discussing orders and prescriptions; giving or receiving patient handover; performing general procedures of a physician; and identifying system failures and contributing to a culture of safety and improvement.

In a 2015 study, 119 surgery program directors rated their level of confidence for entering surgery residents performing the EPAs compared to graduating medical students' self-reported confidence performing the EPAs.¹² The latter data came from unpublished components of the 2014 AAMC Graduation Questionnaire.¹³ Using a collapsed binary rating scale, graduating medical student ratings in the 2015 study were comparable to entering resident baseline responses in the present study; revealing EPAs 1, 5, 6, and 9 as areas with a large number of respondents reporting confidence; and EPAs 4, 8, 12, and 13 as areas with a low number of respondents reporting confidence. The surgery program directors also used a binary outcome based on collapsed ratings and their overall levels of confidence for entering first-year residents performing the EPAs were lower than those reported by graduating medical students in the 2014 AAMC Graduation Questionnaire or by entering residents in the present study. Surgery program directors' confidence ranged from 13% for entering residents performing EPA 13 to 78% for entering residents performing EPA 1.

By the end of the first-year of residency training, respondents in the present study indicated a high level of confidence performing nearly all of the EPAs. In only two areas did less than ninety percent of residents report confidence. These were in performing general procedures of a physician and identifying system failures and contributing to a culture of safety and improvement. These results raise concerns about whether the activities are being

systematically taught and assessed for residents in all of the sampled residency programs.

On the final study survey there were very few responses where residents did not report feeling confident performing an activity. This included 11 residents not confident performing a single EPA and only 6 residents not confident performing more than one EPA. Residency programs need to establish methods for formally assessing resident performance in each of the EPA areas to assure that those residents lacking confidence in a particular area at the start of residency training demonstrate proficiency in this area during the first year of training.

With increased attention during post-graduate medical training on patient safety, presented findings raise concerns about what activities entering residents can be safely entrusted to perform. A recent review by Englander et al., discussed how the medical education community needs to develop curricula, assessment tools, faculty development resources, and pathways to entrustment for each of the 13 EPAs.¹⁴ An obvious question is where the assessment and documentation of entering resident proficiency in the EPAs should occur and how to standardize assessments. Medical schools may be able to perform these tasks by establishing a requirement for proficiency testing of students prior to graduation. Residency programs may also establish formal assessment programs at the start of residency training to assess proficiency. If assessments occur, programs would need to develop remediation programs for entering residents found deficient in one or more activity areas.

Residency programs at a minimum should not allow entering residents to perform activities unsupervised until competence is documented. Entering residents should receive close supervision in EPA areas until faculty have observed and documented each entering resident's proficiency in completing these clinical activities. Several of the areas include basic clinical skills that can be taught and assessed during clinical rotations such as prioritizing a differential diagnosis, recommending and interpreting common diagnostic tests, entering and discussing orders and prescriptions, giving and receiving patient handovers, and recognizing patients needing urgent or emergent

care and initiating evaluation and management. Other entrustable activities may be more specialized and require different educational methods and assessment tools. These activities include forming clinical questions and retrieving evidence, obtaining informed consent, performing general procedures, and identifying system failures and contributing to patient safety and quality improvement efforts. The use of simulation training may be an option to address issues in some of these areas.¹⁵⁻¹⁸

The present study is one of the first to assess entering resident confidence performing the EPAs. It is also the only study to track changes in confidence over the first year of residency training, with the study having a 100% survey response rate for all eligible residents.

Limitations of the study included the generalizability of results from residents in primary care residency programs located at one regional branch campus. Results are also limited to the construct of resident self-confidence performing the 13 EPAs. In particular, the study did not attempt to examine the possible correlation between self-reported and actual documented deficiencies in the activity areas. Phenomena related to misperceptions and discrepancies in self-assessments have been documented in the literature and support the need for subsequent research to be conducted based on multiple EPA assessment sources.¹⁹⁻²⁰

In conclusion, the present study revealed residents may not report being confident performing all 13 EPAs at the beginning and end of the first year of residency training. Medical schools need to examine the preparation of graduating students in the EPA areas. Residency programs need to assess entering resident competency in these areas and evaluate the need for increased initial supervision and remediation.

Table 1. Core Entrustable Professional Activities (EPA) for entering residency

EPA #	Activity
EPA 1:	Gather a history and perform a physical examination
EPA 2:	Prioritize a differential diagnosis following a clinical encounter
EPA 3:	Recommend and interpret common diagnostic and screening
EPA 4:	Enter and discuss orders and prescriptions
EPA 5:	Document a clinical encounter in the patient record
EPA 6:	Provide an oral presentation of a clinical encounter
EPA 7:	Form clinical questions and retrieve evidence to advance patient care
EPA 8:	Give or receive a patient handover to transition care responsibility
EPA 9:	Collaborate as a member of an interprofessional team
EPA 10:	Recognize a patient requiring urgent or emergent care and initiate evaluation and management
EPA 11:	Obtain informed consent for tests and/or procedures
EPA 12:	Perform general procedures of a physician
EPA 13:	Identify system failures and contribute to a culture of safety and improvement

Source: Association of American Medical Colleges (AAMC). Core Entrustable Professional Activities for Entering Residency. (<https://www.aamc.org/cepaer>).

Table 2. Study sample characteristics (n=46, 100%)

Variable	Count (%)
Male	22 (48%)
Female	24 (52%)
Residency Programs	
Family Medicine (2)	14 (30%)
Internal Medicine (1)	12 (26%)
Pediatric (1)	7 (15%)
Surgery (1)	5 (11%)
Transitional Year (2)	8 (17%)
Medical School ^a	
Allopathic	23 (50%)
Osteopathic	23 (50%)

^aIncluded 10 different allopathic and 4 different osteopathic schools.

Table 3. Self-reported confidence for entering residents performing the Entrustable Professional Activities across first year of residency (n=46; 100%)

Entrustable Professional Activities	Self-Reported Confident or Very Confident				Trend
	Baseline	3 Months	6 Months	12 Months	p-value ^a
1: Perform history and physical exam ^a	44(96%)	43(93%)	45(98%)	44(96%)	0.7621
2: Prioritize a differential diagnosis	25(54%)	38(83%) ^b	37(80%)	45(98%)	0.0003
3: Recommend/interpret diagnostic test	21(46%)	36(78%) ^b	43(93%)	43(93%)	< 0.0001
4: Enter/discuss orders & prescriptions	7(15%)	35(76%) ^b	38(83%)	46(100%)	< 0.0001
5: Document clinical encounter	38(83%)	44(96%)	45(98%) ^b	46(100%)	0.0290
6: Provide oral presentation ^{a,c}	36(78%)	42(91%) ^b	42(91%)	45(98%)	0.0036
7: Form questions & retrieve evidence	26(57%)	37(80%) ^b	41(89%)	46(100%)	0.0004
8: Give/receive patient handover	14(30%)	40(87%) ^b	41(89%)	46(100%)	< 0.0001
9: Collaborate inter-professional team	37(80%)	42(91%)	45(98%) ^b	46(100%)	0.0282
10: Recognize urgent/emergent care & initiate evaluation/management ^{a,c}	22(48%)	31(67%) ^b	39(85%)	43(93%)	< 0.0001
11: Obtain informed consent ^{a,c}	21(46%)	37(80%) ^b	39(85%)	43(93%)	< 0.0001
12: Perform general procedures ^{a,c}	15(33%)	29(63%) ^b	29(63%)	39(85%)	< 0.0001
13: Identify system failures and contribute to safety/improvement	12(26%)	30(65%) ^b	34(74%)	41(89%)	< 0.0001

^aRandom effects intercepts used to explain a significant portion of between subject variance.

^bTime point where a significantly greater proportion of residents reported being confident in EPA area compared to baseline.

^cModel controlled for unequal times space between third and fourth survey.

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