Simulation And Self-Assessment: A Medical-Simulation Based Exploration Of Medical Trainee Understanding Of Epa 6 (oral Presentation) And Epa 8 (handoff)

Shuaib Raza

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Simulation and Self-assessment: A medical-simulation based exploration of medical trainee understanding of EPA 6 (oral presentation) and EPA 8 (handoff)

A Thesis Submitted to the Yale University School of Medicine
In Partial Fulfillment of the Requirements for the Degree of Doctor of Medicine

By
Shuaib Raza
2018
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Abstract

SIMULATION AND SELF-ASSESSMENT: A MEDICAL-SIMULATION BASED EXPLORATION OF TRAINEE UNDERSTANDING OF EPA 6 (ORAL PRESENTATION) AND EPA 8 (HANDOFF)

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Introduction:
Entrustable Professional Activities are clinical tasks that are observable, executable, and reflect one or more clinical competency. The goal of “entrustment” is that trainees perform their work safely and effectively without supervision once they have demonstrated sufficient competency. Simulation offers a unique opportunity to assess EPAs and objectively measure skills without threat to patient safety. Dr. Gielissen and Dr. Moadel chose oral presentations (EPA 6) and handoffs (EPA 8) due to their natural interconnectedness and ability to be readily measured in a simulation environment.

Methods:
The study is a prospective, mixed methods approach at a single site (Yale School of Medicine). Sample: Students were recruited from all class levels (MS1-5) at Yale School of Medicine to undergo two 30 minute emergency medicine simulations. Data collection: Immediately following simulation, students were asked to complete a brief survey of 4 questions describing an ideal hand-off and oral presentation, as well as a self reflection on their own hand-off and oral presentation skills. They also rated themselves on a supervisory entrustment scale (1-5). Data analysis: Self-assessment data were analyzed for significant associations with students’ demographics via SPSS. Qualitative responses were coded and analyzed via inductive reasoning and compared to the AAMC Core EPA Developers Toolkit (Core EPA Curriculum Developers Guide 2014).

Results:
There was a significant correlation between higher self-assessment scores and months spent in medical school for both oral presentations and hand-offs. Furthermore, there was a significant correlation between higher self-assessment scores and number of prior simulation experience and English as a primary language for oral presentations. Self-assigned hand-off score and oral presentation score were also significantly correlated with each other. No
correlation was observed between self-assessed scores of either handoff or oral presentation and gender.

Discussion:
As expected, our study demonstrates a positive correlation between self-assessed entrustment scoring and the number of months in medical school as well as amount of exposure to simulation for oral presentation specifically. However, many students self-scored higher than would be expected for their level of training (expected level at graduation is 3, indicating readiness for indirect supervision). These findings mirror those observed by Dunning and Kruger in 1999, where students with greater preparation or experience demonstrate a more accurate score, whereas the early trainees appeared to demonstrate greater insight. Qualitative data from this study will form a key component of understanding between any discrepancies between attending entrustment scoring and students’ self-scores as part of a larger concurrent study.
Acknowledgements

I am incredibly indebted to Professor Hafler for her infinite level of compassion, patience and support throughout this project. This project would not have been remotely possible without her steadfast guidance and advocacy. Similarly, an immense deal of gratitude is due to Chair Gruen for his support in making this project a reality.

A heartfelt thank you to Dr. Gielissen for taking me on as a mentee and allowing me an incredible exposure to the meaningful and rewarding field of medical education. Thank you for your kind mentorship, guidance in creating my first poster presentation and constant encouragement. Thank you to Dr. Tiffany Moadel for allowing me to join the broader cutting edge project.

Thank you to my academic advisor, Dr. Emily Wang for allowing me the space to breathe and open up about my medical school hurdles, and providing a wellspring of optimism. Thank you to Dean Angoff for consistently providing sage advice, thoughtful questions and a multitude of resources to foster my personal and professional growth.

Thank you to my parents, Dr. Saleem Raza and Shumaila Raza for their unconditional love and support; being your son is the single greatest blessing I am endowed with. Thank you to Afrah, Omair, Leena, Saim and Rayaan for reminding me what really matters in life.

Alhamdulillah.
Introduction

Origins of the Modern North American Medical System; The Flexner Report

The landscape of medical education over the past century in the United States has been one of constant change. Regardless of the titanic transformations that are taking place with undergraduate medical education today, none can match the iconoclastic changes due to the Flexner report. Over a century ago Abraham Flexner went across the country to evaluate every single medical school in operation in the United States and Canada. His findings were not directed towards his colleagues, rather they were directed towards the lay public, in the form of an accessible and frank assessment of state of medical education at the time. His groundbreaking report was “derived from his emphasis on the scientific basis of medical practice, comprehensive nature of the survey, and the appeal of his message the American public.” (Cooke et al 2006) His report condemned the multitude of maladies affecting undergraduate medical education including a lack of adequate facilities and anemic curricula.

One of his most salient points was to contrast the predominant North American undergraduate medical education curriculum with the analytical reasoning of the university-based German system (Duffy 2011). This far
superior German model, Flexner suggested, should be the basis of any curriculum. He suggested a curriculum of analytical reasoning and rigorous approach to the natural sciences, followed by clinical training under the close supervision of experienced physicians in an academic medical setting (Flexner 1910).

An argument can be made that over the course of the past century, the pendulum has perhaps swung too far in this analytical direction. The unfortunate reality on the ground is that hospital systems, and especially academic institutions, fall under the dual constrictions of financial solvency and publication pressure. More specifically, in the climate of decreasing reimbursements and unsteady healthcare system economics (due to a fluctuating state of the Affordable Care Act), hospitals are under an ever increasing amount of financial strain (Cooke et. al 2006). Furthermore the impetus to publish new findings has led to a “publish or perish” modus operandi for academic institutions. This is perhaps ironic because Flexner himself advocated for publishing sparingly.

In this context there is an ever diminishing returns for investment in clinical education and rather a focus of resources towards the basic sciences. All of which is to say that in the current climate there are many obstacles facing the second half of graduate medical education, specifically the synthesis of abstract natural sciences and biomedical sciences with the very pragmatic matters of clinical education. Ultimately the goal of medical
school is to train clinically excellent healers whose other interests can include research, policy and community engagement.

However the fundamental goal of producing a practicing physician cannot be ignored. Cooke et al argue that perhaps the pendulum towards the biomedical sciences (at the detriment of the social and humanistic aspects of medical education) occurred far earlier than the recent past. For example they cite Flexnor’s own observations that. “Scientific medicine in America – young, vigorous and positivistic – is today sadly deficient in cultural and philosophic background.” (Cooke et. al 2006)

**Advancements in Clinical Care and Medical Education**

Thankfully the prospect is not entirely bleak. Compared to Flexner’s time, there has been a quantum leap forward in terms of cultural norms shifting within medicine to better serve the wider public. In particular, the American Medical Association (AMA) had been a relatively recalcitrant and conservative force of political will with regards to shifting cultural norms. For example, the AMA maintained an American medical directory that listed all practicing US physicians, but denoted African American with a ‘col’ (shorthand for colored) designation (Washington et. al 2009). Furthermore, the AMA turned a blind eye towards the struggle of hospital segregation of African American physicians and patients (Washington et. al 2009).

Thankfully for all involved, both the AMA and the field of medicine as a whole has become far more inclusive. There is a widespread and ever increasing movement to better understand and serve the needs of
marginalized communities whether they be from outside the traditional gender binary norm or from other communities that have historically been marginalized by medical services. This has taken the form of concrete steps in patient care evaluation and data collection such as the requirement for “...electronic health record software certified for Meaningful Use to include sexual orientation and gender identity (SO/GI) fields. This is a critical step toward making SO/GI data collection a standard practice in clinical settings.” (Cahill et al 2006). Long gone are the days of the Tuskegee experiment, though the health inequities still exist for many subsets of African-American patients. For example an eye-opening study illustrated multiple “... racial differences in severity of disease, comorbidities, and care status among women with pregnancy-related complications that would place African-Americans at disadvantage to survive pregnancy.” (Harper et. al 2007).

Another example of the advancement of clinical care, education and metrics of improvement for medical education involves the evolution of learning while providing patient care. In decades past, graduate medical education consisted of a seemingly unlimited numbers of hours worked with in the hospital, consigning the house staff to literally reside within the hospital in efforts to provide a comprehensive clinical education and excellent clinical care. Thanks to the humane advent of work hour restrictions, the value within limited clinical hours must be the new means of attaining clinical excellence, not just a brute force number of hours worked.
Though this welcome change in the format of hours worked has contributed to a safer learning environment, it cannot accommodate for the vast changes that have occurred since Flexner’s time. For example the domains of knowledge required for excellent and current medical practice have greatly expanded. Furthermore the actual mechanisms and levers of power utilized to deliver excellent healthcare have become far more complicated, along with high expectations of healing the public which are bitinglly enforced by ever looming threat of malpractice lawsuits (frivolous or indeed merited) or less adversarial, natural ‘competition for business’ between medical centers to provide care to the public.

Therefore the current medical student must have a complex multi-dimensional modality of learning and self-evaluation in order to understand the variables affecting their patients’ healthcare delivery, the medicine necessary to treat their ailments and most fundamentally an intimate and engaging bedside manner.

Returning to the development of educational evaluation systems, the idea of competency-based medical education was finding greater acceptance from the 1970’s to the early 1990’s. There had already been hesitation on the part of certain UK Royal colleges to certify a trainee’s competence purely on time based metric; that is to say simply completing a prescribed number months in graduate medical training did not necessarily yield a fully competent physician (Cooke et al 2006).
In the United States, program directors have remarked upon a disconnect between the level of preparedness of medical school graduates and the duties expected of them, July of intern year (Cohen et. al 2013). This has resulted in the form of many supplemental ‘Boot Camps’ or extended orientation months immediately prior to the commencement of intern year.

It is important to note there are many expectations for graduates of residency programs. The LCME, Liaison Committee for Medical Education maintains exacting standards expected of all graduates of medical institutions that are comprehensive in their scope. However, while many schools do have clearly listed evaluation-based objectives that are linked to fundamental competencies, and often linked to the individual school's mission statement, there is no explicit agreement in a common core set of behaviors expected all graduates entering residency.

**Milestones, Competencies and Entrustable Professional Activities**

Thankfully a precedent for standardized performance evaluation metrics has recently been established at the graduate medical level. A partnership between two largest accreditation bodies in graduate and postgraduate medical education respectively (the Accreditation Council for Graduate Medical Education ACGME and the American Board of Medical Specialties) convened a “Milestone Project” to define progressive levels of
performance for each competency, with the expectation that residents achieve specific milestones before graduating from training and taking their specialty certification exam (Hamstra et. al 2016).

In a similar vein, the Association of American Medical Colleges (AAMC) has in the recent past established a drafting panel with the specific aim of listing a core set of integrated activities expected of an undergraduate medical trainee at the cusp of their graduation, prior to starting residency training. It is important to note this most recent endeavor has been built upon a sturdy bedrock of previous work consisting of the aforementioned Milestones Project, an AAMC Project on the Clinical Education of Medical Students and recently published literature of the undergraduate medical education to graduate medical education transition point (Hamstra et. al 2016).

The initial step of this process consisted of an agreement of clearly defined terms, thus grounding the debate in particulars that are often found to overlap within other domains. The following three definitions were agreed upon:

Competency: An observable ability of a health professional, integrating multiple components such as knowledge, skills, values, and attitudes. Since competencies are observable, they can be measured and assessed to ensure their acquisition. The greatest advantage of competencies over Entrustable Professional Activities are that competencies have been the accepted standard for clinical assessment in the graduate medical education field for a
decade. Taken together, the competencies comprise a high-performing physician. Furthermore, in contrast to Entrustable Professional Activities, there exists a reasonably established body of evidence around traditional domains of medical knowledge and patient care. Therefore they have been accepted in the use of developing milestones for graduate medical education.

The disadvantages of competencies are that they are rather abstract and not easily able to be scaled to the level of individual learners. For example they are not useful in providing a framework to observe individual learners in individual or specific settings. For the sake of clarity, a ‘milestone’ is a behavioral descriptor that marks a level of performance for a given competency (Core EPA Curriculum Developers Guide 2014).

Entrustable Professional Activity: EPAs are units of professional practice, defined as tasks or responsibilities that trainees are entrusted to perform unsupervised once they have attained sufficient specific competence. EPAs are independently executable, observable, and measurable in their process and outcome, and, therefore, suitable for entrustment decisions involving clinical care. The benefits of Entrustable Professional Activities are that they are specific performative goals or activities which are very easily defined and mutually understood between faculty, trainings, and the public. In essence they represent the more mundane, day-to-day work involved in medical training. Furthermore they take the more abstract competencies and long-term milestones and realize them in the day-to-day clinical context in which a trainees practice. Another advantage is that this assessment tool clusters milestones in an interdisciplinary
manner under a clinically meaningful and clearly defined a task. More importantly, Entrustable Professional Activities also add to the paradigm of trust and supervision into the clinical assessment of the training.

The disadvantages of the Entrustable Professional Activities are that they are somewhat new in the medical literature. Due to their relatively novel introduction, they are not widely used and only recently has research been published to support them (Core EPA Curriculum Developers Guide 2014). Furthermore these metrics were initially conceived for a different checkpoint of medical training, specifically that of the residency to solo attending practice condition, as opposed to medical student to resident transition point.

**AAMC Convenes an EPA Drafting Panel for UGME**

The EPA drafting panel was given the responsibility of creating a robust core set of skills that could be expected of all medical trainees on the first day of their residency training. This framework would be broad enough to capture the range of skills utilized and honed on a daily basis such as emotional awareness, ability to engage with patients and fellow professionals as well as the more clinically-focused tasks of patient evaluation and care. A fundamental crux of this frameworks was that the medical trainees would perform these Entrustable Professional Activities without direct supervision.

Naturally this begs the question: what defines direct supervision? The committee is fairly clear in that direct supervision denotes that the supervising physician is directly present with both the trainee and patient during the clinical encounter.
And related follow-up, what denotes indirect supervision? Here two forms of indirect supervision are offered. Immediately available indirect supervision allows for the supervising physician to be in close physical proximity to the clinical encounter but not necessarily in the same room or even at the same time as the medical trainee’s evaluation. The supervising physician could be in another unit within the hospital, at the bedside of another patient on the same ward or else otherwise nearby but available at a moment’s notice to provide direct supervision if the encounter required such.

The second category of indirect supervision is defined as “direct supervision available”. This term encapsulates a situation in which the medical trainee is engaging the patient on their own, but has access to the assigned supervising physician via means of digital communication a la phone, text or pager. Therefore, should the need arise, the supervising physician can assist and supervise the medical trainee.

**Principles and Purpose of the EPAs**

The Drafting panel agreed upon a set of guiding principles that would inform the project’s vision, prior to devising the EPAs. The primary focus of the project was to enhance patient safety. There is an observed increase in the number of fatal medication orders during the month of July, some of which can be attributed “at least partially from changes associated with the arrival of new medical residents.” (Phillips et. al 2010). Therefore, any enhancement of patient safety would be of the utmost importance, especially since some increased risk could be attributed to the introduction of new medical learners into the clinical
environment. The ideal of enhancing patient care was synergistically incorporated into the DNA of the endeavor by “aligning the professional development at the UME-GME transition with safe, effective, and compassionate care.” (Core EPA Curriculum Developers Guide 2014)

The next guiding principle of the panel was to fortify the confidence of new trainees, medical residency directors and patients in the abilities of the aforementioned new medical trainees. Specifically, to ensure a core set of skills that could be ‘entrusted’ to the medical trainee without direct supervision, ostensibly to further the sense of trainee autonomy at a safe pace of progress.

Apart from the more obvious roles of the EPA as a means to increase patient safety and trust in medical learner’s skills, the committee sought to delineate where this corpus of new tools and training would fit within the broader, existing framework of medical education. To that end, the EPA activities were meant to “supplement, not replace, the mission- and specialty-specific graduation competencies of the individual medical schools and specialties.” (Core EPA Curriculum Developers Guide 2014) Furthermore, this framework was to be a core set of skills that would be a part of the expected knowledge and skill levels of a new resident. The EPAs would not wholesale replace any existing framework nor would serve as a ‘ceiling’ in terms of evaluating performance. Rather, the EPAs were “...designed to be a subset of all of the graduation requirements of a medical school.” (Core EPA Curriculum Developers Guide 2014) This in-built flexibility allows individual medical schools to construct
curricula that honor their respective mission statements, while also adhering to the soon-to-be-introduced EPA skills list.

Figure 1: This venn diagram from the Core EPA Curriculum Developers Guide 2014 pg 4, succinctly describes the overlap between the core EPA expected of a new resident and the subsequent levels of EPAs that would be added at each level of increased responsibility or specialization.

Finally, the drafting panel did not ignore the more pragmatic realities of testing and implementing the EPAs. Accordingly, the “assessment of these activities must embrace qualitative feedback based on direct observation” and “cost, feasibility and educational impact should be added to the validity and reliability considerations of new or existing assessment tools.” (Core EPA Curriculum Developers Guide 2014) Additionally, the ideal model would provide a competency and milestone-integrated EPA curriculum that would allow medical trainees multiple opportunities to perform, evaluate and iterate throughout their residency training in a low-stakes environment. This would organically and
cumulatively build towards entrustment decisions in all listed EPAs by the time they matriculate into their roles as junior attendings and fellows.

A Brief Description of EPA 6 and 8

The two EPAs observed in this study were EPA 6 and 8. EPA 6’s goal is to provide an oral presentation of a clinical encounter. The expectation for a resident on their first day is to be able gather, synthesize, appropriately prioritize and present the clinical picture with a coherent plan to both family members and fellow professionals alike. A more robust description can be found in Appendix A.

EPA 8 centers around giving or receiving a patient handover to transition care responsibility. An effective Hand-over is an increasingly crucial element of daily patient care, especially since the previously mentioned restriction in daily and weekly work hours for residents presents a subsequent increase in the number of handoffs. Fortunately, a recent study has demonstrated that “...Implementation of the handoff program was associated with reductions in medical errors and in preventable adverse events and with improvements in communication, without a negative effect on workflow.” (Starmer et. al 2014) A more robust description of EPA 8 can be found in Appendix B.
Statement of Purpose

The state of medical education is perhaps at its greatest point of flux in the past century. There are dynamic changes occurring with regards to biomedical advancement, bench-to-bedside research discovery and implementation as well as a widening of the previously brittle understandings that underpinned and influenced the practice of medicine.

One of the most exciting challenges, or opportunities, is that of innovation within the medical education arena. Modalities such as simulation allow for an increased level of responsibility and engagement on the part of the medical trainee that are often beyond their clinical comfort or scope of practice.

Simulation can therefore be utilized for methods of both teaching and evaluation. The latter of which promises a possible advent highly specialized educational exercises that not only increase the level of clinical knowledge and skills of a trainee, but also help identify a learner’s gaps in self-reflection.

This project endeavors to explore this fertile ground of self-reflection and analysis vis a vis two simulated, Emergency Department cases that specifically test EPA 6 and 8 and more importantly, the medical trainees’ subsequent self-reflections.

The specific aim is provide a critical and timely window into the thought processes and self-evaluation of still-malleable medical trainees, with respect to these two Entrustable Professional Activities. The findings can ideally be
leveraged into enhanced learning objectives and exercises for medical school curricula in order to facilitate a life-long, longitudinal approach to self-driven intellectual inquiry.
Methods

Sample: Participants were recruited via email invitations to their official yale-email addresses on a volunteer basis and included medical students from YSM and interns from Yale-New Haven Hospital (n=31). Preclinical students (MS 1 & 2) and post-clerkship students (MS 4 & 5) were recruited via email beginning Spring 2017. Students participating in clerkships (MS3) were recruited as they rotated through the Yale Center for Medical Simulation (YCMS) during their emergency medicine (EM) clerkship. Beginning in January 2017, study participants were enrolled in the study and data collection continued till early December 2017. Due to a significant curriculum change at the YSM, we had the opportunity to test students who are in the first six months as well as the last six months of their MS3 clerkship year between January and July 2017.

Data collection: A set of 20-minute simulated case encounters that evoke the critical competencies outlined in the AAMC Core EPA Curriculum Developer's Guide for EPA 6 and EPA 8 were developed by Drs. Moadel and Gielissen. These encounters presented multiple opportunities to demonstrate oral presentation and handoff skills. Starting in October 2016, Drs. Moadel and Gielissen created cases using the modified delphi method for developing content and objectives using the simulation assessment consortium at Yale School of Medicine. Pilots were conducted on learners at various levels of training, including attending physicians (expert), resident physicians (advanced), and
medical students (novice). The behaviors observed through these participants helped to further refine those expected at certain levels of training.

These cases underwent several iterations based on feedback from participants and simulation-trained faculty who have experience with similar Accreditation Council for Graduate Medical Education (ACGME) milestone assessments. After each revision, the critical actions presented in the cases were mapped to the competencies and milestones specified for EPA 6 and 8.

Data collection: All trainees participated voluntarily, with a choice to opt out of the study without penalty at any time. All simulated case encounters were recorded with both audio and video recordings stored on a password-protected server.

Immediately following the cases, participants were asked to complete a survey which, includes demographic information, year/month in training, clinical experience prior to medical school, prior simulation experience, and intended specialty. Drs. Gielissen and Moadel were the primary facilitators of these cases with volunteer help to serve in the role of patient simulator’s family/next of kin.

Each study participant was assigned a numeric code that corresponds to their identity, and this code was used to identify their database. All study data from participants were collected by a research assistant and placed in a computerized database on a secure, password protected server. Shuaib Raza, was blinded to the identities of the participants and was only provided with their numerical code and the accompanying (but not participant-identifying) survey study data in the form of their quantitative and qualitative survey responses.
The demographic data was manually input into a local-drive excel spreadsheet from the survey response forms. The data were organized in ascending order of assigned three-digit numerical Identification Code. The first digit of the Identification Code corresponded to their year in medical school. The tens and ones place aspect of their Identification Code was assigned in a temporally increasing fashion. For example, a medical student in their second year of study (MS2) who was the first of their class to participate in the study was assigned 201. The second medical student in their second year of study (MS2) to participate in this study was assigned 202, and so on.

The data in the excel spreadsheet was thus primarily organized by Identification code ID in the first column, with subsequent columns including in the following table. This collection of data included numerical values (such as the self-assessed score or oral presentation and hand-off performance) and categorical variable data (such as intended specialty). All study participants were able to respond to these ‘core’ questions:

**Table 1: Universally applicable data questions**

<table>
<thead>
<tr>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age?</td>
</tr>
<tr>
<td>Gender?</td>
</tr>
<tr>
<td>Prior clinical experience?</td>
</tr>
<tr>
<td>Completed degrees?</td>
</tr>
<tr>
<td>Prior full-body mannequin simulation participation?</td>
</tr>
<tr>
<td>How many prior full-body mannequin simulation studies?</td>
</tr>
<tr>
<td>Whether English is their primary language?</td>
</tr>
</tbody>
</table>
If not English, then their other primary language(s)?

Self assigned oral presentation score (1-5, with 5 representing the highest score)?

Self assigned handoff score (1-5, with 5 representing the highest score)?

Intended specialty?

Months in medical school?

Anticipated graduating class year?

The subsequent demographic columns were only applicable to students at an advanced stage of training and specifically asked about the following:

**Table 2: Demographic questions for advanced Medical Students**

<table>
<thead>
<tr>
<th>Advanced-medical student-specific demographic variable data questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest level of clerkship block completed?</td>
</tr>
<tr>
<td>Whether they participated in a Sub-internship rotation?</td>
</tr>
<tr>
<td>If prior Sub-internship rotation, then in what field?</td>
</tr>
<tr>
<td>Whether they are pursuing a PhD?</td>
</tr>
<tr>
<td>Whether they have completed Pre-clinical courses?</td>
</tr>
<tr>
<td>Whether they have completed clinical rotation?</td>
</tr>
<tr>
<td>Whether they are currently focused on their PhD?</td>
</tr>
</tbody>
</table>

Students were asked to rate their performances using the below entrustment scales. The scores they could award themselves ranged from 1 – 5, with 1 representing the lowest level of entrustment (this was the description found in the leftmost cell). There is a progressive increase in entrustment as one progresses to the right of the scales below.
Figure 2: Entrustment Scale for Hand-off (sample score of 5/5)

Reflecting on your performance in both of the simulation scenarios, please circle one box that best describes how well you can perform a handoff for the purpose of transitioning patient care:

- “My attending would need to do it”
  (I would observe a resident or attending performing the task)
- “My attending would need to talk me through it”
  (I could practice the task as a co-activity with a resident or attending)
- “My attending would need to prompt me from time to time”
  (I can practice the task with a resident or attending in the room, ready to step in if needed)
- “My attending would not need to be nearby just in case”
  (I can fully perform the task without an attending or resident being there)

Figure 3: Entrustment Scale for Oral Presentation (sample score of 5/5)

Reflecting on your performance in both of the simulation scenarios, please circle one box that best describes how well you can perform an oral presentation of a patient encounter:

- “My attending would need to do it”
  (I would observe a resident or attending performing the task)
- “My attending would need to talk me through it”
  (I could practice the task as a co-activity with a resident or attending)
- “My attending would need to prompt me from time to time”
  (I can practice the task with a resident or attending in the room, ready to step in if needed)
- “My attending would not need to be nearby just in case”
  (I can fully perform the task without an attending or resident being there)

The excel spreadsheet of demographic data and self-assessment on the above entrustment scale was then imported into the SPSS digital data processing package on the same encrypted, local hard-drive. The categorical variables were converted into binary format in order to facilitate statistical analysis. For example, all study participants responded with either a ‘male’ or ‘female’ categorization in response to the gender demographic question. A new column in the STATA file was created adjacent to the gender demographic column in which a response of ‘male’ was assigned a value of ‘1’ and a response of female was assigned a value of ‘0’.
This process was applied to all categorical variables collected in the survey data that were both of research interest and amenable to a binary format conversion. These included: gender, English as a primary language and MD or MD/PhD student status. After binary conversion, a simple regression analysis was applied via STATA data processing software to observe for any statistically significant associations between said demographic data and self-assigned oral presentation score (p<0.05, with a 95% confidence interval). This process was repeated between said demographic data and self-assigned hand-off score.

A large portion of the survey data captured was already in numerical form and allowed for immediate simple regression analysis with self-assigned oral presentation score (p<0.05, with a 95% confidence interval). This analysis was repeated between said demographic data and self-assigned hand-off score.

**Qualitative Data Analysis**

The medical trainees were asked four long form questions, which included:

**Table 3: Post-simulation reflective questions**

| Q1: Describe the ideal behaviors you would expect to see in a fully competent physician as they perform an oral presentation of a patient encounter |
| Q2: Describe the ideal behaviors you would expect to see in a fully competent physician as they perform a hand off for the purpose of transitioning patient care |
| Q3: Please reflect on your performance in performing an oral presentation of a patient encounter |
| Q4: Please reflect on your performance in performing a verbal hand-off for the purpose of transitioning patient care |
The responses were organized into word processor documents by question type and in ascending order of trainee Identification number. The results were qualitatively analyzed via inductive methodology using Schifferdecker et. al and Hanson et. al for methodology (Schifferdecker et. al 2009, Hanson et. al 2011). After an immersion in the data via multiple passes, various thematic groups were populated with coded language from the trainee’s responses. These domains generated from Q1 and Q2 above were compared with the EPA Curriculum Developers Guide ideals for an entrustable learner for EPA 6 (oral presentation) and 8 (handoff). This was done in order to shed light on the medical student’s understanding of these critical clinical functions and what gaps existed between the top-down, developer-driven ideals and the facts-on-the-ground situation of medical trainee understanding and practice.
## Results

Table 4: Linear regression of Self-assessed Oral Presentation score on 5 point Entrustment Scale vs. listed demographic variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Observations</th>
<th>P – Value</th>
<th>Standard Coefficient (mean)</th>
<th>Confidence Interval (Lower)</th>
<th>Confidence Interval (Upper)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Months in Medical School</td>
<td>29</td>
<td>0.018     *</td>
<td>7.9</td>
<td>1.4</td>
<td>14.5</td>
</tr>
<tr>
<td>Prior Simulation Experience (total)</td>
<td>29</td>
<td>0.022     *</td>
<td>2.6</td>
<td>0.3</td>
<td>4.8</td>
</tr>
<tr>
<td>Self assessed Handoff Score</td>
<td>29</td>
<td>0.000     *</td>
<td>0.7</td>
<td>0.3</td>
<td>1.0</td>
</tr>
<tr>
<td>Gender</td>
<td>29</td>
<td>0.279</td>
<td>-0.1</td>
<td>-0.3</td>
<td>0.1</td>
</tr>
<tr>
<td>Age</td>
<td>29</td>
<td>0.102</td>
<td>0.8</td>
<td>-0.1</td>
<td>1.8</td>
</tr>
<tr>
<td>Primary Language: English</td>
<td>29</td>
<td>0.048     *</td>
<td>-0.1</td>
<td>-0.3</td>
<td>-0.001</td>
</tr>
</tbody>
</table>

Table 5: Linear regression of Self-assessed Handoff score on 5 point Entrustment Scale vs. listed demographic variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Observations</th>
<th>P – Value</th>
<th>Standard Coefficient (mean)</th>
<th>Confidence Interval (Lower)</th>
<th>Confidence Interval (Upper)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Months in Medical School</td>
<td>29</td>
<td>0.037     *</td>
<td>8.12</td>
<td>0.5</td>
<td>15.7</td>
</tr>
<tr>
<td>Self assessed Oral Presentation Score</td>
<td>29</td>
<td>0.000     *</td>
<td>0.5</td>
<td>0.2</td>
<td>0.8</td>
</tr>
<tr>
<td>Prior Simulation</td>
<td>29</td>
<td>0.345</td>
<td>1.2</td>
<td>-1.4</td>
<td>4.0</td>
</tr>
<tr>
<td>Experience (total)</td>
<td>n</td>
<td>Gender</td>
<td>Age</td>
<td>Primary Language: English</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>----</td>
<td>--------</td>
<td>-------</td>
<td>---------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>29</td>
<td>0.854</td>
<td>-0.02</td>
<td>0.510</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.2</td>
<td>0.1</td>
<td>-0.06</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.810</td>
<td>0.1</td>
<td>-1.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.2</td>
<td>0.1</td>
<td>0.1</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4: Scatterplot with line of linear line of best fit of Months in Medical School vs. Handoff Self-Assessment Score

\[ y = 0.0236x + 3.0874 \]

\[ R^2 = 0.26926 \]
Figure 5: Scatterplot with line of linear line of best fit of Months in Medical School vs. Oral Presentation Self-Assessment Score

Figure 6: Prior Simulation Exposure vs. Handoff Score Self Assessment Score
Figure 7: Prior Simulation Experience vs. Oral Presentation Self Assessment Score

Prior Simulation Experience vs. Oral Presentation Self Assessment Score

\[ y = 0.0447x + 3.4494 \]

\[ R^2 = 0.07183 \]

Oral Presentation

Linear (Oral Presentation)
Figure 8: Frequency-generated Wordcloud from student responses from Qualitative questions 1 and 2 (corresponding to EPA 6 and 8)

Figure 9: Wordcloud generated from EPA Curriculum Developer’s Guide for ideal, entrustable behavior for EPA 6 and 8

Actively engages patient
supports plan
Respects patient privacy
organizes and prioritizes information
filter
prioritize
Uses a template
concise

Acknowledges gaps
Demonstrates situational awareness
Avoids medical jargon

synthesize
efficiently tells story
well organized presentation
Discussion

The initial foray into the results was motivated by a desire to understand the context within which the students were performing the assessed tasks. The range of experiences medical trainees regularly bring to bear on any clinical encounter are vastly different based on various demographic sub-groups they associate with. Therefore, the initial analysis of the data was focused on ascertaining possible associations between the student’s self-assessed scores and demographic data collected in their survey.

Statistically significant correlations between self-assigned scores on the entrustment scale for oral presentation was found in the following areas: months in medical school, number of prior full-body mannequin simulations performed, English as a primary language and self-assigned hand-off scores.

Statistically significant correlations between self-assigned scores on the entrustment scale for the handoff was found in the following areas: months in medical school, and self-assigned oral presentation scores.

One expected finding was the correlation between the self-assessed score and number of months spent in medical training. The fundamental premise of education is that one will enhance their skill set with greater training and practice. There is even a colloquially quoted maxim that alludes to this, in albeit a tad hastened fashion: “See one, do one, teach one” (Tuthill 2008). In essence, this maxim points to the fact that students appreciate
(however erroneously) a greater degree of basic science and clinical knowledge with the passage of time in medical school.

A corollary of this maxim is also reflected in the statistically significant association between number of prior full-body mannequin simulations and self assessed scores for both oral presentations. Students who have performed a greater number of simulations have an inherent comfort gained with experience of the use of simulation for testing; thereby providing a degree of comfort with the simulation procedure that confers a competitive advantage over another student with otherwise equal abilities in hand-off or oral presentation. Specifically, a student who has never encountered the simulation environment would be at a disadvantage not due to their actual knowledge or skill level but rather the experience. They might then assign themselves a lower score, partially based on their degree of discomfort with use of the simulation for testing. Also, almost every simulation within the Yale Medical School curriculum (which forms the majority, if not totality of the volunteer’s simulation experience) requires multiple oral presentations, thereby granting students advanced practice with this skill and in this particular testing modality.

The last major statistically significant correlation was found between hand-off and oral presentation self-assessed scores themselves. This finding seems to imply that the students’ predilection of self-assessment was relatively consistent across discrete tasks. Despite the tasks of oral presentation and hand-offs presenting diverse challenges and pitfalls, the
students’ were almost uniformly comfortable with rendering their performances with similar scores. This may indeed be possible for the more advanced students (see above: increased exposure, training resulting in higher scores). However, for the junior students this may beg the question: Do they possess enough insight to differentiate between the skills tested for a hand-off and those of an oral presentation? Granted, these two skills have considerable overlap (and were chosen to be tested in tandem in this research project for that reason as well). But do these skills sets overlap so much that the students' provide such strongly overlapping scores?

Perhaps it is the level of self-confidence that underpins these exercises that causes the correlation of the scores? A follow-up focus group with the study participants would garner rich qualitative data that could potentially further shed light on this correlation.

**Non-significant finding of particular note: Gender**

Much of the demographic variables self-reported by the students in this project did not exhibit statistically significant correlations with their self-assessed scores on their oral presentation and hand-off scales. That is well within the nature of research findings. However, some of the particular variables deserve comment even though, and in some cases especially because, they did not exhibit significant associations with self-assessed scores.

There was no significant correlation between a student’s self-described gender identity and self-assessed oral presentation or hand-off score. This is
notable because, “Past research indicates that despite performing equally to their male peers, female medical students consistently report decreased self-confidence and increased anxiety, particularly over issues related to their competence.” (Blanch et al 2008) A study of 141 third year medical students at the University of Indiana School of Medicine that found in a “…standardized patient examination situation, female medical students appeared significantly less confident than male medical students to independent observers.” (Blanch et. al 2008).

It is possible that by isolating the volunteers in our study away from any other students or standardized patients allowed for a more ‘neutral’ testing environment that lessened the potential variance between male and female trainee self-confidence. However, the potential likelihood of this variable contributing to the final self-assessed scores is still possible given the widely observed differences in female and male medical student confidence levels in their own competence (Colbert-Getz 2013).

**Dunning Kruger Observation**

One would expect that students exhibit and acknowledge an almost absolute complete dearth of clinical knowledge and skills at the outset of their training. Their knowledge base and confidence in their skills would increase with corresponding time spent in medical training, with the highest level of knowledge and training more likely to be found at the culmination of medical training than before.
Interestingly enough, this was not observed in our findings. There was indeed a correlation between months in medical school and self assessed scores, as evidenced by the significant p values and graphically with a line of best fit showing a roughly linear relationship between these two variables. However, the r-squared calculation of the line of best fit shows a much weaker correlation than a nearly perfectly linear correlation (with r-squared value of close to 1). The calculated r-squared value was .26 for months in medical school vs. hand-off score and .28 for months in medical school vs. oral presentation score. This finding was also manifest in the r-squared values of the line of best fit for the scatterplots of number or prior simulation experiences and handoff score (.26). The expected strongly linear correlation of close to 1 was far from observed.

Compounding this interesting finding was the apparent disconnect between some of the junior students’ self-assessed scores and their qualitative descriptions of their performances. Most of the students across the training spectrum placed themselves at a weakly linear relationship with their time-point in medical training. These students also wrote forthcoming and critical self-assessments of their performances that reflected some critical gaps in form and function of their clinical skills.

However, as mentioned above, there were some particularly large discrepancies between some of the junior students’ self-assessed score and their qualitative descriptions of their performances. This presented in the form of students who described, with a impressive degree of alacrity, their
struggles with gathering information, synthesizing a concise presentation and presenting next steps to the admitting clinical team. Despite the commendable degree of introspection, their self-assigned scores on the entrustment scale had an inordinate number of scores of 4 or 5 (out of 5 point); a level commensurate with a high-functioning intern, many years ahead of their level.

This differential could be attributed to a number of potential factors. The simplest explanation is one of cognitive dissonance. Despite acknowledging the various gaps in their performance, the selectively score-inflating junior students did not carry that introspection forward to their entrustment scale rating performance. Another possible explanation could be the previously observed phenomenon of grade inflation (Fazio et. al 2013). A precedent of higher-skewed scores despite variable performances could reinforce the cognitive dissonance that resulted in this mismatch.

This contrasts with the phenomenon noticed clustering at the more advanced student’s range. Their performances were logically more clustered around the four and five range on the five point entrustment scale; a highly competent medical student at the cusp of graduation would be expected to perform at near-intern levels. Nonetheless, their qualitative descriptions were somewhat lacking in rich descriptors. An obvious explanation would be that those who accorded their performances with high scores did not perceive major areas for improvement. While this aspiration may be true a few years
after a trainee has completed residency, this does not reflect the truth of their much more likely room for improvement.

Another potential explanation is that the medical trainees (and the years of training and examinations in preparation for its entry) are heavily focused on the ‘ends’ of grades and scores, at the ostensible neglect of the ‘means’ of process and discovery. This leads to an overall decrease in empathy and increase in cynicism that can inhibit both inter-personal and intra-personal reflection (Hojat et al 2004). After years of being exposed to and processed in a methodology steeped in ranking and percentiles with little regard for written evaluations or formative feedback, it is altogether not surprising that the students focus on their performance and summative score, rather than producing insights into their performance and what areas they may be prone to improving.

Another observation that is somewhat perplexing is the near complete absence of mention regarding an established hand-off tool to guide one’s patient delivery. Despite many of the students in the research sample having had considerable if not years of clinical exposure, almost none of them made even a mention of widely accepted and utilized clinical tools such as I-PASS or even a simple checklist.

As expected, the results demonstrate a positive correlation between self-assessed entrustment scoring and the number of months in medical school as well as amount of exposure to simulation. The finding of many
students ranking themselves above an expected level of 3 (commensurate with a readiness for indirect level of supervision).

These Some of the findings mirror those observed by Dunning and Kruger, where students with greater preparation or experience demonstrate a tendency to underestimate themselves slightly, whereas students with less competence are overconfident in their estimation of their abilities (Dunning and Kruger 1999).
Future Directions

This study provides some interesting insights into the concordances and gaps between the EPA Council’s defined ideal behavior of an entrustable learner for EPA 6 and 8. A focus group of medical trainees could provide more qualitatively rich responses to further elucidate the observed findings.

While there were some interesting correlations observed between the demographic data and self-assigned scores on the entrustment scale, these findings were partially undermined by a smaller sample size. A future study could incorporate some of the questions involved in this particular study, albeit with a larger sample size of students. Furthermore, a multi-center study could allow for greater insight by capturing a larger and more diverse sample size.
Appendix

Appendix A: Description of EPA 6, from EPA Curriculum Developers Guide.

EPA 6: Provide an oral presentation of a clinical encounter

1. Description of the activity

The day 1 resident should be able to concisely present a summary of a clinical encounter to one or more members of the health care team (including patients and families) in order to achieve a shared understanding of the patient's current condition. A prerequisite for the ability to provide an oral presentation is synthesis of the information, gathered into an accurate assessment of the patient's current condition.

Functions

- Present information that has been personally gathered or verified, acknowledging any areas of uncertainty.
- Provide an accurate, concise, and well-organized oral presentation.
- Adjust the oral presentation to meet the needs of the receiver of the information.
- Assure closed-loop communication between the presenter and receiver of the information to ensure that both parties have a shared understanding of the patient's condition and needs.

2. Most relevant domains of competence

<table>
<thead>
<tr>
<th>Patient Care</th>
<th>Professionalism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge for Practice</td>
<td>Systems-Based Practice</td>
</tr>
<tr>
<td>Practice-Based Learning and Improvement</td>
<td>Interprofessional Collaboration</td>
</tr>
<tr>
<td>Interpersonal and Communication Skills</td>
<td>Personal and Professional Development</td>
</tr>
</tbody>
</table>
Appendix B: Description of EPA 8, from EPA Curriculum Developers Guide.

EPA 8: Give or receive a patient handover to transition care responsibility

| 1. Description of the activity | Effective and efficient handover communication is critical for patient care. Handover communication ensures that patients continue to receive high-quality and safe care through transitions of responsibility from one health care team or practitioner to another. Handovers are also foundational to the success of many other types of interprofessional communication, including discharge from one provider to another and from one setting to another. Handovers may occur between settings (e.g., hospitalist to PCP; pediatric to adult caregiver; discharges to lower-acuity settings) or within settings (e.g., shift changes).

Functions for transmitter of information
- Conduct handover communication that minimizes known threats to transitions of care (e.g., by ensuring you engage the listener, avoiding distractions).
- Follow a structured handover template for verbal communication.
- Provide succinct verbal communication that conveys, at a minimum, illness severity, situation awareness, action planning, and contingency planning.
- Elicit feedback about the most recent handover communication when assuming primary responsibility of the patients.
- Demonstrate respect for patient privacy and confidentiality.

Functions for receiver of information
- Provide feedback to transmitter to ensure informational needs are met.
- Ask clarifying questions.
- Repeat back to ensure closed-loop communication.
- Ensure that the health care team (including patient/family) knows that the transition of responsibility has occurred.
- Assume full responsibility for required care during one’s entire care encounter.
- Demonstrate respect for patient privacy and confidentiality.

| 2. Most relevant domains of competence | ☑ Patient Care
☐ Knowledge for Practice
☐ Practice-Based Learning and Improvement
☐ Interpersonal and Communication | ☑ Professionalism
☐ Systems-Based Practice
☐ Interprofessional Collaboration
☐ Personal and Professional Development |


17. Herbstreit, Frank, Stefanie Merse, Rainer Schnell, Marcel Noack, Daniel Dirkmann, Anna Besuch, and Jürgen Peters. "Impact of Standardized Patients on the Training of Medical Students to


