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Targeting Implicit Bias in Medicine: Lessons from Art and Archaeology

Amy Zeidan, MD*
Anne Tiballi, PhD†
Melanie Woodward, MD‡
Isha Marina Di Bartolo, MD§

*Emory University, Department of Emergency Medicine, Atlanta, Georgia
†University of Pennsylvania, Museum of Archaeology and Anthropology, Philadelphia, Pennsylvania
‡University of Pennsylvania, Perelman School of Medicine, Department of Internal Medicine, Philadelphia, Pennsylvania
§Rowan University School of Medicine/Cooper Hospital, Department of Internal Medicine, Camden, New Jersey

Implicit bias training is not currently a required component of residency education, yet implicit bias in medicine exists and may influence care provided to patients. We propose an innovative exercise that allows trainees to explore implicit bias outside of the clinical environment, in an interdisciplinary manner with museum anthropologists and archaeologists. The curriculum was designed with leaders at the Penn Museum and focuses on differentiating between objective and subjective assessments of historical objects. The first part of the exercise consists of a pre-brief, to introduce trainees to bias through the lens of an anthropologist/archaeologist. The second part guides trainees through "deep description," where they explore objective and subjective findings of three different objects. The exercise concludes with a debrief and application of concepts learned to everyday clinical practice. This innovation was successful at introducing trainees to implicit bias in a nontraditional environment, and participants reported an improved understanding of implicit bias. Residency programs could consider partnering with local museums to implement a similar exercise as a component of conference curriculum. [West J Emerg Med. 2020;21(1)1-3.]

BACKGROUND

Implicit bias involves associations outside our conscious awareness that lead to misleading, often-negative evaluations of a person or patient, on the basis of characteristics such as race, ethnicity, sexual orientation, or gender. Medical professionals are not immune to implicit bias, and research has shown that the rates of implicit bias as measured by the Implicit Association Test (IAT) within the medical community are equal to that of the general population.[1] In fact, studies have shown that physicians have a pro-white bias.[2] These biases may influence diagnoses and ultimately, treatment decisions for patients.[3] Leaders in healthcare are faced with the task of addressing these implicit biases by further investigating the role they play in the care of patients, and by addressing how to combat these biases. Numerous approaches have been employed; however, implicit bias education is not yet a requirement in emergency medicine

(EM) residency curriculum, or more broadly, in graduate medical education curriculum.[4,5,6] We provide a description of an educational approach using archaeologic concepts to introduce implicit bias to trainees.

OBJECTIVES

There are many challenges in developing implicit bias training during residency. Because of the limited time available to residents in their training, educators must try to coalesce as much content as possible into a limited amount of time. Furthermore, implicit bias training has been frequently associated with increasing rates of anxiety and disengagement.[5] We postulated that decoupling the training from the hospital and direct clinical experiences and having the discussions in a low-stakes environment, such as a museum, could be an effective way to introduce the concept of implicit bias to trainees. Therefore, the

educational objective of this curriculum was to develop an exercise that can be performed during residency conference that allows the trainee to explore implicit bias through the lens of an archaeologist, using objects and artwork, rather than clinical settings.

CURRICULAR DESIGN

This curriculum was designed with anthropology and archaeology experts at the Penn Museum of Archaeology and Anthropology. Similar collaborations have been implemented between Yale Medical School and the Center for British Art and Harvard Medical School and the Museum of Fine Arts Boston.[7] The exercise consists of three components: a pre-brief with session leaders; viewing three objects using a tool called "deep description;" and a post-session reflective discussion.

During the pre-brief, trainees are introduced to the kinds of biases that exist while creating narratives and explanations for the ancient past by museum anthropologists and archaeologists. The group leader emphasizes that archaeologists work with an incomplete record, and must "fill in the gaps" in the histories they write, but that this process necessarily introduces the scholar's own bias into the story of the past.

After this introduction, trainees visit three objects and are asked to practice performing "deep description." Deep description is the process of analyzing an object with the intent of understanding human behavior and activities. It pushes the observer to think critically about each small detail of an object with the purpose of understanding the intent of the creator, and how the object represents traditions, cultures, and communities. Importantly, this technique encourages the participant to separate objective findings from subjective evaluations.

Each object session begins with five minutes of silent observation and proceeds to observations and inferences based on those observations. Prompts included both aesthetic questions that required the trainees to closely examine the objects, and anthropological questions that encouraged them to make inferences about how the object was made and used and the people who made and used it (Figure 1).

Using deep description in this setting allows trainees to distinguish objective findings, "the handle is broken," from subjective evaluations, "the bowl was thrown away after it broke, since it could no longer be used." Interestingly, further examination might show that the bowl was repaired in antiquity and continued to be used, suggesting that the owner valued it highly or could not afford to replace it. Exploring objective and subjective findings assists trainees in acknowledging that biases exist and are almost inevitable.

Finally, trainees participated in a reflective discussion to share their experiences of using deep description and how these experiences allowed the observer to understand implicit bias outside of a clinical environment. Participants easily moved between the specific, archaeological aspects of the curriculum and their experiences in clinical settings. Assumptions about objects had direct parallels in assumptions about patients, and participants were aware of the ways in which the need to create a complete "story" can often be influenced by their own biases.

IMPACT/EFFECTIVENESS

Participants were asked voluntarily and anonymously to complete a survey prior to the start of the exercise. Participants then completed the same survey at the conclusion of the exercise after the reflective discussion. The pre and post survey included six questions that aimed to assess the participant's understanding of implicit bias including questions such as, "I believe that addressing

Figure 1. Sample object with aesthetic and anthropologic prompts.

Aesthetic	Anthropological
What colors do you see? How are they combined?	Who made this object?
What is the object made out of? Why did the maker use that material?	Who used it?
What patterns do you see? How do they repeat?	How old is it?
Do you see any artisanal "mistakes"?	Was the user wealthy? Poor? Male? Female?
What words would you use to describe the object?	What does this object do?
What do you feel when you look at this object?	What meaning or idea does it convey?

implicit bias can improve patient care." The survey also included short-answer questions about prior experiences with implicit bias. Results were collected and collated by the authors, and analyzed using Excel (Microsoft Corp., Redmond, WA) statistics.

A total of 26 participants completed this workshop as a compulsory part of their curriculum. There were three workshops in total, two for internal medicine (IM) residents and one for EM residents/clerkship students. All seven IM residents completed the pre/post survey. There were 19 total participants in the EM group consisting of EM residents and medical students participating in their EM clerkship. In the EM group, 11 participants completed both the pre/post survey (four medical students, seven EM residents). Most participants had minimal to no training on implicit bias prior to this exercise (89%). Participants reported having a better understanding of implicit bias after the exercise (67%) and reporting feeling more empowered to address their biases after completion of the exercise (61%). Most participants reported learning something new or surprising from the session (78%), specifically commenting on how "quickly we jump to conclusions and assumptions" and how challenging it is to "separate observation from interpretation."

Finally, participants expressed wanting more time for this and similar sessions, specifically recommending a longer "lecture" on implicit bias, longitudinal exercises, and a more thorough discussion on interventions that may help prevent implicit bias from affecting clinical care. In the future, we recommend expanding the allotted time of the session to at least four hours, or dividing the session into two components over a two-week period to provide ample time for reflective discussion.

This workshop was effective at delivering content on the subject of implicit bias, and it fostered conversations about bias in a low-stakes, interdisciplinary environment. It should be noted that this exercise has not been shown to alter an individual's implicit biases, or evaluate how this may affect clinical care and outcomes, which is an important area for further investigation.

Address for Correspondence: Amy Zeidan, Emory University, Department of Emergency Medicine, 531 Asbury Circle, Annex Building, Suite N340, Atlanta, GA 30322. Email: amy.waldner@gmail.com.

REFERENCES

1. FitzGerald C, Hurst S. Implicit bias in healthcare professionals: a systematic review. *BMC Med Ethics.* 2017;18(1):19

2. Hall WJ, Chapman M V, Lee KM, et al. Implicit racial/ethnic bias among health care professionals and its influence on health care outcomes: A systematic review. *Am J of Public Health*. 2015;105(12):e60–76.

3. Chapman EN, Kaatz A, Carnes M. Physicians and implicit bias: How doctors may unwittingly perpetuate health care disparities. *J of Gen Intern Med.* 2013;28(11):1504–10.

4. Beach MC, Price EG, Gary TL, et al. Cultural competence: a systematic review of health care provider educational interventions. *Med Care.* 2005;43(4):356–73.

5. Godsil RD, Tropp LR, Goff PH, et al. The Perception Institute: Addressing Implicit Bias, Racial Anxiety and Stereotype Threat in Education and Healthcare – The Science of Inequality Volume 1. November 2014. Available at http://perception.org/wp-content/uploads/2014/11/Science-of-Equality.pdf. Accessed June 4, 2018.

6. Stone J, Moskowitz, GB. Non-conscious bias in medical decision making: What can be done to reduce it? *Med Educ.* 2011;45: 768–76.

7. Naghshineh S, Hafler JP, Miller AR, et al. Formal art observation training improves medical students' visual diagnostic skills. *J Gen Intern Med.* 2008;23(7):991-7.

Misunderstanding the Match: Do Students Create Rank Lists Based on True Preferences?

Benjamin H. Schnapp, MD, MEd
Kathleen Ulrich, MD
Jamie Hess, MD
Aaron S. Kraut, MD
David Tillman, MD
Mary Westergaard, MD

University of Wisconsin School of Medicine and Public Health, BerbeeWalsh Department of Emergency Medicine, Madison, Wisconsin

Introduction: The "stable marriage" algorithm underlying the National Residency Match Program (NRMP) has been shown to create optimal outcomes when students submit true preference lists. Previous research has shown students may allow external information to affect their rank lists. The objective of this study was to determine whether medical students consistently make rank lists that reflect their true preferences.

Methods: A voluntary online survey was sent to third-year students at a single midwestern medical school. Students were given hypothetical scenarios that either should or should not affect their true residency preferences and rated the importance of six factors to their final rank list. The survey was edited by a group of education scholars and revised based on feedback from a pilot with current postgraduate year 1 residents.

Results: Of 175 students surveyed, 140 (80%) responded; 63% (88/140) reported that their "perceived competitiveness" would influence their rank list at least a "moderate amount. Of 135 students, 31 (23%) moved a program lower on their list if they learned they were ranked "low" by that program, while 6% (8/135) of respondents moved a program higher if they learned they were ranked "at the top of the list." Participants responded similarly ($\kappa = 0.71$) when presented with scenarios asking what they would do vs what a classmate should do.

Conclusion: Students' hypothetical rank lists did not consistently match their true residency preferences. These results may stem from a misunderstanding of the Match algorithm. Medical schools should consider augmenting explicit education related to the NRMP Match algorithm to ensure optimal outcomes for students. [West J Emerg Med. 2020;21(1):4-7.]

INTRODUCTION

The National Residency Match Program (NMRP) algorithm has been shown to create optimal outcomes for students when students and programs submit true preference lists.[1] Despite this, previous research and anecdotal reports suggest that students may allow external information, such as perceived competitiveness, to influence their rank lists. This may be because historically it was possible to "game" the Match, although as of the most recent revision in 1998, this is no longer true.[2]

Multiple studies have shown that students alter their rank lists based on post-interview communication with programs. In a study of over 800 students across multiple specialties, 23.4% of respondents reported changing their rank order list based on communications with programs.[3] One cross-sectional study of emergency medicine applicants found that 51% changed their rank lists based on post-interview communication.[4] More

recently, an online thread on *Reddit* entitled "How to Game the Match. Rank List Tips!" relayed stories of students stating "how dangerous it was to rank 'reach' programs higher."[5]

To date however, there has been no study specifically examining the factors that medical students weigh to create rank lists. Our hypothesis was that medical students would be influenced in their creation of a hypothetical rank list by external information that did not affect their true residency preferences, suggesting a fundamental misunderstanding of the core principles of the NRMP Match algorithm.

METHODS

The study was conducted at the University of Wisconsin School of Medicine and Public Health in Madison, Wisconsin, with 663 total students. All actively enrolled students in their third year of medical school (175 students) were eligible to participate.

To test students' understanding of the Match algorithm, we created two types of case scenarios. One set of scenarios presented information that should cause a student to alter their true residency preferences and therefore their rank list, such as a partner securing a dream job in a new city or an ill family member. The other set of scenarios presented information that should not alter students' true residency preferences or their rank lists, such as learning that they were highly competitive or would be low on a residency rank list. These case scenarios were developed to represent real-life scenarios that students might encounter as closely as possible to enhance content validity. Each type of scenario was presented in two ways: a "personal" scenario where students were asked what they *would* do if they were presented with this situation, and a "peer" scenario where they were asked to weigh in on what another student *should* do.

These case scenarios, as well as several questions about factors important in developing a rank list to provide internal structure validity, were developed by a group of three experienced education researchers within the Department of Emergency Medicine at the University of Wisconsin School of Medicine and Public Health. The scenarios were then piloted with several postgraduate year (PGY) 1 residents who had recently completed the Match process, and minor revisions were made for clarity and understanding for response process validity. While no formal assessment was made of consequences validity, third-year students were chosen as understanding the NRMP Match process is highly consequential to them during this period, while they remain unbiased by personal and peer experience with the Match. We did not explore relationships with other variables validity evidence in this study.

The combined instrument (Appendix A) was then emailed to the class email list as a voluntary, uncompensated Qualtrics (Provo, UT) survey in November 2018. Two reminder emails were sent approximately two weeks apart after the initial solicitation. The survey response rate used the second definition of response rate provided by the American Association for Public Opinion Research.[6] We also conducted a wave analysis using Microsoft Excel (Redmond, WA) to determine whether

nonresponse bias was present by comparing intial respondents with late respondents.[7] An unweighted kappa was calculated using SPSS (Armonk, NY) between participants' responses to "personal" and "peer" scenarios as a proxy for test-retest reliability and further evidence of internal stucture validity, since responses should not change based on the framing of the scenario. The study was determined to be exempt by the University of Wisconsin School of Medicine and Public Health Institutional Review Board.

RESULTS

A total of 140/175 (80%) potential respondents completed at least the first section of the survey, and 131/175 (75%) respondents completed the survey in its entirety. Of these, 63% (88/140) reported that their "perceived competitiveness" would influence their rank list at least a "moderate amount."

When presented with scenarios that should influence a rank list, 90% (122/135) of respondents would move a program higher on their list if they learned their significant other could only work in that program's city, while 83% (112/135) of respondents would move a program lower on their list if they learned that the program director, who was their the sole reason for their interest in that program, was retiring. When asked to advise a friend on scenarios that should influence a rank list, 96% (126/131) advised that they should move a program up their rank list to be closer to an ill parent and 77% (101/131) advised that they should move a program down their rank list if a global health director, who was the sole reason for their interest in the program, was leaving.

When presented with hypothetical scenarios that should not influence a rank list, 23% (31/135) of respondents would move a program lower on their list if they learned they were ranked "low" by that program, while 6% (8/135) of respondents would move a program higher on their list if they learned they were ranked "at the top of the list" by that program. When asked to advise a friend on scenarios that should not influence a rank list, 9% (12/131) advised that that they should move a program up their rank list in response to a phone call from a coordinator indicating that they were a top applicant and ranked to match, and 22% (29/131) advised that they should move a program down their rank list when told that they would be low on the rank list at that program. The wave analysis on the "perceived competitiveness" question showed a minimal difference between responders and late responders (-0.02 on a five-item Likert scale) indicating a low likelihood of nonresponse bias. The unweighted kappa between analogous "personal" and "peer" scenarios across all raters was 0.71, indicating good agreement.

DISCUSSION

Overall, our data suggest that there may be imperfect alignment of the Match algorithm design with student behavior. Many students failed to adjust rank lists appropriately according to new information that should have changed their true residency preferences, and a significant number also adjusted rank inappropriately based on "competitiveness" information

that should not have affected their lists. These behaviors are inconsistent with the functioning of the NRMP's matching algorithm[8] and may put students and programs at risk for suboptimal Match outcomes.

One possible explanation is that students simply do not understand how the Match algorithm operates. The NRMP's own video on the subject takes nearly five minutes to fully explain its workings,[9] and the original paper detailing the algorithm runs on for seven highly technical pages.[1] A lack of solid grounding in how the algorithm functions may lead to students leaning instead on hearsay and inherited wisdom. Further complicating the issue is that the Match has not always worked the same way, previously prioritizing the preferences of programs over those of applicants.[10] While many resources for medical students offer good advice on how to construct a rank list correctly, this advice may be drowned out by the volume of suggestions that students are offered during this time period about seeking out mentorship, post-interview communications, and what factors are most important in choosing a residency.[11,12] Medical schools and student advisors may need to make efforts to explicitly address the Match and how to create a proper rank list in order to avoid giving students an unappreciated disadvantage at this important training crossroads.

Of particular note, new information regarding competitiveness (both positive and negative) influenced students' rank lists, when it should not have if students were attempting to obtain optimal outcomes from the Match algorithm. It is possible that the *knowledge* of being high or low on the rank list changes true preferences in some way, such as enhancing or detracting from a subjective assessment of fit. It has previously been shown that being liked improves one's perception of the liker.[13] However, the extent of this phenomenon in the Match process is unknown. It is also interesting that the percent of students deciding to alter their rank list is not the same when applicants are told that a program is ranking them highly compared to when a program is ranking them low (9% vs 23%). This may be related to the specifics of each scenario or represent an attempt at loss-aversion.[14] These results also may suggest the importance of post-interview contacts from programs to applicants, as it appears that competitiveness information may influence student decision-making.

A commitment to the Match algorithm in the purest sense would require students and programs to keep competitiveness and rank information strictly confidential. However, the high-stakes pressures on both students and programs to find outstanding mutual compatibility likely will make this a difficult goal to achieve.

LIMITATIONS

This study has several limitations. Of primary concern is the lack of a gold standard for rank-list behavior according to our specific scenarios. Further, our questions may not have been interpreted by the students as we intended. However, as the reliability was good between analogous scenarios, and the results from the scenarios are consistent with the finding from the first portion of the survey that a large percentage of students would be willing to change their rank list based on perceived competitiveness, we believe that it is likely the questions were understood as posed. Additionally, our study is a cross-sectional survey of a single class within a single medical school and may not be representative of medical students at other institutions or in other parts of the country.

CONCLUSION

Nearly a quarter of students alter hypothetical rank lists based on information that should not affect their true residency preferences. As responses did not differ when asking students what they would do versus what a classmate should do, it is likely these results stem from a lack of understanding of the Match algorithm. Medical schools should consider adding explicit teaching related to the NRMP Match to ensure optimal outcomes for students.

Address for Correspondence: Benjamin H. Schnapp, MD, MEd, University of Wisconsin School of Medicine and Public Health, BerbeeWalsh Department of Emergency Medicine, 800 University Bay Dr., Suite 310, Madison, WI 53705. Email:bschnapp@medicine. wisc.edu.

REFERENCES

1. Gale D, Shapley LS. College admissions and the stability of marriage. *The American Mathematical Monthly*. 1962;69(1):9-15.
2. Roth AE. The origins, history, and design of the resident match. *JAMA*. 2003;289(7):909-12.
3. Jena AB, Arora VM, Hauer KE, et al. The prevalence and nature of postinterview communications between residency programs and applicants during the match. *Acad Med*. 2012;87(10):1434-42.
4. Yarris LM, Deiorio NM, Gaines SS. Emergency medicine residency applicants' perceptions about being contacted after interview day. *West J Emerg Med*. 2010;11(5):474-8.
5. How to game the Match. Rank list tips! *Reddit*. Available at: https://www.reddit.com/r/medicalschool/comments/7nnfjk/how_to_game_the_match_rank_list_tips/ds341cu?utm_source=share&utm_medium=web2x. Accessed May 10, 2019.

6. Phillips AW, Friedman BT, Durning SJ. How to calculate a survey response rate: best practices. *Acad Med*. 2017;92(2):269.

7. Phillips AW, Reddy S, Durning SJ. Improving response rates and evaluating nonresponse bias in surveys: AMEE Guide No. 102. *Med Teach*. 2016;38(3):217-28.

8. Roth AE, Peranson E. The effects of the change in the NRMP matching algorithm. National Resident Matching Program. *JAMA*. 1997;278(9):729-32.

9. How the matching algorithm works. Available at: http://www.nrmp.org/matching-algorithm/. Accessed May 10, 2019.

10. Another 34,000 people are about to put their future in the hands of an algorithm. *FiveThirtyEight*. Available at: https://fivethirtyeight.com/features/another-34000-people-are-about-to-put-their-future-in-the-hands-of-an-algorithm/. Accessed May 10, 2019.

11. Ziegelstein RC. "Rocking the Match": applying and getting into residency. *J Natl Med Assoc*. 2007;99(9):994-9.

12. Gisondi MA, Fant A, Shakeri N, et al. A user's guide to the ALiEM emergency medicine Match advice web series. *West J Emerg Med*. 2017;18(4):698-704.

13. Backman CW, Secord PF. Liking, selective interaction, and misperception in congruent interpersonal relations. *Sociometry*. 1962;25(4):321-35.

14. Tversky A, Kahneman D. Loss aversion in riskless choice: a reference-dependent model. *The Q J Econ*. 1991;106(4):1039-61.

Establishing an Elective Rotation Director and Its Effect on Elective Opportunities and Satisfaction

Adam J. Janicki, MD
Michele L. Dorfsman, MD

University of Pittsburgh School of Medicine, Department of Emergency Medicine,
Pittsburgh, Pennsylvania

Elective rotations are valuable, allowing trainees to personalize their educational experience, focus on areas of weakness, and offer personal and professional development. Emergency medicine (EM) residency program elective rotations may be limited due to the absence of awareness of opportunities and administrative support. We sought to increase the breadth of elective rotation opportunities, improve residents' satisfaction with their elective rotations, and enhance the opportunities for clinical training. To increase the breadth of our elective rotation opportunities, we established an elective rotation director—a dedicated faculty member to aid in elective planning and provide administrative support. This faculty member met with all residents during their second year, coordinated new electives with the graduate medical education office, and assisted with administrative tasks. Ten new rotations (two local, five domestic away, three international away) were established during the position's first two years, increasing available rotations from nine to 19. A survey was sent to graduates of the program two years before and two years after the position was established to inquire about their elective experience. Of 64 graduates, 49 (76.6%) participated in the survey. Graduates exposed to the dedicated faculty member reported increased exposure to novel learning environments ($p<0.001$), improved wellness ($p<0.001$), and were more likely than pre-director graduates to choose the same elective rotation ($p=0.006$). Programs with multiple elective rotations may benefit more from this position, but additional resources may be needed given the associated increase in administrative time. [West J Emerg Med. 2020;21(1)8–11.]

BACKGROUND

The majority of emergency medicine (EM) residency programs in the United States (U.S.) offer opportunities for local, domestic and international elective rotations. Elective rotations allow trainees to personalize their educational experience, focus on areas of weakness, and provide opportunities for personal and professional development.[1,2] Increased interest in domestic and international away rotations has placed more pressure on residency programs to offer a wide variety of elective opportunities.[3] International rotations have been previously shown to be a source of resident satisfaction and a strong recruitment tool for EM residency programs; however, significant barriers remain to expand these opportunities.[4]

Over the last five years, our residents consistently cited an absence of opportunity awareness and administrative support as barriers to the creation of new local electives and pursuit of away-elective opportunities. Local and institutional barriers made navigating the process daunting for residents, even with the help of program coordinators tasked with facilitating elective rotations. This often resulted in our residents often limiting themselves to local opportunities in areas such as ultrasound, research, emergency medical services, and toxicology.

OBJECTIVES

We sought to increase the breadth of elective rotation opportunities our training program offers, improve resident satisfaction with their elective rotations, and enhance opportunities for clinical training.

DESIGN

In October 2016 we established an elective rotation director, a dedicated academic faculty member to aid in

elective planning and provide administrative support. This faculty mentor, in conjunction with the residency program director (PD), worked with each resident to expand and individualize elective rotation choices to include more local, national, and international rotations.

Our residency program is a three-year program that offers only one elective rotation during the third year. The faculty member met with each resident early in postgraduate year (PGY)-2 to identify three viable rotation options based upon the resident's interests. The director subsequently helped the resident procure his or her ideal rotation while ensuring that backup choices were still attractive. The elective rotation director worked with the residency PD, the rotation director at the receiving institution for away rotations, and the graduate medical education (GME) office to complete all administrative tasks including completion of program letters of agreement (PLAs), memorandums of understanding, and master affiliation agreements. At the end of the academic year, the faculty member presented a summary of elective opportunities at residency education conference to inform junior residents for future planning.

The rotation director met with the residency program leadership monthly to review established rotations, revise new rotations based on feedback, and to ensure all institutional and national residency guidelines were followed. While administrative support from program coordinators is essential, the process is optimized through guidance that a faculty member provides in craftign goals and objectives and ensuring educational value. The rotation director received a financial stipend and adequate protected time to meet with each resident, research elective opportunities based on the resident's academic wants and needs, conceptualize rotations and ensure they met institutional guidelines, and complete administrative tasks.

Much was learned from the position's creation and implementation. The largest, unexpected barriers were administrative. Much time was spent revising PLAs based on departmental and Office of Graduate Medical Education feedback. Away rotations, both domestic and international, and planning and administrative tasks were delayed based upon feedback and response times from hosting institutions. We established that it takes approximately six months from elective conceptualization to finalization and confirmation.

IMPACT/EFFECTIVENESS

To assess the impact of the director, we determined the number of elective rotation opportunities two years prior to (pre-director) and two years after (post-director) the creation and implementation of the director position. In addition, a survey designed by the study authors to obtain preliminary data regarding the position's effectiveness was distributed directly to both pre-director and post-director

graduates (Supplemental File). The survey addressed the following domains: resident satisfaction; electives' learning environments, wellness, and attitudes towards the elective rotation director position. We used five-point Likert scale items in which the lowest score (1) corresponded to "strongly disagree" and the highest score (5) corresponded to "strongly agree." The survey was reviewed by two experts in medical education as well as an expert in survey design to ascertain content validity. The survey was piloted on a resident physician not participating in the study to assess response process validity and was subsequently revised based on feedback.

Residency graduates who participated in an elective rotation during their residency training were emailed invitations directly with a survey link administered via SurveyMonkey. Student's t-test was used to compare responses and effect sizes were calculated (5,6). Given our 1-5 Likert scale, effect sizes greater than 0.5 were deemed large, 0.25-0.5 intermediate, and less than 0.25 small. All study procedures were approved by the University of Pittsburgh Institutional Review Board.

Prior to the elective rotation director, nine rotations were offered – seven local (within our institution), one domestic away (within the U.S., but outside of our institution), and one international away rotation. Two years after establishing this position, elective opportunities increased to 19 rotations – nine local, six domestic away, and four international away. Table 1 provides a description of offered electives.

Our survey was completed by 49 of 64 (76.6%) of eligible graduates, 20 pre-director graduates (62.5%), and 29 post-director graduates (90.6%). Post-director graduates felt that their elective exposed them to a novel learning environment ($p<0.001$, effect size = 1.15) and contributed to their wellness ($p<0.001$, effect size = 1.08). If offered the opportunity to choose their elective again, post-director graduates were more likely than pre-director to choose the same elective rotation ($p=0.006$, effect size = 0.77). Pre-director graduates reported that they would have welcomed administrative support in planning their elective rotation (mean 3.86; 95% confidence interval [CI], 3.4-4.5), and post-director graduates felt that administrative support helped them plan their elective rotation (mean 4.5; 95% CI, 4.3-4.7).

Programs with multiple elective rotations may benefit even more from this position given the associated increase in planning and burden of administrative tasks. Additional resources may be needed given the associated increase in required protected time.

This position was implemented at a single institution with results from a small cohort of residency graduates, but preliminary data supports its creation given the increased breadth of available elective opportunities and potential impact on resident education and well-being.

Table 1. Elective rotations including location and description of away electives.

	Pre-director[a]	Post-director[b]
Local	Clinical decision unit/observation	Orthopedics
	Emergency medical services	Sports medicine
	Medical education	
	Post-cardiac arrest service	
	Research	
	Toxicology	
	Ultrasound	
Domestic Away	Honolulu, Hawaii	Anchorage, Alaska
	Emergency medicine	Emergency medicine
		Native American medical care
		Block Island, Rhode Island
		Island medicine
		Rural medicine
		Denver, Colorado
		Wilderness medicine
		Medical education
		Telluride, Colorado
		Emergency medicine
		Wilderness medicine
		Tuba City, Arizona
		Rural medicine
		Native American medical care
International Away	Auckland, New Zealand	Cape Town, South Africa
	Emergency medicine	Emergency medicine
		Bali, Indonesia
		Medical education
		Tropical medicine
		American Samoa
		Emergency medicine
		Tropical medicine

[a]Electives offered prior to establishing director position.
[b]Electives added after establishing director position based on resident interest.

Address for Correspondence: Adam J. Janicki, MD, University of Pittsburgh School of Medicine, Department of Emergency Medicine, 230 McKee Pl, Pittsburgh, PA 15213. Email: janickiaj@upmc.edu.

REFERENCES

1. Hayden SR, Valderrama CM, Xu M, et al. Development of an international elective in an emergency medicine residency. *J Emerg Med*. 2016;50(1):153-8.
2. Gottlieb M, Arno K, Kuhns M, et al. Distribution of clinical rotations among emergency medicine residency programs in the United States. *AEM Educ Train*. 2018;2(4):288-92.
3. Hansoti B, Douglass K, Tupesis J, et al. Guidelines for Safety of Trainees Rotating Abroad: Consensus Recommendations from the Global Emergency Medicine Academy of the Society for Academic Emergency Medicine, Council of Emergency Medicine Residency Directors, and the Emergency Medicine Residents' Association. *Acad Emerg Med*. 2013;20(4):413–20.

4. Drain P, Primack A, Hunt D,et al. Global health in medical education: a call for more training and opportunities. *Acad Med.* 2007;82(3):226–30.

5. Lenhard W, Lenhard A. (2016). Calculation of Effect Sizes. Available at: https://www.psychometrica.de/effect_size.html. Dettelbach (Germany): Psychometrica.

6. Cohen J. (1988). Statistical power analysis for the behavioral sciences (2nd Edition) Hillsdale, NJ: Erlbaum.

A Roadmap for the Student Pursuing a Career in Pediatric Emergency Medicine

Aaron N. Leetch, MD
Joshua A. Glasser, MD
Dale P. Woolridge, MD, PhD

The University of Arizona College of Medicine, Department of Emergency Medicine and Pediatrics, Tucson, Arizona

Introduction: Three pathways are available to students considering a pediatric emergency medicine (PEM) career: pediatric residency followed by PEM fellowship (Peds-PEM); emergency medicine residency followed by PEM fellowship (EM-PEM); and combined EM and pediatrics residency (EM&Peds). Questions regarding differences between the training pathways are common among medical students. We present a comparative analysis of training pathways highlighting major curricular differences to aid in students' understanding of these training options.

Methods: All currently credentialed training programs for each pathway with curricula published on their websites were included. We analyzed dedicated educational units (EU) core to all three pathways: emergency department (ED), pediatric-only ED, critical care, and research. Minimum requirements for primary residencies were assumed for fellowship trainees.

Results: Of the 75 Peds-PEM, 34 EM-PEM, and 4 EM&Peds programs screened, 85% of Peds-PEM and EM-PEM and all EM&Peds program curricula were available for analysis. Average Peds-PEM EUs were 20.4 EM, 20.1 pediatric-only EM, 5.8 critical care, and 9.0 research. Average EM-PEM EUs were 33.2 EM, 18.3 pediatric-only EM, 6.5 critical care, and 3.3 research. Average EM&Peds EUs were 26.1 EM, 8.0 pediatric-only EM, 10.0 critical care, and 0.3 research.

Conclusion: All three pathways exceed pediatric-focused training required for EM or pediatric residency. Peds-PEM has the most research EUs, EM-PEM the most EM EUs, and EM&Peds the most critical care EUs. All prepare graduates for a pediatric emergency medicine career. Understanding the difference in emphasis between pathways can inform students to select the best pathway for their own careers. [West J Emerg Med. 2020;21(1):12-17.]

INTRODUCTION

Many physicians have elected to pursue career pathways focused on the care of children in the emergency setting. Focused training toward such a profession began in a non-accredited format in the early 1980s.[1] In 1987, the American Board of Emergency Medicine (ABEM) and the American Board of Pediatrics (ABP) published guidelines to combined training in their two specialties. Later, the ABP developed a pediatric emergency medicine (PEM) fellowship-training track with ABEM participation, and the first sub-board certification exam was offered in 1992. As a result, there are three distinct training pathways available to medical students considering a career in pediatric emergency medicine (EM): a three-year pediatric residency followed by a three-year PEM fellowship (Peds-PEM); a three- to four-year EM residency followed by a two-year PEM fellowship (EM-PEM); and a five-year combined EM and pediatrics residency (EM&Peds). All three pathways provide pediatric emergency care training in excess of what is required by the Accreditation Council for Graduate Medical Education (ACGME) training guidelines for both EM and pediatric residencies.[2-4] Peds-PEM and EM-PEM pathways were established in the 1990s by the ABP

in conjunction with ABEM. EM&Peds guidelines were first described in a joint position statement by ABEM and ABP originally published in 1987 and were recently updated in 2016.[5-6] The specific requirements for Peds-PEM, EM-PEM and EM&Peds are detailed in Table 1.

Residency and fellowship programs are given autonomy by the ACGME to design their curricula in accordance with the resources of their institutions and the needs of their residents or fellows within approved training guidelines.[2-6] All pathways impart pediatric emergency care expertise but with differences in core training content that lead to a variation in clinical practice. Given the five-to-six-year training commitment, it is crucial that medical students considering a career in pediatric EM understand the nuances of each pathway prior to the National Resident Matching Program submission deadlines. We present a curriculum analysis that aims to elucidate the different clinical trajectories of each pathway and aid in appropriate selection for the individual student's career goals.

METHODS

We obtained a list of currently credentialed Peds-PEM, EM-PEM, and EM&Peds programs from the ACGME website in January 2018. Each program's curriculum was obtained from its official website. Programs with insufficient curriculum or no curriculum posted on their websites were excluded. We analyzed dedicated educational units (EU) regarding time spent in the emergency department (ED) (adult or not specified between adult & pediatric), pediatric-only ED, critical care (including adult medical, trauma, pediatric, and neonatal), and research. These were chosen as they are the most common for comparison purposes and make up the

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Educational Research Capsule Summary

What do we already know about this issue?
There are three pathways toward a career in pediatric emergency medicine (EM), each with its own strengths and limitations.

What was the research question?
What are the differences between pediatric EM training pathways that students pursuing this career should understand?

What was the major finding of the study?
The curriculum of each pathway with their noted strengths can be used to guide students toward their ultimate desired careers.

How does this improve population health?
Students can identify their career path early in their training toward future careers focused on the care of children in the emergency setting.

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majority of EUs in each of the three pathways. The ACGME considers 12-month/year and 13-block/year EUs to be equivalent. EUs split between two experiences were assigned 0.5 EU to each area. Results were averaged for each of the three training pathways.

Table 1. Accreditation Council for Graduate Medical Education (ACGME) curricular requirements for pediatric emergency medicine pathways.

Pathway	Required EUs per ACGME Guidelines	
EM&Peds	General pediatric requirements: • 3 pediatric emergency department and acute illness • 1 developmental-behavioral • 1 adolescent medicine • 1 term newborn • 5 inpatient pediatrics • 2 ambulatory experiences • 2 neonatal intensive care • 2 pediatric intensive care • 7 pediatric subspecialty	Emergency medicine requirements: • 4 critical care • 5 pediatric emergency department
Peds-PEM	General pediatrics requirements as above plus: • 12 pediatric-only emergency department • 4 adult emergency medicine, including 1 adult trauma, 1 emergency medical services, • 1 toxicology	
EM-PEM	General emergency medicine requirements as above plus: • 12 pediatric-only emergency department • 4 pediatric training; including 1 ambulatory pediatrics, 1 care of critically ill neonates, 1 care of critically ill children	

EU, educational units defined as 1 month or 1 block in a 13-block/year schedule; *Peds-PEM*, pediatrics-pediatric emergency medicine fellowship; *EM-PEM*, emergency medicine-pediatric emergency medicine; *EM&Peds*, combined emergency medicine and pediatrics residency.

Peds-PEM and EM-PEM graduates were assumed to have fulfilled the minimum ACGME-required EUs during their primary residency and these were added to each fellowship's totals prior to averaging. These include three EU pediatric-only ED and four EU critical care required to complete a pediatric residency, and five EU pediatric ED and four EU critical care required to complete an EM residency. Dedicated EUs spent in the ED for primary EM residents were assumed to be 21.8 based on the mean number for three-year EM residencies published in 2015 by Stowell et al.[7] We used Google Sheets (Google, Mountain View, CA) to tabulate and average the totals.

RESULTS

We identified a total of 113 active programs from the ACGME website (75 Peds-PEM; 34 EM-PEM; 4 EM&Peds). Of these, 64 Peds-PEM (85%) programs, 29 EM-PEM (85%), and 4 Peds-EM (100%) had published curricula on their official websites and were included. Results are tabulated in Table 2.

The EM-PEM training track demonstrated the most overall dedicated ED EUs (35.4) followed by EM&Peds (26.1) and Peds-PEM (20.4). Peds-PEM graduates have the most dedicated pediatric-only ED EUs (20.1) followed by EM-PEM (18.3) and EM&Peds (8.0). EM&Peds graduates have the most dedicated critical care EUs (10) followed by EM-PEM (6.5) and Peds-PEM (5.8). Peds-PEM graduates have the most dedicated research EUs (9.0) followed by EM-PEM (3.3), and EM&Peds (0.3).

DISCUSSION

As all three pathways offer pediatric emergency training beyond what the primary residencies of EM or pediatrics offer, it is the route taken that will most affect the ultimate career options. The overlapping strengths of each provide an environment for the graduates of each training pathway to gain sufficient experience in both acute and critical care of the pediatric patient. The strengths and potential limitations of each pathway are highlighted in Table 3.

Pediatrics-Pediatric Emergency Medicine Pathway

The Peds-PEM pathway offers the most overall training in pediatrics with a foundation of ambulatory and inpatient care in the primary residency followed by specialty training in pediatric emergency care during the fellowship. This requires both a residency and a fellowship match. The Peds-PEM route aims to train pediatricians first and then focus them into pediatric emergency physicians through a large amount of time spent in the pediatric ED with a targeted exposure to adult EM as required by the ACGME. There is a heavy focus on dedicated research time compared to the other pathways. Peds-PEM graduates are eligible for the PEM sub-boards co-sponsored by ABEM and ABP. The clinical scope of Peds-PEM is limited to patients <21 years of age, making children's hospitals or EDs with a high pediatric volume the ideal career for these graduates. However, these age limits are noted to be arbitrary and 21 years is not a firm limit.[8] Still, much of adult EM will be outside the scope of training and hospital privileges afforded to Peds-PEM graduates. Peds-PEM duration of training is six years without variation as described by the ACGME program requirements for PEM fellowships.[4]

Emergency Medicine-Pediatric Emergency Medicine Pathway

The EM-PEM pathway offers the most overall training in EM with a foundation of emergency and critical care in the primary residency followed by specialty training in pediatric emergency care during the fellowship. This requires both a residency and a fellowship match. The EM-PEM route aims to train emergency physicians first and then to focus them into pediatric emergency physicians through dedicated pediatric ED time and some subspecialty pediatrics. EM-PEM graduates are eligible for the PEM sub-boards co-sponsored by the ABP and the ABEM. The clinical scope of EM-PEM is all ages, although they are limited to an ED practice setting without the potential for pediatric ambulatory or inpatient medicine. EM-PEM duration of training is between five and six years. This is variable as students may choose to pursue a three- or four-year EM primary residency prior to their two-year fellowship.

Emergency Medicine and Pediatrics Pathway

The EM&Peds pathway offers the broadest training of all pathways with complete training in both general pediatrics and emergency medicine. This requires only a residency match. The EM&Peds route aims to simultaneously train emergency physicians and general pediatricians, resulting in pediatric emergency physicians. Although this pathway has the

Table 2. Results of average educational units (EU) in each pathway according to published curricula.

Pathway	Peds-PEM (n=64)	EM-PEM (n=29)	EM&Peds (n=4)
Total ED	20.4 (17 – 34)	35.4 (32.8 – 40.8)	26.1 (23.5 – 31.5)
Pediatric-only ED	20.1 (16 – 31)	18.3 (14 – 22)	8.0 (6 – 10)
Critical care	5.8 (4 – 8)	6.5 (4 –9)	10.0 (8 – 12)
Research	9.0 (1 – 15)	3.3 (1 – 8)	0.3 (0 – 1)

Peds-PEM, pediatrics-pediatric emergency medicine fellowship; *EM-PEM*, emergency medicine-pediatric emergency medicine; *EM&Peds*, combined emergency medicine and pediatrics residency; *ED*, emergency department.

Table 3. Strengths and potential limitations of training pathways in pediatric emergency medicine.

Characteristics	Peds-PEM	EM-PEM	EM&Peds
Duration of training	6 years	5-6 years	5 years
Training methodology	General pediatric residency with PEM fellowship	EM residency with PEM fellowship	Simultaneous EM and general pediatric residency
NRMP cycles	2	2	1
Training focus by curriculum	Research pediatric ED	General ED Pediatric ED	General pediatrics General ED Critical care
Primary board eligibility	General pediatrics	Emergency medicine	General pediatrics and emergency medicine
PEM Sub-board eligible?	Yes	Yes	No
Can care for adults?	No	Yes	Yes
Ambulatory or hospitalist potential?	Both	Neither	Both

EM, emergency medicine; *PEM*, pediatric emergency medicine; *Peds-PEM*, pediatrics-pediatric emergency medicine fellowship; *EM-PEM*, emergency medicine-pediatric emergency medicine; *EM&Peds*, combined emergency medicine and pediatrics residency; *NRMP*, National Residency Match Program.

least amount of pediatric-only ED EUs, the philosophy is to learn procedural skills and acute care principles through EM residency training and complete care of the pediatric patient through ambulatory and inpatient pediatric rotations. The result is not only an exposure to all aspects of pediatric and EM care but also a heavier focus on critical care compared to the other pathways.

EM&Peds graduates are eligible for dual board certification in both EM and general pediatrics but have not been eligible for the PEM sub-board certification since 1998. Some centers, predominately freestanding children's hospitals that care only for children, consider PEM sub-board certification a prerequisite which may be a limitation for EM&Peds graduates. However, the versatility of EM&Peds training may be a strength to centers that care for both adults and children. Many EM&Peds graduates work in academic, community, or rural centers.[9] EM&Peds graduates are trained to care for children in ED, ambulatory and inpatient settings. EM&Peds training duration is five years as set by the joint ABP and ABEM agreement.

Nuances Between Pathways

The EM&Peds physician and the Peds-PEM physician both share the primary pediatric board, allowing eligibility for additional ABP-sponsored fellowship training or shared time as a clinical pediatrician or pediatric hospitalist in addition to their EM practice. Similarly, the EM&Peds physicians and EM-PEM physician share the primary EM board allowing for EM fellowship training potential. Certainly, all of the pathways in pediatric EM provide a background for such physicians to take positions of advocacy and leadership in clinical and academic settings.[10]

There are notable differences in the number of physicians trained through each pathway. A 2006 pediatric

study referencing the Future of Pediatric Education II data revealed that at the time there were approximately 1300 ABP-certified Peds-PEM practitioners compared to only 170 ABEM-certified EM-PEM practitioners, a proportion that has likely continued to shift to less representation by EM-PEM physicians.[11] In 2007, Murray et al. also showed through a survey of PEM fellowship programs that only 5% of entering fellows had an EM primary board background.[12] More recently, 2018 ABEM data reveals that in 2017, only 40 ABEM-eligible EM-PEM physicians were enrolled in PEM fellowship programs, suggesting that only ~ 20 EM residency graduates enter PEM fellowships annually.[13]

The reasons for this are not clear, although recently the ABEM EM to PEM taskforce has sought to address this difference. One possibility is that EM graduates do not seek to be further specialized as acute care of children is already within their scope of practice.[2] Centralization of pediatric emergency care may also lead to fewer opportunities for EM-PEM graduates in community EDs, where PEM fellowship training would not necessarily be more advantageous than general EM training alone.[14] During our research we noted that there were less EM-based PEM fellowships (29) compared to pediatrics-based PEM fellowships (64). Notably, several pediatrics-based programs that published a Peds-PEM curriculum did not publish an EM-PEM curriculum.

Although possibly due to omission from their websites, PEM fellowship programs are not required to accept both pediatrics and EM candidates. This may indicate fewer available fellowship opportunities for the EM-PEM pathway compared to Peds-PEM or that EM-PEM trainees are required to complete three years at that fellowship instead of two.[15] Lastly, financial differences may contribute to this issue. PEM-fellowship trained physicians traditionally have a lower salary than general emergency physicians.[16] However,

EM&Peds graduates do report making similar salaries to that of their general EM colleages.[9] We speculate that EM-PEM graduates likely make similar salaries to EM and EM&Peds graduates given their capacity to care for adults. We also speculate that salary is more likely related to the practice setting than the training itself, although the training does in part help determine the practice setting.

There were 48 postgraduate year 1-5 candidates enrolled in EM&Peds programs in the ABEM dataset, making it the second most common pathway chosen. Still the vast majority of pediatric emergency providers are Peds-PEM, making the EM&Peds pathway less well known by comparison. More research might reveal more subtle differences between the specifics of these training pathways as regards specific procedural experience, patient volume, or other metrics.

Choosing a Pathway

What may be considered a limitation to one student may be a strength to another. An appropriate starting point may be whether the student wishes to care for adults or only children. Should students not wish to care for adults, a Peds-PEM pathway would be most suitable. If students would like to care for adults, the applicant would be directed toward either EM-PEM or EM&Peds. The difference here is eligibility for the PEM sub-boards and general pediatrics exposure for the EM&Peds graduate. EM-PEM graduates are eligible for sub-board certification, which may increase the likelihood for employment in some children's hospitals or other centers that require subspecialty certification. EM&Peds graduates are no longer eligible for sub-board certification, which can be a deterrent to certain centers. However, EM&Peds graduates have a much broader scope of practice with the potential for more varied career paths including ambulatory and hospital pediatrics to which EM-PEM graduates do not have access. This may be attractive to centers looking to employ a provider in several clinical areas or departments. Students can certainly blaze their own trail within a given pathway but should be aware and well prepared for the path ahead of them.

LIMITATIONS

Data collected is limited to only those programs with a published online curriculum. By not polling programs directly, this does give an incomplete picture and may have failed to recognize more recent developments in certain programs. However, the authors felt that this approach was similar to that of a medical student researching future career options and was thus appropriately realistic with a relatively large sample size. Confirmation and clarification from programs would increase the overall accuracy of the available data by ensuring only the most recent/updated curriculum was used, and would add more data points by including programs without a publicly published curriculum.

Longitudinal experience was not accounted for in the dataset as only dedicated EUs were included. Similarly,

many training programs also incorporate clinical shifts into elective or research time. However, dedicated EUs are what is mandated by the ACGME as well as by the ABP and ABEM for board certification and thus are a better marker of the overall goals of training programs. The exact number of dedicated EUs that Peds-PEM and EM-PEM residents do during residency was estimated. However, all graduates from accredited pediatrics or EM primary residencies are eligible for the PEM fellowship, thus making the minimum number required a reasonable estimation. To our knowledge, a central resource with this depth of analysis and information was not previously available to medical students considering their career choices.

CONCLUSION

Three training pathways lead to expertise in pediatric emergency medicine although with different career trajectories. Peds-PEM training is ideal for the student who does not wish to care for adults, although clinical career options may be limited to children's hospitals or EDs with a high enough pediatric volume to sustain the narrower scope of practice. EM-PEM and EM&Peds pathways are similar, although the lack of sub-board eligibility for EM&Peds may be a limitation for clinical careers in centers that require the sub-board certification. The curriculum of each pathway can be used to guide students toward their ultimate desired career. Understanding the characteristics of current available paths will hopefully set students up for success in future careers focused on the care of children in the emergency setting.

Address for Correspondence: Aaron N. Leetch, MD, The University of Arizona College of Medicine, Department of Emergency Medicine, PO Box 245057, Tucson, AZ 85724. Email: aleetch@aemrc.arizona.edu.

REFERENCES

1. Jaffe DM, Ludwig S, Zieserl EJ, et al. Fellowship training in pediatric emergency care. *Pediatr Emerg Care*. 1986;2(1):45-53.
2. Accreditation Council for Graduate Medical Education. Program Requirements for GME in Emergency Med - ACGME Home. Available at: https://www.acgme.org/Portals/0/PFAssets/

ProgramRequirements/110_emergency_medicine_2017-07-01.pdf. Accessed July 5, 2019.

3. Accreditation Council for Graduate Medical Education. Program Requirements for GME in Pediatrics - ACGME Home. Available at: https://www.acgme.org/Portals/0/PFAssets/ ProgramRequirements/320_pediatrics_2017-07-01.pdf. Accessed July 5, 2019.

4. Accreditation Council for Graduate Medical Education. Program Requirements for GME in Pediatric Emergency Med - ACGME Home. Available at: https://www.acgme.org/Portals/0/PFAssets/ ProgramRequirements/114_PediatricEmergencyMedicine_2019_ TCC.pdf?ver=2019-02-19-105913-690. Accessed July 5, 2019.

5. Guidelines for combined training in emergency medicine and pediatrics leading to credentialing for ABEM and ABP examinations. *Pediatr Emerg Care*. 1990;6(2):81-83.

6. Pediatrics-Emergency Medicine Program. The American Board of Pediatrics. 2018. https://www.abp.org/content/pediatrics-emergency-medicine-program. Accessed July 6, 2019.

7. Stowell JR, Vohra TT, Luber SD. Emergency medicine resident clinical hours: a national survey. *J Emerg Med*. 2015;48(4):474-80.e1-4.

8. Hardin AP, Hackell JM, Committee on Practice and Ambulatory Medicine. Age limit of pediatrics. *Pediatrics*. 2017;140(3). pii:e20172151.

9. Strobel AM, Chasm RM, Woolridge DP. A survey of graduates of combined emergency medicine–pediatrics residency programs: an update. *J Emerg Med*. 2016;51(4):418-25.

10. O'Neill J, Fox S, Kou M. Should you do a pediatric emergency medicine fellowship? 2016. Available at: https://www.aliem. com/2015/02/pediatric-emergency-medicine-fellowship/. Accessed July 6, 2019.

11. Althouse LA, Stockman JA III. Pediatric workforce: a look at pediatric emergency medicine data from the American Board of Pediatrics. *J Pediatrics*. 2006;149(5):600-2.e1.

12. Murray ML, Woolridge DP, Colletti JE. Pediatric emergency medicine fellowships: faculty and resident training profiles. *J Emerg Med*. 2009;37(4):425-9.

13. Nelson LS, Keim SM, Beeson MS, et al. American Board of Emergency Medicine Report on Residency and Fellowship Training Information (2018-2019). *Ann Emerg Med*. 2019;73(5):524-41.

14. Sacchetti A, Benjamin L, Soriano AR, et al. Should pediatric emergency physicians be decentralized in the medical community? *Pediatr Emerg Care*. 2014;30(8):521-4.

15. Abel KL, Nichols MH. Pediatric emergency medicine fellowship training in the new millennium. *Pediatr Emerg Care*. 2003;19(1):20-4.

16. Watts SH, Promes SB, Hockberger R. The Society for Academic Emergency Medicine and Association of Academic Chairs in Emergency Medicine 2009-2010 emergency medicine faculty salary and benefits survey. *Acad Emerg Med*. 2012;19(7):852-60.

Does the Medium Matter? Evaluating the Depth of Reflective Writing by Medical Students on Social Media Compared to the Traditional Private Essay Using the REFLECT Rubric

Alisha Brown, MD*
Joshua Jauregui, MD*
Jonathan S. Ilgen, MD, MCR*
Jeff Riddell, MD†
Douglas Schaad, PhD‡
Jared Strote, MD, MS*
Jamie Shandro, MD, MPH*

*University of Washington, Department of Emergency Medicine, Seattle, Washington
†Keck School of Medicine of University of Southern California, Department of Emergency Medicine, Los Angeles, California
‡University of Washington, Department of Biomedical Informatics and Medical Education, Seattle, Washington

Introduction: Social media is a novel medium to host reflective writing (RW) essays, yet its impact on depth of students' reflection is unknown. Shifting reflection on to social platforms offers opportunities for students to engage with their community, yet may leave them feeling vulnerable and less willing to reflect deeply. Using sociomateriality as a conceptual framework, we aimed to compare the depth of reflection in RW samples submitted by medical students in a traditional private essay format to those posted on a secure social media platform.

Methods: Fourth-year medical students submitted a RW essay as part of their emergency medicine clerkship, either in a private essay format (academic year [AY] 2015) or onto a closed, password-protected social media website (AY 2016). Five raters used the Reflection Evaluation for Learners' Enhanced Competencies Tool (REFLECT) to score 122 de-identified RW samples (55 private, 67 social media). Average scores on two platforms were compared. Students were also surveyed regarding their comfort with the social media experience.

Results: There were no differences in average composite REFLECT scores between the private essay (14.1, 95% confidence interval [CI], 12.0-16.2) and social media (13.7 95% CI, 11.4-16.0) submission formats (t [1,120] = 0.94, p = 0.35). Of the 73% of students who responded to the survey, 72% reported feeling comfortable sharing their personal reflections with peers, and 84% felt comfortable commenting on peers' writing.

Conclusion: Students generally felt comfortable using social media for shared reflection. The depth of reflection in RW essays was similar between the private and social media submission formats. [West J Emerg Med. 2020;21(1):18-25.]

INTRODUCTION

Reflection provides medical students with opportunities to interrogate their past experiences, puzzle over events that are mentally or emotionally troubling, process the meaning of these experiences, and engage in efforts to transform future actions or attitudes.[1,2] Instilling students with these metacognitive habits has been promoted as a way for them to gain a "greater understanding of both the self and the situation so that future encounters with the situation are informed from previous encounters."[3] Following these deliberate metacognitive exercises, students are

often prompted to share their personal reflections in the form of reflective writing (RW).[4–7] Ideally, these reflection experiences can help to transform individuals' attitudes or approaches regarding similar events in the future,[7] and these new ideas can be expressed to other community members as a means to demonstrate what they have learned.[2]

In medical education, RW narratives are typically shared from students to faculty, then returned by faculty to students with individualized feedback and perspective-sharing.[6,8] While faculty undoubtedly share valuable perspectives with students,[6,9] there are potential opportunities for learning between students that is lost in this curricular structure. Social media provides new ways to think about how reflections can create communities of practice among learners,[5,10–13] offering the potential benefits of peer mentorship, broadened perspectives,[14] and mutual support.[15–17] The conversational nature of social media may allow for more real-time, formative feedback,[11,18] which is likely to be important for deeper reflection.[6,8,19] Further, medical students may already be using social media to reflect upon their experiences outside of existing medical school curricula,[20] potentially highlighting missed opportunities for faculty to explore and enrich students' perspectives. For example, social media platforms such as FemInEM have provided meaningful spaces for reflection to occur in emergency medicine (EM) outside of the halls of academia.

Moving written reflections from the traditional private paradigm and into a social setting, however, has potential to change how this exercise is experienced by students. Deep reflection requires the learner to engage with his or her sense of self,[7] and sharing these personal essays with peers may leave students feeling vulnerable to critical peer judgment.[15] Students may thus choose to censor their deepest thoughts and offer more superficial impressions on social platforms.[10,21,22] Further, the framework of sociomateriality would suggest that humans interact with materials (ie, objects, technologies) in critical ways that impact performance and learning.[23] As such, the mere act of asking students to change the tools they use to document their experiences (eg, private word-processing document vs a social media post) may change how students approach the content, length, and depth of their RW essays.

Given the importance of reflection for medical students' ongoing professional development[23,24] and the multitude of consequences—both positive and negative—that could result from placing RW essays onto more social platforms, deliberate efforts to understand the effects of these curricular shifts are needed. As such, we were interested in knowing how changing the submission process for RW exercise from a private to a more public format would impact students' depth of reflections. Using an established scoring rubric,[25] we sought to compare the depth of reflection in RW essays submitted in a private essay format visible to preceptors only to a new format where RW essays were submitted onto an institutionally-secure social media platform.

Population Health Research Capsule

What do we already know about this issue?
The reflective writing (RW) essay is a common pedagogical tool in medical education. Social media, however, is an increasingly popular venue for physician reflections and may offer a more contemporary setting for students.

What was the research question?
Does depth of reflection change when students reflect using the traditional essay versus social media?

What was the major finding of the study?
The depth of reflection was similar between the private and social media submission formats. Students generally felt comfortable using social media for shared reflection.

How does this improve population health?
Social media may be a feasible platform to host formal RW exercises, yet issues surrounding mentorship, peer vulnerability, and topic selection should be studied further.

METHODS
Setting

This study took place within the required fourth-year emergency medicine (EM) clerkship at the University of Washington School of Medicine (UW). The majority of UW institution students complete their clinical rotation at two academic urban emergency departments (ED) in Seattle, Washington, although some students elect to rotate in one of 16 community-based clerkship sites across Washington, Wyoming, Alaska, Montana, and Idaho. Clerkship requirements were standardized across training sites. Each student was required to write a RW essay regarding a bioethical dilemma they encountered in the ED during their rotation, and to submit this reflection during week three of their four-week rotation. By way of guidance, students were provided with an RW example written by an emergency physician[26] and were given the following prompt:[9]

"There are many ethical dilemmas faced in the Emergency Department on a daily basis, such as in this clerkship bioethical reading. Pick one such situation you encountered during your EM clerkship and describe what you learned from it."

During the 2015 academic year, students submitted RW essays using Microsoft Word (Microsoft Corp., Redmond, WA)

format directly to the clerkship directors on a secure, private electronic platform (Catalyst, University of Washington, Seattle, WA). The following academic year (2016), students posted their RWs on a secure social media platform (Yammer, Microsoft Corp., San Francisco, CA), and these samples were visible to their student peers on the rotation, as well as the EM clerkship directors. To facilitate discussion and engagement, students in the 2016 cohort were required to use the online social media platform to respond to at least two of their peers' RW posts; this assignment was due before the conclusion of their rotation.

We felt that these two student cohorts with comparable preceding clerkship experiences offered an opportunity to examine how students' depth of reflection might change as a result of this curricular shift. Accordingly, we used the Reflection Evaluation for Learners' Enhanced Competencies Tool (REFLECT) described by Wald and colleagues[25] to compare the depth of reflection in RW essays submitted by the 2015 ("private essay") cohort to those who submitted their essays the following year ("social media" cohort). This study was reviewed by the UW Human Subjects Division and deemed to be exempt based upon its alignment with ongoing curricular evaluation.

Data Collection

All RW samples from June–September 2015 and June–September 2016 were collected, re-formatted onto a standardized, Word document template and anonymized by a research assistant. All identifying information referencing when or where the student completed the clerkship was removed. The research assistant then assigned a unique, non-consecutive numerical identifier to each RW. Student gender was linked to each de-identified RW in a consolidated database (Excel, OneDrive, Microsoft Corp., Redmond, WA).

Measures

Word counts were calculated for each RW to gauge differences in essay length between groups. We employed the REFLECT rubric to measure students' reflective capacity in the RW essays,[25] an instrument that has existing validity evidence in similar contexts,[27,28] and – in contrast to other tools developed for similar purposes[29,30] – permits greater granularity of assessment across different subdomains of reflection (Appendix 1).[31] The REFLECT rubric assesses five subdomains of students' depth of reflection in RW essays: writing spectrum; presence; description of conflict or disorienting dilemma; attending to emotions; and analysis and meaning making. We used working definitions of each of these categories based upon prior descriptions.[25] Consistent with past use of this tool, raters independently assigned an integer score of 1-4 for each subdomain corresponding to the anchors of "non-reflective," "thoughtful action or introspection," "reflection," and "critical reflection," respectively. We combined scores for each of the five subdomains to calculate a composite REFLECT rubric score, ranging between 5-20 for each essay.

During the rater training period described below, faculty raters described strong emotional reactions to reading RW pieces. We subsequently decided to record these reactions as a single-item general impression score for each RW essay. General impressions were rated on a three-point scale as negative, neutral, and positive (scored 0-2, respectively).

Rater Training

Past work with the REFLECT instrument has emphasized the importance of rater training,[31] with guidance that 4-5 raters, each scoring a minimum of 14 writing samples, were needed to achieve adequate inter-rater reliability (IRR).[27] In an effort to ensure sufficiently reliable faculty ratings, we trained five faculty raters (AB, JS, JS, JR, JJ), using a sample of RW essays submitted in October 2015 and 2016 (outside of our two RW study periods). Raters independently read the initial published description of the REFLECT rubric[25] and then scored two representative de-identified RW samples taken from each study cohort. Reviewers met to discuss the rubric and their scoring interpretations; subdomain definitions were subsequently clarified via email communication with the original REFLECT study authors.[32]

To ensure ongoing calibration within our team of raters, a shared document was used across raters to provide clarifications regarding how scores should be applied for each item. Raters then independently coded 10 RW pieces, met to discuss scoring and resolve discrepancies, and again amended the scoring description document. This calibration process was completed twice, for a total of 22 writing samples over three meetings. IRR, as measured by intra-class correlation coefficients (ICC) for the REFLECT rubric scores was calculated sequentially during this training process. Training concluded when the IRR ICC for composite REFLECT score reached 0.80. The ICCs for each subdomain ranged from 0.57-0.86 at the conclusion of rater training (Appendix 2).

Scoring Period

Following rater training, anonymized RW essays from the 2015 and 2016 enrollment periods were randomly intermixed and sent to reviewers in batches of 25 at timed intervals. Reviewers were blinded to all student characteristics (gender, location of rotation, timing of rotation, essay submission format). Five trained faculty raters independently scored all RW samples and entered scores (REFLECT and general emotional impression) using Google Forms (Alphabet Corp., Mountain View, CA) into an online database. Raters were blinded to each other's scores, although they met at the approximate halfway point of the study (50 samples) to discuss scoring challenges and improve calibration. To ensure that the reflective writing sample[26] provided as a prompt to students was illustrative of a "highly reflective" essay, this sample was randomly inserted into the essays scored by three authors unfamiliar with the essay. This essay received an average REFECT score of 19.5 out of 20.

Post-clerkship Survey

A 12-question electronic survey was developed to gauge students' perceptions and comfort using the social media platform during the 2016 AY. We developed this survey instrument using guiding principles from Messick's framework for validity evidence[33] and survey design best practices.[34] Survey questions were developed by the study author (AB), drawing from prior work exploring the feasibility of using a social media platform to share reflection,[5] and then reviewed and revised by five of the authors (AB, JS, JS, JR, JJ). We pilot-tested the survey with four fourth-year medical students (two male, two female) who were not involved in the study, and used a talk-aloud exercise to gather response process validity evidence. Survey questions were revised to ensure clarity. The finalized survey of nine multiple choice and three free-response questions (Appendix 3) was administered in electronic format at the conclusion of the clerkship to all rotating students between June–September 2016. Results were anonymized by the clerkship coordinator, and data were analyzed in aggregate.

Analyses

Each anonymized RW sample was scored independently by five faculty raters (AB, JS, JS, JR, JJ). REFLECT rubric composite and subdomain scores and general impression scores for each essay were averaged across raters. IRR for the REFLECT composite score, each REFLECT subdomain, and the overall general impression score were calculated using Shrout and Fleiss (2,k) ICCs,[35] which reflect the reliability of the average score across the five raters (the equivalent of Cronbach's alpha). We classified these IRR ICCs using criteria proposed by Landis and Koch as fair (ICC values: 0.21– 0.4), moderate (ICC values: 0.41– 0.6), substantial (ICC values 0.61– 0.8)[36] and include 95% confidence interval (CI). We used descriptive statistics to summarize average composite and subdomain REFLECT scores as well as general impression scores. Average word counts and average REFLECT and general impression scores across the two study periods were compared using two-tailed t-tests with 95% CI; an alpha of 0.05 was considered significant. We correlated average REFLECT composite and general impression scores using Pearson correlation coefficients with 95% CI. We classified correlation coefficients as small (0.10– 0.29), moderate (0.30–0.49) and large (≥0.50) using thresholds proposed by Cohen.[37] We used IBM-SPSS Statistics V24 (IBM Corp., Armonk, NY) to perform all analyses.

RESULTS

A total of 122 RW essays were scored independently by five trained faculty raters: 55 submitted on the private platform and 67 on the social media platform. The demographics of these two student cohorts and average word counts are shown in Table 1. Essay length for the private submission format (480 words, 95% CI, 380-580) was, on average, 14 words longer than those submitted using the social media platform (466 words, 95% CI, 349-582), but this difference was not statistically significant (t

[120] = 0.72, p = 0.47). There were no significant differences in word count between genders within the private (p = 0.98) and social media (p = 0.41) submission cohorts.

The five-rater ICC (alpha) for the REFLECT rubric composite scores was substantial (ICC 0.80), as were the ICCs within each of the REFLECT rubric subdomains (ICC range 0.68-0.80). IRR of the general impression was moderate (ICC 0.55). Average overall REFLECT rubric composite scores ranged from 6–20 in the private group and 5–20 in the social media group. There were no significant differences between the composite REFLECT score from the private-submission cohort (14.1, 95% CI 12.0-16.20) and social media (13.7, 95% CI (11.4-16.0) cohorts (t[120] = 0.944, p = 0.35). There were no significant between-group differences in the average scores within each of the five REFLECT rubric subdomains (see Table 2). There were no significant differences in average scores by gender across the entire collection of essays or within each of the two essay submission format cohorts

Average overall rater general impression scores were not significantly different between the private (1.04, 95% CI 0.7-1.4) and social media (0.98, 95% CI 0.6-1.3) submission cohorts (see Table 2). Looked at individually, there was no statistical difference for any subdomain with exception of presence. There was a large degree of correlation between raters' REFLECT composite and average general impression scores (r = 0.60, p<0.001).

Survey results

Fifty of 67 students (74.6%) in the social media cohort completed the post-rotation survey (Figure 1). Most students felt comfortable sharing their reflections with peers (72%) and commenting on their peers' reflections (84%). While 62% of

Table 1. Characteristics of 122 medical student essays submitted in 2015 and 2016 via a traditional, private essay format or social media platform, respectively.

	Private (n=55)	Social media (n=67)	t-value (P value)[a]
Number of essays (% women)	30 (55%)	34 (51%)	
Word count (95% CI)	480 (380-580)	466 (349-582)	t(120)=0.72, p=0.47
Gender Subgroup Analysis			
Word count - women (95% CI)	480 (387-574)	477 (360-595)	
Word count - men (95% CI)	480 (371-588)	454 (337-570)	
t-value (P value)[a]	t(53)=0.03, p=0.98	t(65)= 0.84, p=0.41	

CI, confidence interval; *t*, t-value; *p*, p value.
[a]Significance calculated by comparing private and social media submission using two-tailed t tests with 95% confidence intervals.

Table 2. Mean composite and subdomain scores for the REFLECT rubric and average general impression scores for 122 medical student essays submitted in 2015 and 2016 via a traditional, private, essay format or social media platform, respectively.

	Private Cohort Scores (95% CI)	Social Media Cohort Scores (95% CI)	t-value (P value)[b]
Mean REFLECT Composite Scores (IRR 0.80)	14.1 (12.0-16.2)	13.7 (11.4-16.0)	t(1,120)= 0.94, (p=0.35)
Mean REFLECT Subdomain Scores			
Writing spectrum (IRR 0.73)	2.97 (2.5-3.5)	2.95 (2.4-3.5)	t=0.27 (p=0.79)
Presence (IRR 0.80)	3.12 (2.5-3.8)	2.86 (2.3-3.4)	t=2.36 (p=0.02)
Description of disorienting dilemma (IRR 0.68)	2.98 (2.5-3.4)	3.02 (2.5-3.5)	t=-0.44 (p=0.66)
Attention to emotion (IRR 0.79)	2.28 (1.6-2.9)	2.22 (1.5-2.9)	t=0.50 (p=0.62)
Analysis & meaning making (IRR 0.73)	2.73 (2.3-3.1)	2.67 (2.1-3.2)	t=0.75 (p=0.45)
Mean General Impression Scores (IRR 0.55)	1.04 (0.7-1.4)	0.98 (0.6-1.3)	t=1.03 (p=0.31)

CI, confidence interval; *t*, t-value; *p*, p value.
The five Reflection Evaluation for Learners' Enhanced Competencies Tool (REFLECT) subdomains were scored from 1-4 with a maximum composite score of 20, while general Impressions were scored on a three- point scale (0-2).
[a]The inter-rater reliability (IRR) for five faculty raters was calculated using intraclass correlation coefficients.
[b]Significance was calculated by comparing private and social media scores using two-tailed t tests.

students reported that submitting RW samples on social media prompted them to think more deeply about the bioethical challenges they faced, 20% of students reported changing the content of their essays in response to knowing that peers would be reading their reflections. Ten percent of respondents felt that having a password-protected online community would *not* be a valuable resource for them to share reflections and receive input from peers (50% agreed, 40% neutral). Subgroup analysis revealed no differences in survey results between students who regularly used social media in their personal lives compared to those who did not.

DISCUSSION

Acts of reflection are conceptualized as deeply personal endeavors.[2,7] Sharing personal reflective writing exercises in social spaces has the potential to foster community and shared learning among peers,[10,13] although the act of sharing risks that students may censor their personal narratives to avoid exposing their deepest feelings with others.[10,21,22] Despite these potential influencing factors, our study demonstrated no significant differences in the overall depth of reflection or essay lengths among fourth-year student essays who submitted under private and social formats. Survey results from students who used the social media platform suggest that most felt comfortable sharing their personal reflections and commenting on reflections written by their peers, although it does appear this curricular shift impacted these students in ways that need further exploration.

Integration with prior work and implications for future research

The lens of sociomaterality enables deliberate consideration of the consequences of introducing a new material or technology,[23] by exploring how the interplay between the user and the object come together.[38] This bi-directional interaction

between technology and the social person changes interpersonal connections, impacts organizational structures, and shapes the work that these individuals produce.[23,38,39] In the context of our curricular shift, we would consider the social media platform as more than an inert technology that passively hosts RW assignments; instead, it becomes an instrument with potential to fundamentally change the practice of reflection itself.

While our study did not show significant differences in the overall depth of reflection as scored by the REFLECT rubric, 20% of our students reported modifying their essay content in consideration of peer viewing. While the majority felt comfortable sharing their essays, it is notable that nearly a third of students felt neutral or uncomfortable with this experience. These findings may suggest that some students would generally prefer to keep their reflections private, although the findings could also align with past research demonstrating the complexity of student peer-to-peer relationships that oscillate between support and judgment.[15] Did students change their essays because their reflections identified nuances of a case that they had overlooked in the moment? Were there certain topics that inspired new ideas or resonated with individual experiences? Were there certain topics that student felt "safe" or "not-safe" discussing? All of these issues may have influenced the depth and topic choice in complex ways that are not captured in the net neutral effects on the two groups' average REFLECT scores. A deeper exploration of students' lived experiences under each of the submission formats would help to elaborate how they balanced these competing tensions.

There are many opportunities to explore how a shift toward making RW exercises more "public" might impact reflection, particularly how faculty input might change students' experiences of sharing in these new social settings. Faculty feedback is especially critical for learners for whom reflection does not come easily,[3,10,40] and effective reflection requires cultivation
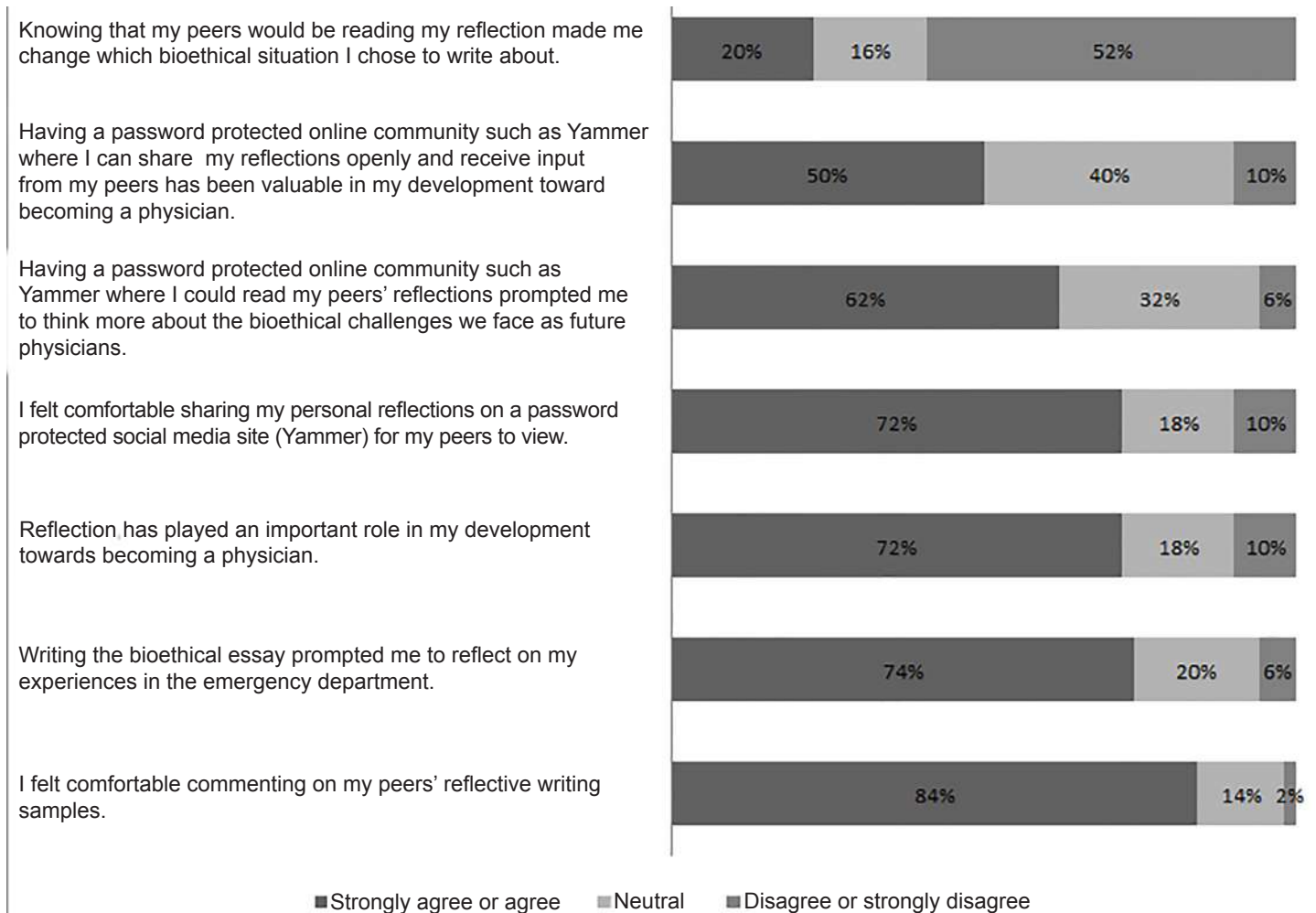
Figure 1. Survey results regarding students' perceptions and comfort using a social media platform from a study evaluating the depth of reflective writing by medical students on social media compared to the traditional private essay using the REFLECT rubric, 2016.
[a]Reflection Evaluation for Learners' Enhanced Competencies Tool (REFLECT).

and mentorship.[41] Students in our social media group shared and received feedback with peers without a faculty moderator, and the addition of faculty input might have helped these students capitalize on the conversational advantages of this learning platform.[41,42] More regular mentorship on a social media platform may help students recognize the ways in which reflection impacts their personal experiences and the experiences of their peers,[3] and could help students work toward deeper reflection through formative feedback.[43] Yet it remains possible that the presence of a faculty moderator in these types of online social forums could also add performance expectations that cause students to withhold particularly sensitive or personally-unflattering disclosures. A richer understanding of how a social media moderator might impact these types of reflective exercises is needed.

By allowing reflections to be visible to peers, many students reported that they continued to engage in reflection about bioethical dilemmas beyond their assigned essay exercise. Although our survey question did not prompt students to distinguish whether their ongoing reflection pertained to the content in their own RW exercise or to RW essays posted by their peers, this finding offers promise. It is quite possible that setting expectations for shared reflection on social media among a community of students and faculty will prompt broader and more regular opportunities for participants to consider and reconsider their challenging professional experiences. The ways that these forms of ongoing shared reflection impact individual members of a community warrant deeper exploration.

LIMITATIONS

This was a single-center study evaluating a single, reflective-writing sample per student, which limits generalizability. Further, the REFLECT rubric was designed for formative rather than summative evaluation, and thus total scores at a single time point may not accurately reflect students' growth of reflective capacity.[42,43] While we used mean REFLECT performance metrics as a means to understand performance differences between groups in the context of our curricular shift, this does not fully capture the individualized experiences of our students.

Because our RW was a required clerkship assignment, there may also be a component of performance bias in which students write for approval from their clerkship directors or peers.[44] That said, the majority of students in the social media group reported that this exercise caused them to reflect, and the assignment was ungraded. For these reasons, we are hopeful that this mitigated these concerns of students "performing" at the expense of true reflection. Finally, it is possible that the rubric itself was not sensitive enough to detect a difference in reflective depth. Two of the rubric domains (ie, "presence" and "analysis and meaning making") had anchors that were subjective or not well defined, which may explain our lower inter-rater ICC during the study period compared to other studies using the REFLECT rubric.[27] That said, we used a robust rater-training program and followed pre-existing recommendations for scoring to achieve adequate inter-rater reliability. Our raters' mean general impressions correlated with mean REFLECT rubric scores, suggesting that these two tools were measuring similar constructs related to faculty members' impressions of students' reflections.

CONCLUSION

Average mean depth of student reflection, as measured by the REFLECT rubric, does not change when students submit reflective-writing essays onto a social media platform compared to submissions sent privately to clerkship directors. While issues of mentorship, peer vulnerability, and topic selection offer opportunities for future exploration, most students feel comfortable sharing reflections and receiving feedback from peers on social media, suggesting this new educational format has potential for future curricula.

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Address for Correspondence: Alisha Brown, MD, University of Washington School of Medicine, Harborview Medical Center, Department of Emergency Medicine, 325 9th Ave., Box #359702, Seattle, WA 98104-2499. Email: aecbrown@uw.edu.

REFERENCES

1. Mann K, Gordon J, MacLeod A. Reflection and reflective practice in health professions education: a systematic review. *Adv Health Sci Educ Theory Pract*. 2009;14(4):595-621.

2. Wear D, Zarconi J, Garden R, et al. Reflection in/and writing: pedagogy and practice in medical education. *Acad Med*. 2012;87(5):603-9.

3. Sandars J. The use of reflection in medical education: AMEE Guide No. 44. *Med Teach*. 2009;31(8):685-95.

4. Song P, Stewart R. Reflective writing in medical education. *Med Teach*. 2012;34(11):955-6.

5. Bernard AW, Kman NE, Bernard RH, et al. Use of a secure social media platform to facilitate reflection in a residency program. *J Grad Med Educ*. 2014;6(2):326-9.

6. Wald HS, Reis SP. Beyond the margins: reflective writing and development of reflective capacity in medical education. *J Gen Intern Med*. 2010;25(7):746-9.

7. Wald HS, White J, Reis SP, et al. Grappling with complexity: medical students' reflective writings about challenging patient encounters as a window into professional identity formation. *Med Teach*. 2019;41(2):152-60.

8. Coulehan J, Granek IA. Commentary: "I Hope I'll Continue to Grow": rubrics and reflective writing in medical education. *Acad Med*. 2012;87(1):8-10.

9. Charon R, Hermann N. Commentary: a sense of story, or why teach reflective writing? *Acad Med*. 2012;87(1):5-7.

10. Chretien K, Goldman E, Faselis C. The reflective writing class blog: using technology to promote reflection and professional development. *J Gen Intern Med*. 2008;23(12):2066-70.

11. Cheston CC, Flickinger TE, Chisolm MS. Social media use in medical education: a systematic review. *Acad Med*. 2013;88(6):893-901.

12. Gunawardena CN, Hermans MB, Sanchez D, et al. A theoretical framework for building online communities of practice with social networking tools. *EMI Educ Media Int*. 2009;46(1):3-16.

13. Wenger E. (1999).*Communities of Practice: Learning, Meaning, and Identity*. Cambridge, United Kingdom: Cambridge University Press.

14. McGee JB, Begg M. What medical educators need to know about "Web 2.0." *Med Teach*. 2008;30(2):164-9.

15. Lovell B. "We are a tight community": social groups and social identity in medical undergraduates. *Med Educ*. 2015;49(10):1016-27.

16. Hu YY, Fix ML, Hevelone ND, et al. Physicians' needs in coping with emotional stressors: the case for peer support. *Arch Surg*. 2012;147(3):212-7.

17. Huang HY. Examining the beneficial effects of individual's self-disclosure on the social network site. *Comput Human Behav*. 2016;57(C):122-32.

18. Brown AD. Social media: a new frontier in reflective practice. *Med Educ*. 2010;44(8):744-5.

19. Armstrong GW, Wald HS. Fostering reflective capacity with interactive reflective writing in medical education: using formal analytic frameworks to guide formative feedback to students' reflective writing. *Med Teach*. 2013;35(3):258.

20. Chretien KC, Goldman EF, Beckman L, et al. It's your own risk: medical

students' perspectives on online professionalism. *Acad Med*. 2010;85(10 Suppl):S68-S71.

21. Shaughnessy AF, Duggan AP. Family medicine residents' reactions to introducing a reflective exercise into training. *Educ Health*. 2013;26(3):141-6.

22. Vivekananda-Schmidt P, Marshall M, Stark P, et al. Lessons from medical students' perceptions of learning reflective skills: a multi-institutional study. *Med Teach*. 2011;33(10):846-50.

23. Fenwick T. Sociomateriality in medical practice and learning: attuning to what matters. *Med Educ*. 2014;48(1):44-52.

24. Borgstrom E, Morris R, Wood D, et al. Learning to care: medical students' reported value and evaluation of palliative care teaching involving meeting patients and reflective writing. *BMC Med Educ*. 2016;16(1):306.

25. Wald HS, Borkan JM, Taylor JS, et al. Fostering and evaluating reflective capacity in medical education: developing the REFLECT rubric for assessing reflective writing. *Acad Med*. 2012;87(1):41-50.

26. Strote J. When in doubt. *Ann Emerg Med*. 2012;59(1):75.

27. Moniz T, Arntfield S, Miller K, et al. Considerations in the use of reflective writing for student assessment: issues of reliability and validity. *Med Educ*. 2015;49(9):901-8.

28. Ottenberg AL, Pasalic D, Bui GT, et al. An analysis of reflective writing early in the medical curriculum: the relationship between reflective capacity and academic achievement. *Med Teach*. 2016;38(7):724-9.

29. Plack MM, Driscoll M, Blissett S, et al. A method for assessing reflective journal writing. *J Allied Health*. 2005;34(4):199-208.

30. Devlin MJ, Mutnick A, Balmer D, et al. Clerkship-based reflective writing: a rubric for feedback. *Med Educ*. 2010;44(11):1143-4.

31. Miller-Kuhlmann R, O'Sullivan PS, Aronson L. Essential steps in developing best practices to assess reflective skill: A comparison of two rubrics. *Med Teach*. 2016;38(1):75-81.

32. Shmuel Reis. Personal e-mail communication. October 28, 2016.

33. Messick S. Standards of validity and the validity of standards in performance asessment. *EM:IP*. 2005;14(4):5-8.

34. Magee C, Rickards G, A Byars L, et al. Tracing the steps of survey design: a graduate medical education research example. *J Grad Med Educ*. 2013;5(1):1-5.

35. Shrout PE, Fleiss JL. Intraclass correlations: uses in assessing rater reliability. *Psychol Bull*. 1979;86(2):420-8.

36. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics*. 1977;33(1):159-74.

37. Lachenbruch PA, Cohen J. Book reviews: *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). *J Am Stat Assoc*. 1989;84(408):1096.

38. MacLeod A, Kits O, Whelan E, et al. Sociomateriality: a theoretical framework for studying distributed medical education. *Acad Med*. 2015;90(11):1451-6.

39. Goldszmidt M. When I say … sociomateriality. *Med Educ*. 2017;51(5):465-66.

40. Wald HS, Davis SW, Reis SP, et al. Reflecting on reflections: enhancement of medical education curriculum with structured field notes and guided feedback. *Acad Med*. 2009;84(7):830-7.

41. Dekker H, Schönrock-Adema J, Snoek JW, et al. Which characteristics of written feedback are perceived as stimulating students' reflective competence: an exploratory study. *BMC Med Educ*. 2013;13:94.

42. Aronson L. Twelve tips for teaching reflection at all levels of medical education. *Med Teach*. 2011;33(3):200-5.

43. Reis SP, Wald HS, Monroe AD, et al. Begin the BEGAN (The Brown Educational Guide to the Analysis of Narrative) - a framework for enhancing educational impact of faculty feedback to students' reflective writing. *Patient Educ Couns*. 2010;80(2):253-9.

44. Embo MP, Driessen E, Valcke M, et al. Scaffolding reflective learning in clinical practice: a comparison of two types of reflective activities. *Med Teach*. 2014;36(7):602-7.

What's All the Chatter? A Mixed-Methods Analysis of Emergency Physicians' Tweets

Jeff Riddell, MD*
Alisha Brown, MD†
Lynne Robins, PhD‡
Rafae Nauman, BA§
Jeanette Yang, BA¶
Joshua Jauregui, MD†

*University of Southern California Keck School of Medicine, Department of Emergency Medicine, Los Angeles, California
†University of Washington, Department of Emergency Medicine, Seattle, Washington
‡University of Washington, Department of Biomedical Informatics and Medical Education, Seattle, Washington
§University of Nevada, Las Vegas School of Medicine, Las Vegas, Nevada
¶University of Washington, Department of Surgery-Surgical Outcomes Research Center, Seattle, Washington

Introduction: Twitter is growing in popularity and influence among emergency physicians (EP), with over 2200 self-identified EP users. As Twitter's popularity has increased among EPs so too has its influence. While there has been debate about the value of Twitter as an effective educational delivery tool, little attention has been paid to the nature of the conversation occurring on Twitter. We aim to describe how influential EPs use Twitter by characterizing the language, purpose, frequencies, content, and degree of engagement of their tweets.

Methods: We performed a mixed-methods analysis following a combined content analysis approach. We conducted qualitative and quantitative analyses of a sample of tweets from the 61 most influential EPs on Twitter. We present descriptive tweet characteristics and noteworthy themes.

Results: We analyzed 1375 unique tweets from 57 unique users, representing 93% of the influential Twitter EPs. A majority of tweets (1104/1375, 80%) elicited some response in the form of retweets, likes, or replies, demonstrating community engagement. The qualitative analysis identified 15 distinct categories of tweets.

Conclusion: Influential EPs on Twitter were engaged in largely medical conversations in which most messages generated some form of interaction. They shared resources and opinions while also building social rapport in a community of practice. This data can help EPs make informed decisions about social media engagement. [West J Emerg Med. 2020;21(1)26-32.]

INTRODUCTION

Twitter is a social media platform that allows individuals to communicate through short, 280-character messages that are accessible to the public. Twitter has grown in popularity and influence among emergency physicians (EP) with over 2200 self-identified users in 2013.[1] More than a quarter of emergency medicine (EM) faculty now use Twitter.[2] EPs use Twitter for both formal and informal reasons including discussing clinical cases, collaborating on and disseminating research, advocating for patients, participating in journal clubs, promoting educational messages from national conferences, and providing feedback to learners.[3–9] Some have even suggested that Twitter has facilitated the formation of virtual communities of practice among its users.[10,11]

As Twitter's popularity has increased among EPs so too has its educational influence.[12] While there has been debate about the value of Twitter as an effective educational delivery tool, little attention has been paid to the nature of the conversation occurring

on Twitter.[12–17] As the clinical and academic interaction among EPs continues to grow on social media platforms, a more robust understanding of the characteristics of these interactions can help provide a framework for conscientious EPs to consider whether Twitter represents a platform for meaningful communication among a professional digital community of practice or simply a "insubstantive fragmented" stream of "doubtful significance."[15,17]

This study addresses this gap by analyzing the messages of influential EPs on Twitter. We sought to describe the current state of Twitter usage among EPs by exploring the tweets of influential EPs. A deep exploration of the language, frequencies, domains, and degrees of engagement of their messages can provide a contextualized understanding of the real-life Twitter experience, allowing faculty and trainees to make mindful decisions about social media participation.

Objective

The purpose of this study was to describe the nature of EPs' communications on Twitter by characterizing the language, purpose, frequencies, content, and degree of engagement of their tweets.

METHODS
Study design

We performed a mixed-methods analysis following a combined content analysis approach. Because text is originally qualitative, and the quantification of text alone is insufficient for successful understanding of content,[18] combined content analysis has been suggested to address the mixed nature of Twitter feed data in a single study.[19]

Sample

We conducted qualitative and quantitative analyses of a sample of tweets from the 61 most influential EPs on Twitter, as defined in a previous study.[12] We chose to include tweets from influential EPs because they disproportionately impact the spread of information and directly shape social media conversations.[20,21,22] As demonstrated in previous studies, analyzing influencers yields a broad description of Twitter activity without having to analyze all users.[23] As such, the tweets of the most influential EPs were likely to provide a narrative that reflected the general conversation of EPs on Twitter.

Data Source and Search Strategy

To avoid variation in tweet content due to world events, national professional conferences, and seasonal variation, we analyzed tweets from random days in 2015. Specific days were identified using a random date generator function in Microsoft Excel (Redmond, WA, 2016). Once these dates were identified, we used the Twitter Advanced Search (https://Twitter.com/search-advanced?lang=en) function to identify and download all tweets produced by the influential EPs on these random days. We stopped our analysis after 10 days of tweets when we reached

Educational Research Capsule Summary

What do we already know about this issue?
Twitter is popular among emergency physicians.

What was the research question?
What is the nature of influential emergency physicians' communications on Twitter?

What was the major finding of the study?*A majority of tweets elicited some engagement. The qualitative analysis identified 15 distinct categories of tweets.*

How does this improve population health?
This data can help emergency physicians make informed decisions about social media engagement.

theoretical sufficiency in the qualitative[15,17,24] component. Previously published Twitter content analyses outside of EM have examined between 288 and 12,666 tweets.[25,26,27,28]

We included all original tweets that appeared in the Twitter Advanced Search timeline of the influential EPs on the selected days. Our corpus included original tweets, replies, and modified re-tweets. It did not include any unmodified re-tweets (messages that pass along another user's tweet to one's followers without adding one's own comment or opinion).

Qualitative Component

We analyzed the content of the of tweets using a naturalistic inductive content analysis approach.[19] Four authors (AB, JR, JY, and RN) initially read all tweets line-by-line through the first three days of tweets and met to develop and refine the initial coding categories in an inductive manner. We developed and clarified the coding categories in an iterative approach and identified tweets to serve as unambiguous examples, which allowed each relevant item from a single tweet to be placed into a category. All authors met to discuss and distinguish between descriptive and thematic categories. We used the languages of content analysis and conversation analysis as sensitizing frameworks to guide the a priori determination of descriptive categories for our qualitative analysis.[29,30,31] Thematic categories were identified using an iterative approach to coding. The first day's tweets were used exclusively for code development, and were excluded from further analysis.

After the initial code and categorical development, two team members (JY and RN) coded the remaining tweets. Any disagreements were brought to the coding team for resolution.

Our experiences, backgrounds, and assumptions influence

our approaches to analysis, so we chose a coding team with diverse experience with EM Twitter.[32] Three authors are EPs (AB, JJ, and JR). The lead author (JR) has extensive Twitter experience including daily use of the platform, and was positively predisposed toward Twitter. One author (AB) rarely uses Twitter, and brought a more neutral lens to the analysis. Two authors (JY and RN) were undergraduate students with no experience on Twitter, created accounts solely for the purpose of this study, and had minimal preconceptions about physicians on Twitter. One author (LR) has background training in anthropology, and extensive experience using qualitative research methods in health professions education.

To enhance the trustworthiness and credibility of our data analysis we employed memoing, reflexivity, triangulation of data among researchers, and the formation of an audit trail of the analytical process.

Quantitative Component

For each individual tweet we recorded message-level data to better understand tweet engagement. We defined tweet engagement by the number of retweets, "likes" (when another user clicks a heart on the message, generally indicating some form of agreement), and replies (the number of responses to a tweet prior to the author re-entering the conversation). We also logged the use of hyperlinks, embedding of media (pictures or video), and the first three hashtags (a type of metadata tag that makes it possible for others to easily find messages with a specific theme or content) per message. We also recorded the number of times each of the qualitatively-derived categories were applied to a tweet. Descriptive statistics were used to analyze this data.

RESULTS

We analyzed 1375 unique tweets from 57 unique users, representing 93% of the influential Twitter EPs. Four (7%) influential users did not record any tweets on the sample of days analyzed. Quantitatively, a majority of tweets (1104/1375, 80%) had some engagement in the form of retweets, likes, or replies. The mean number of times a tweet was retweeted by another user was 2.1 (standard deviation [SD] 7.24), liked was 3.4 (SD 9.4), and replied to (messages from others before the original tweet author re-entered the conversation) was 0.8 (SD 1.4).

There were 448 hashtags used, occurring in 337/1375 (25%) tweets. The most common hashtags used are displayed in Table 1. #smaccUS and #FOAMed were the most common, occurring in 6.5% (90/1375) and 6.4% (88/1375) of tweets, respectively.

The qualitative analysis identified 15 distinct descriptive categories and eight thematic categories of tweets. Descriptive categories of tweet characteristics are presented in Table 2. Messages were split evenly between initiations of new conversation and replies to other tweets. While most tweets were statements, 22% were either questions or answers. Most were related professionally to the broad domain of medical practice, while fewer were social in nature. Interestingly, 13% of tweets served to change the domain of the conversation, blending the

medical and social. The valence of most tweets was neutral, with only 3% expressing a negative tone, attitude, or feeling.

Noteworthy thematic categories with exemplary tweets are presented in Table 3. Over a quarter of tweets (375/1375, 27%) contained a summary of a resource, generally with a hyperlink to a blog post, journal article, podcast episode, or third-party website containing clinical information. Nearly a quarter of tweets (336/1375, 24%) contained illuminating statements that provided new perspective to move a conversation forward. These messages often added a different interpretation of clinical practice from one's own experience. Rapport building (252/1375, 18%) and humor (165/1375, 12%) were also prevalent. Self-promotion and advertisements were less common, occurring in less than 5% of tweets. Although also rare, some tweets (31/1375, 2%) contained reflections on character, actions, professional practice, and relationships. Additional results are available as supplemental material accompanying the online article.

DISCUSSION

Our results provide a contextualized understanding of the real-life EM Twitter experience, enabling EPs to make mindful decisions about social media participation. While the conversation skewed to medical topics, there was a significant social component to the interactions we analyzed. Humor, networking strategies, and rapport-building messages were common, revealing a human side to the EM Twitter conversation. Although not surprising given the "social" nature of social media and physicians' desires to connect,[33] the blend of personal and medical tweets highlights the ways in which social media tangles with traditional notions of friendships with colleagues outside of work.[34]

Influential EPs on Twitter also demonstrated a shared domain of interest (EM) and helped each other by sharing information and building relationships. These characteristics are consistent with traditional notions of a community of practice (CoOP).[35] Within CoOPs, interpersonal professional connections have traditionally been limited by geographic spread, organizational hierarchies, and institutional siloing.[36] Twitter may offer a new opportunity to weave a more accessible human element into the fabric of professional conversations,

Table 1. Most commonly used hashtags among tweets of influential emergency physicians.

Hashtag	Incidence (n=1375)
#smaccUS	90 (6.5%)
#FOAMed	88 (6.4%)
#EMconf	12 (0.8%)
#MEMC15	12 (0.8%)
#Read	10 (0.7%)
#smaccDUB	10 (0.7%)

Table 2. Descriptive categories of tweet characteristics of influential emergency physicians.

Tweet characteristic*	Definition	N (of 1375)	%
Position of message			
Initiation	The first tweet in a conversation, including retweets (RT) in which words are inserted prior to the RT message. Also includes modified tweets	673	49%
Reply	A response to any message from another user.	702	51%
Type of message**			
Question	A tweet worded or expressed so as to elicit information from other users. Not every tweet with a question mark fits here. For example, if a linking article has a question mark in the title, this does not count as a question on its own.	140	10%
Statement	Making a declarative initiation or reply, including rhetorical questions.	1117	81%
Answer	A reply to another user's question.	166	12%
Domain***			
Medical	Pertaining to medicine or the broad domain of professional practice as a physician (this is NOT about the words used in the tweet, it is about the context of the conversation).	964	70%
Social	Unrelated to medicine - may be personal, cultural, political.	411	30%
Blend	A reply (not initiation) tweet that signals a change in the tone of the conversation between medical and social (can blend in either direction).	176	13%
Evaluate			
Yes	User adds his/her own judgment or opinion on the significance, worth, or quality of something. For example: "totally agree - just don't have much luck admitting elsewhere due to rapid response parameters" was considered evaluative.	636	46%
No	User does not add his/her own judgment or opinion on the significance, worth, or quality of something.	739	54%
Valence			
Positive	Positive intrinsic feeling, emotional tone, or attitude expressed.	323	23%
Negative	Negative intrinsic feeling, emotional tone, or attitude expressed.	47	3%
Neutral	Default to neutral if not clearly positive or negative.	1005	73%

*Categories of tweet characteristics were defined *a priori* but derived qualitatively using the methodology referenced above.
**Several tweets were dual coded as both answering a question and asking another. Or making a statement and asking a question.
***Each tweet was coded as either medical or social. If there was a change in the tone over the course of a conversation, it could receive an additional code as a "blend." In blended tweets, the initial domain was coded.

fostering the development of the relationships and networks that are important to organizational development, engagement, and vitality.[37,38] The emergence of a Twitter CoOP among EM and critical care may enable relational and professional communication among colleagues who might not otherwise connect due to structural, political, or geographic barriers.[11] While Twitter can break down traditional hierarchical structures and barriers to collaboration, education, and innovation, new challenges emerge that require "reconciliation."[39]

Wenger-Trayner's metaphor of "landscapes of practice" highlights the ways in which professionals negotiate their identities among many different CoOPs.[40] In an increasingly complex "landscape" that involves several local (administration, clinical practice, teaching, etc), and now virtual (Twitter), communities, our findings support the notion that EPs are working to negotiate a productive identity with respect to the various CoOPs that constitute this landscape. Through self-promotion and networking messages, users were moving between and bridging CoOPs to connect their scholarly work (local or national research CoOPs) with their social media colleagues (Twitter CoOP). The use of hashtags like #smaccUS and #EMconf demonstrate how users blur the boundaries between traditional communities built around contemporaneous co-located educational conferences and their asynchronous virtual community.

The influential EPs we studied were innovators who formed the EP Twitter community based on egalitarian principles,[41] and our data elaborate on their willingness to share resources and connect with the community. However, as previous professional boundaries blur, it is possible that new professional silos will

emerge in their place. Could EM Twitter become the hierarchy from which a new group of "outsiders" could feel ostracized? Are there non-influential outsiders within EM Twitter that feel like the community is not theirs?

Future work might explore the perceived value of Twitter to the individual EPs who use the platform. While humor, sharing resources, networking, retweets, likes, and replies may appear on the surface to represent connection to the EM community, we did not explore whether Twitter users truly experienced this sense of connection. A recent study demonstrated that young adults with high social media use feel more socially isolated than their counterparts with lower social media use.[42] While influential EPs may appear to be connecting on Twitter, they may actually feel socially isolated. Likewise, those not actively engaged in the Twitter conversation may feel like outsiders peering in on a community to which they are not connected. This topic of perceived vs lived experiences of connection is ripe for future inquiry.

Our data suggests that people are engaging in conversation and interacting by exchanging resources, creating new contacts, sharing ideas, thoughts, and reflections. While we see this broadly as a positive trend, it may be dangerous if, as has been reported, half of medical tweets from professional accounts are inaccurate.[16] We did not evaluate the scientific accuracy of any tweets, nor did we examine the content of tweets for issues of professionalism or violations of privacy. These important issues deserve further exploration.

LIMITATIONS

We analyzed English-language content only and findings may not generalize to the global medical community. We chose to analyze tweets from random days, allowing for the possibility that we may have missed significant and/or meaningful events in the EM community that could have changed the nature of the conversation and thus our conclusions. While we analyzed influential EPs due to the way they disproportionately impact the

Table 3. Thematic categories of tweets of influential emergency physicians.

Theme	Definition	Exemplary tweet	N (of 1375)	%
Resource summary	A mostly sterile accounting of the main points of something – including the title of a linked to resource or the summary of a case.	The problem with calf clots? Everyone handles them differently...and @ emergencypdx explains why http://blog. ercast.org/the-problem-with-calf-clots/ … #FOAMed	375	27%
Rapport building	Explicitly pursuing relational connection, especially harmonious or sympathetic relation.	@JohnPurakal @mksheehy @UICBrownCoat Really great idea and stellar start. Can't wait for the next video! Keep up the good work.	252	18%
Illumination	A statement that adds substantially to, clarifies, explains, reveals, or enlightens – including their interpretation of data, conclusions, and results. Often in the middle of a conversation, these messages push conversation in a new direction by offering a new perspective, often forcing someone to think of someone in a new light.	@FireEMSChief There was probably a little leeway between 30 and 60. Also the breathalysers were reasonably inaccurate for this sort of thing.	336	24%
Opinion	The substantive idea that a person has about something or someone, which is based mainly on their personal feelings, beliefs, experiences or views.	agree w @ketaminh bad hypotension with verapamil I have good results with dilt @ MDaware @RAGEpodcast @stemlyns	270	20%
Humor	Attempting to offer a funny or comical slant to a topic in discussion.	As everyone leaves for #smaccus, ketamine use plummets in EDs around the world...	165	12%
Reflection	Meditation or serious thought about one's character, actions, professional practice, and motives with purpose of understanding self or situation.	Sitting amongst the debris of Monday, picking up pieces of rubble & turning them over. My hands are grubby with start of week dust & decay.	31	2%
Networking	Interacting to meet professionally, exchange information, or develop contacts – especially to further one's career or social network.	.@PEMEMS @artangelo I'd be happy to look at what you sent, but I meant he should DM me too. I'd be happy to send him resources.	62	5%
Self-promotion	Publicizing one's own activities, including linking to one's own work if overt about one's role. If linking to own work but not explicit about author's role, it is not self-promotion.	Excited to be publishing in the new @ STEL_BMJ journal! Excellent review process - #MedEd / #Simulation researchers consider contributing.	23	2%

spread of information and directly shape social media conversations, our analysis may not reflect the lived experience of all EPs on Twitter. Further, the subjects we studied were deemed most influential from data analyzed in 2015. As EM Twitter rapidly evolves, those driving the discourse today may be significantly different from the influencers of three years ago. In particular, the representation of females on the list of influential Twitter users that we used was likely not representative of the EM social media community as a whole.

CONCLUSION

Influential emergency physicians on Twitter were engaged in largely medical conversations in which most messages generated some form of interaction. They shared resources and opinions while also building social rapport in a community of practice. This data can help emergency physicians make informed decisions about social media engagement.

Address for Correspondence: Jeff Riddell, MD, University of Southern California Keck School of Medicine, Department of Emergency Medicine, 1200 North State Street, Room 1011, Los Angeles, CA 90033. Email: jriddell@usc.edu.

REFERENCES

1. Lulic I, Kovic I. Analysis of emergency physicians' Twitter accounts. *Emerg Med J*. 2013;30(5):371-6.
2. Pearson D, David P, Michael B, et al. Evaluation of social media use by emergency medicine residents and faculty. *West J Emerg Med*. 2015;16(5):715-20.
3. Udani AD, Moyse D, Peery CA, Taekman JM. Twitter-augmented journal club: educational engagement and experience so far. *A A Case Rep*. 2016 Apr 15;6(8):253-6.
4. Roland D, Damian R, Natalie M, Richard B, Simon C, Lyttle MD. Are you a SCEPTIC? SoCial mEdia Precision & uTility In Conferences. *Emerg Med J*. 2014;32(5):412-3.
5. Desai B. A novel use of Twitter to provide feedback and evaluations. *Clin Teach*. 2014;11(2):141-5.
6. Reames BN, Sheetz KH, Englesbe MJ, Waits SA. Evaluating the use of Twitter to enhance the educational experience of a medical school surgery clerkship. *J Surg Educ*. 2016;73(1):73-8.
7. Chai PR. Enriching the toxicology experience through Twitter. *J Med Toxicol*. 2015;11(4):385-7.
8. Galiatsatos P, Porto-Carreiro F, Hayashi J, Zakaria S, Christmas C. The use of social media to supplement resident medical education - the SMART-ME initiative. *Med Educ Online*. 2016;21(0).
9. Webb AL, Dugan A, Burchett W, et al. Effect of a novel engagement strategy using Twitter on test performance. *West J Emerg Med*. 2015;16(6):961-4.
10. Gilbert S. Learning in a Twitter-based community of practice: an exploration of knowledge exchange as a motivation for participation in #hcsmca. *Inf Commun Soc*. 2016;19(9):1214-32.
11. Roland D, Spurr J, Cabrera D. Preliminary evidence for the emergence of a health care online community of practice: Using a netnographic framework for Twitter hashtag analytics. *J Med Internet Res*. 2017;19(7):e252.
12. Riddell J, Brown A, Kovic I, Jauregui J. Who are the most influential emergency physicians on Twitter? *West J Emerg Med*. 2017;18(2):281-7.
13. Greene J. Social media and physician learning: Is it all Twitter? *Ann Emerg Med*. 2013;62(5):11A-13A.
14. Kind T. Professional guidelines for social media use: a starting point. *AMA J Ethics*. 2015;17(5):441-7.
15. Weiner J. A personal reflection on social media in medicine: I stand, no wiser than before. *Int Rev Psychiatry*. 2015;27(2):155-60.
16. Alnemer KA, Alhuzaim WM, Alnemer AA, et al. Are health-related Tweets evidence based? Review and analysis of health-related tweets on Twitter. *J Med Internet Res*. 2015;17(10):e246.
17. Berger E, Eric B. This sentence easily would fit on Twitter: emergency physicians are learning to "tweet." *Ann Emerg Med*. 2009;54(2):A23-5.
18. Krippendorff K. *Content Analysis: An Introduction to Its Methodology*. Thousand Oaks, CA: SAGE Publications, 2012.
19. Hamad EO, Savundranayagam MY, Holmes JD, Kinsella EA, Johnson AM. Toward a mixed-methods research approach to content analysis in the digital age: the combined content-analysis model and its applications to health care Twitter feeds. *J Med Internet Res*. 2016;18(3):e60.
20. Bakshy E, Eytan B, Hofman JM, Mason WA, Watts DJ. Everyone's an influencer. *Proceedings of the Fourth ACM International Conference on Web Search and Data Mining*. 2011;65-74.
21. Wu S, Shaomei W, Hofman JM, Mason WA, Watts DJ. Who says what to whom on Twitter? *Proceedings of the 20th International Conference on World Wide Web*. 2011;705-14.
22. Albalawi Y, Sixsmith J. Identifying Twitter influencer profiles for health promotion in Saudi Arabia. *Health Promot Int*. 2017 Jun 1;32(3):456-63.
23. Sugawara Y, Narimatsu H, Hozawa A, Shao L, Otani K, Fukao A. Cancer patients on Twitter: a novel patient community on social media. *BMC Res Notes*. 2012;5:699.
24. Varpio L, Ajjawi R, Monrouxe LV, O'Brien BC, Rees CE. Shedding the cobra effect: problematising thematic emergence, triangulation, saturation and member checking. *Med Educ*. 2017;51(1):40-50.

25. Bravo CA, Hoffman-Goetz L. Social media and men's health: a content analysis of Twitter conversations during the 2013 Movember campaigns in the United States, Canada, and the United Kingdom. *Am J Mens Health.* 2017 Nov;11(6):1627-41.

26. Step MM, Bracken CC, Trapl ES, et al. User and content characteristics of public tweets referencing little cigars. *Am J Health Behav*. 2016;40(1):38-47.

27. Park H, Reber BH, Chon MG. Tweeting as health communication: health organizations' use of Twitter for health promotion and public engagement. *J Health Commun.* 2016;21(2):188-98.

28. Krauss MJ, Grucza RA, Bierut LJ, et al. "Get drunk. Smoke weed. Have fun": A content analysis of tweets about marijuana and alcohol. *Am J Health Promot*. 2017;31(3):200-8.

29. Sullivan SJ, Schneiders AG, Cheang CW, et al. 'What's happening?' A content analysis of concussion-related traffic on Twitter. *Br J Sports Med.* 2012;46(4):258-63.

30. Small TA. What the hashtag? *Information, Communication & Society*. 2011;14(6):872-95.

31. Giles D, Stommel W, Paulus T, et al. Microanalysis of online data: themethodological development of "digital CA". *Discourse, Context & Media*. 2015;(7):45-51.

32. Corbin J, Strauss A. 2014. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. Thousand Oaks, CA: SAGE Publications.

33. Steinert Y, Macdonald ME, Boillat M, et al. Faculty development: if you build it, they will come. *Med Educ*. 2010;44(9):900-7.

34. Riddell J, Gottlieb M, Kim DJ, et al. Appropriateness of Facebook friending between residents and attending physicians. *J Grad Med Educ*. 2017;9(2):259-60.

35. Wenger E. 1999. *Communities of Practice: Learning, Meaning, and Identity*. Cambridge, United Kingdom: Cambridge University Press.

36. Kerno SJ. Limitations of communities of practice: a consideration of unresolved issues and difficulties in the approach. *J Leadersh Organ Stud*. 2019;62(1):248–82.

39. Roland D, Brazil V. Top 10 ways to reconcile social media and "traditional" education in emergency care. *Emerg Med J*. 2015;32(10):819-22.

40. Wenger-Trayner E, Fenton-O'Creevy M, Hutchinson S, et al. 2014. *Learning in Landscapes of Practice: Boundaries, Identity, and Knowledgeability in Practice-Based Learning*. Routledge.

41. Nickson C. FOAM / FOAMed - Free Open Access Medical Education. Life in the Fast Lane. Medical Blog. Available at: https://lifeinthefastlane.com/foam/. Accessed November 9, 2018.

42. Primack BA, Shensa A, Sidani JE, et al. Social media use and perceived social isolation among young adults in the U.S. *Am J Prev Med*. 2017;53(1):1-8.

Synchronous Online Journal Club to Connect Subspecialty Trainees across Geographic Barriers

Andrew N. Musits, MD, MS*
Alexandra L. Mannix, MD †

*Brown University Warren Alpert Medical School, Department of Emergency Medicine, Providence, Rhode Island
†University of Florida College of Medicine-Jacksonville, Department of Emergency Medicine, Jacksonville, Florida

Introduction: Journal club holds a well-respected place in medical education by promoting critical review of the literature and fostering scholarly discussions. Journal clubs are often not available to trainees with niche interests due to the geographic limitations of subspecialty programs such as simulation, medical education, disaster medicine, ultrasound, global health, and women's health.

Methods: A recurring online journal club was held on a quarterly basis to connect simulation fellows. An online conferencing program with screen-sharing capabilities served as the platform for this scholarly exchange. Articles were presented by fellows supported by more seasoned mentors. We surveyed participants to evaluate the program and provide feedback to the presenter.

Results: The first eight sessions drew participants from across the United States and Canada. The program was highly rated by participants who commented specifically on its value. Presenters were also highly rated, suggesting that fellows, with online support and mentoring, were effective in providing a quality program.

Conclusion: Online synchronous journal clubs can fill an educational niche for subspecialists and their trainees, as demonstrated with this curriculum piloted with simulation fellows. Challenges of scheduling across time zones, distribution of materials, and recruitment of participants can be overcome by a dedicated team of facilitators aided by readily accessible technology. [West J Emerg Med. 2020;21(1)33-36.]

INTRODUCTION

The practice of journal clubs at academic medical centers began over 100 years ago. Since then, journal clubs have grown to hold a well-respected role in continuing medical education.[1] Journal clubs are now common across many fields of medicine benefiting everyone from physicians in training to participants from pharmacy and nursing.[2] The practice is popular across subspecialties in medicine and occurs throughout the world. Journal clubs have been shown to be effective in improving knowledge and critical appraisal skills.[3]

After residency training, some trainees will continue to build a niche through fellowship training. The educational

innovation described in this report was piloted with simulation fellows. Simulation fellows dedicate their fellowship training to learning the theory behind and practical strategies to implement successful simulation-based medical education and research. Due to the niche of simulation training, fellows are often isolated from like-minded scholars. Local interaction with others in simulation may be limited due to low numbers of faculty trained in simulation, and few passionate simulation experts at their institution. A baseline needs assessment from participants demonstrated that 73% of the participants had, on average, two or less communications per month with simulation colleagues at other centers, and 55% reported they

did not have access to a local simulation journal club.

One might extrapolate that a similar need exists in other subspecialties such as medical education, disaster medicine, ultrasound, women's health, and global health, to name a few. Furthermore, medical students and other trainees may attend institutions where local experts do not exist. For example, a medical student may have an interest in global health but attend a school that does not have a global health program or faculty with this expertise. A synchronous online journal club, as described below, can provide exposure and networking opportunities not locally available. Program goals include exposing simulation fellows to advances in simulation-based education and research outside of their locality and clinical specialty, improving knowledge and critical appraisal of current research, and increasing communication and collaboration among simulation fellows and professionals at different geographic sites.

OBJECTIVES

Through regular participation in this activity, learners will be able to do the following: 1) Identify advances and new trends in their field, occurring outside of their locality; 2) demonstrate critical appraisal of simulation literature; and 3) exhibit increased scholarly communication with colleagues at distant sites.

CURRICULAR DESIGN

In-person journal clubs typically begin with a brief presentation of the article followed by an analytical discussion of methods and how to interpret the results and conclusions. This same structure was followed for the synchronous online journal club. A different simulation fellow presented at each session. He or she chose the article and prepared PowerPoint slides to visually aid the presentation. Presenters connected with a more experienced mentor to help screen appropriate articles and serve as a resource for the trainee preparing the presentation. The article chosen by the presenter was announced to the participants by e-mail 1-2 weeks prior to the live session. The full citation and a link to the article were often included. Unless the article was open access or freely available, the PDF was not included. The other participants in the session were other fellows and scholarly-minded simulation educators/researchers not in a fellowship role.

Presenters were provided with a slide template and encouraged to present using a standardized format. The first 20 minutes consisted of a factual presentation of relevant background, methods, results, and the author's conclusions. The next 30 minutes was used for discussion. Presenters were encouraged to have specific questions and discussion topics to help facilitate and guide the discussion. In lieu of a traditional in-person meeting, the conversation was through an online conferencing program, thus eliminating geographic barriers. This recurring program met quarterly.

Population Health Research Capsule

What do we already know about this issue?
Journal club is a common educational activity that fosters critical literature appraisal. Subspecialty fellows may not have local access to this opportunity.

What was the research question?
Can an online journal club connect geographically distant trainees for discussion of subspecialty literature?

What was the major finding of the study?
An eight-session pilot with simulation fellows had 83 learner encounters. It was feasible and well received.

How does this improve population health?
Online journal club may be applied to other subspecialties to complement education, provide presentation opportunities, and increase networking.

An online conferencing system was used to facilitate the online discussion and allow the presenter to share his or her screen. Several similar platforms exist; some are free while others require an initiation fee for the presenter. A synchronous online journal club could use any platform that allows online group chat, video and audio streaming, and screen sharing. Many institutions have paid subscriptions to one of these services. GoToMeeting was used for the first eight sessions based on availability of an institutional subscription. Zoom and Google Hangouts have also been used with equal success. None of these platforms incur any cost for the attendee. Sessions can be easily recorded with these platforms. However, we decided not to record the journal club discussions, as we felt participants could have been more hesitant to speak and share their analysis and opinion if they were being recorded.

A few ground rules were reviewed prior to each session (Table). The rules exist to remind all participants that this journal club is for professional scholarly discussion. The rules help to clearly set the expectation that unprofessional criticism would not be tolerated. Professional behavior is particularly important in the online setting, where the conversation is broadcast to a larger group and the exact audience is not always known.

Due to the nature of the problem this educational innovation solves, the learner group may not be immediately

Table. Ground rules shared at the beginning of each online journal club.

Ground rules
Critical review of research in this forum is meant for educational purposes and to promote analytic thought. It by no means is meant to offend or devalue the research presented, the authors, or participants.
Please keep your comments constructive and professional.
Please use headphones and mute your microphone when not speaking to reduce feedback.

available or easy to contact. Therefore, some advertising and recruitment of learners is necessary. A network of simulation fellows and scholarly professionals were invited to participate by using a multiplatform approach. Advertisement strategies included directly e-mailing fellowship program directors, posting to discussion boards, and announcing events on social media (Twitter, Instagram, and Facebook). Fellowship directors were targeted as the initial person of contact as they have more visible and stable contact information. Fellows and trainees frequently have changing contact information due to institutional changes during their early career. Senior faculty were also invited to serve as faculty mentors.

In an effort to enhance the educational value of this initiative, the participants were given a program evaluation survey after each session. Additional data collected included demographics and educational opportunities available locally. Participants were also asked to provide feedback to the presenter. Initial data was collected using an online survey tool through the learning management system at the Winter Institute for Simulation, Education, and Research (WISER; Pittsburgh, PA) (Appendix).

IMPACT/EFFECTIVENESS

The synchronous online journal club is an educational innovation connecting simulation fellows across geographic barriers. This electronic education activity allows scholarly exchange using existing technology that is cheap and readily available. The broad geographic and subspecialty participation demonstrates the easy accessibility of this format. The initial eight sessions were hosted by WISER. In this article, we focus on presenting data from these eight sessions, which ran from October 2014 to June 2016. Average attendance at these sessions was 10, with a range of 6-15.

Participants were from various clinical specialties including emergency medicine, anesthesia, surgery, pediatrics, biomedical engineering, critical care, internal medicine, nursing, and pharmacy. The majority of respondents identified as simulation fellows, with a minority identified as researchers, administrators, or simulation center directors.

All participants had a particular interest in simulation. The geographic spread included participants from California, Washington State, Massachusetts, New York, Pennsylvania, Florida, Texas, Ohio, Michigan, Illinois, North Carolina, Washington DC, and Canada. Participants were asked to rate the overall journal club (Figure 1) and provide feedback to the presenter. (Figure 2) Comments to the prompt "Please provide any general comments" included the following: "Great discussion of relevant articles"; "Well-organized, informative, and thoughtful journal club"; and "Great idea to connect sim folks from across the country!"

This innovation broadened the exposure of fellows to journal club, as many participants did not have this available locally. Participation in journal club has been shown to increase scholarly reading behavior.[4] Satisfaction scores indicated a positive response with few technology issues. This program provided a cost-effective way to encourage scholarly activity and collaboration. The feedback indicated a level of quality in the presentation. A key role in developing high-quality content is appropriate mentorship to aid with article selection and presentation preparation. Another important element is providing resources such as the slide template to guide the presentation format.

While this program provides great value, there are some challenges to creating a synchronous online journal club. As a live video conference, audience participation is somewhat limited by times zones. For example, 8 AM might work great for those in Eastern Standard Time (EST), but this translates to 5 AM in Pacific Standard Time. When scheduling journal club events, the leader of the program needs to choose a time that is reasonable to the greatest audience. Through experimentation and informal feedback, we found that 2 PM EST worked the best for participants across U.S. time zones. It is late enough
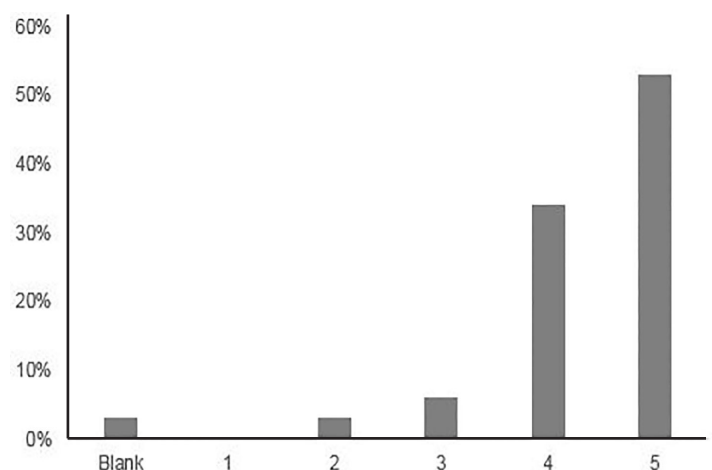
Figure 1. Participant responses on a Likert scale ranging from 1 (poor) to 5 (excellent) in response to the question "Please rate this overall program" (n=32).
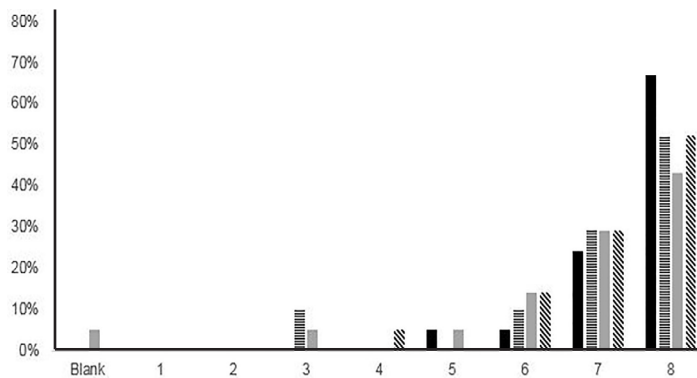
Figure 2. Participant evaluations of presenter on a Likert scale ranging from 1 (disagree) to 8 (agree) (n=32).

▪ The article selected was interesting and relevant

≡ The article was clearly and succinctly presented

▪ The visual aides (slides) were appropriate and helpful

⟍ The presenter effectively facilitated scholarly discussion

CURRENT STATE/FUTURE DIRECTION

Now that the program has been established, it began to be supported by the Society for Simulation in Healthcare (SSH) as an affinity group in 2018. This allows for easier communication to schedule and promote upcoming events through a common website and discussion board. Anyone can create a free account, as it does not require membership in SSH. Current feedback is collected using Google Forms. Dates are now announced annually, at the beginning of the academic year to allow ample time for schedule requests.

In conclusion, the educational experience of subspecialty trainees can be enhanced by using low-cost, existing technology to connect peer learners and passionate experts with an online journal club. Niche training programs, such as simulation fellowships, are not ubiquitous and therefore geographically dispersed. This synchronous journal club was trialed using simulation fellows, and would likely have success in other subspecialties that face similar challenges.

in the day for those on the West Coast to attend after working a late evening shift the night before, but still during the "normal office hours" for those on the East Coast.

The distribution of articles can pose a challenge. Due to copyright concerns, we only distributed citations and links to PubMed. Most participants are able to access the articles for no cost, as they belong to academic institutions with subscriptions to most journals. However, this must be recognized as a potential limitation. Another potential concern is the recruitment of presenters. While any academically minded simulation educators or researchers are welcome to attend the sessions and contribute to the conversation, fellows are identified as presenters. There is generally a steady stream of fellows willing to present. This pool of fellows is refreshed every year or two, as they graduate and are replaced by new trainees. For the fellows, presenting during journal club is an opportunity to increase their visibility in front of a diverse audience while providing a platform for networking and allowing for honing of presentation skills. The journal club also provides publicity for their training program.

LIMITATIONS

Several limitations of this study need to be addressed. In the first eight sessions, we had a total of 83 learner encounters. We collected 32 survey responses, for a response rate of 39%. Feedback forms were completely anonymous; thus, because attendance records did not allow for us to track the percentage of repeat attendees, they could not be excluded from the data. The feedback form was locally developed, and no formal validation occurred. The qualitative comments shared in this article are descriptive and representative of the feedback received; however, no formal thematic analysis was performed and was beyond the scope of this project.

Address for Correspondence: Andrew Musits, MD, MS, Brown University Warren Alpert Medical School, Department of Emergency Medicine, 1 Hoppin Street Suite 106, Providence, RI 02903. Email: musits@brown.edu.

REFERENCES

1. Linzer M. The journal club and medical education: over one hundred years of unrecorded history. *Postgrad Med J*. 1987;63(740):475-8.
2. Lachance C. Nursing journal clubs: a literature review on the effective teaching strategy for continuing education and evidence-based practice. *J Contin Educ Nurs*. 2014;45(12):559-65.
3. Deenadayalan Y, Grimmer-Somers K, Prior M, et al. How to run an effective journal club: a systematic review. *J Eval Clin Prac*. 2008;14(5):898-911.
4. Linzer M, Brown JT, Frazier LM, et al. Impact of a medical journal club on house-staff reading habits, knowledge, and critical appraisal skills. A randomized control trial. *JAMA*. 1988;260(17):2537-41.

Women's Night in Emergency Medicine Mentorship Program: A SWOT Analysis

Alison G. Marshall, MD*
Priyanka Sista, MD†
Katie R. Colton, MD†
Abra Fant, MD, MS†
Howard S. Kim, MD, MS†
Patrick M. Lank, MD, MS†
Danielle M. McCarthy, MD, MS†

*Temple University, Lewis Katz School of Medicine, Department of Emergency Medicine, Philadelphia, Pennsylvania
†Northwestern University, Feinberg School of Medicine, Department of Emergency Medicine, Chicago, Illinois

Introduction: Women in emergency medicine (EM) at all career stages report gender-specific obstacles to satisfaction and advancement. Programs that facilitate longitudinal mentoring, professional development, and networking may ameliorate these barriers.

Methods: We designed and implemented a program for female residents, faculty, and alumnae from our EM training program to enhance social support, leadership training and professional mentorship opportunities. An anonymous, online survey was sent to participants at the end of the academic year, using a SWOT (strengths, weaknesses, opportunities, and threats) format. The survey collected free-text responses designed to evaluate the program.

Results: Of 43 invited participants, 32 responded (74.4%). Eight themes emerged from the free-text responses and were grouped by SWOT domain. We identified four themes relating to the "strength" domain: 1) creating a dedicated space; 2) networking community; 3) building solidarity; and 4) providing forward guidance. Responses to the "weaknesses" and "threats" questions were combined due to overlapping codes and resulted in three themes: 5) barriers to participation; 6) the threat of poorly structured events lapsing into negativity; and 7) concerns about external optics. A final theme: 8) expansion of program scope was noted in the "opportunity" domain.

Conclusion: This program evaluation of the Women's Night curriculum demonstrates it was a positive addition to the formal curriculum, providing longitudinal professional development opportunities. Sharing the strengths of the program, along with identified weaknesses, threats, and opportunities for advancement allows other departments to learn from this experience and implement similar models that use existing intellectual and social capital. [West J Emerg Med. 2020;21(1)37-41.]

BACKGROUND

Gender disparities among emergency physicians (EP) influence compensation, promotion, and wellbeing of female physicians.[1-14] Professional networking, leadership training, and access to mentorship are vital mechanisms for closing the gender gap in academic medicine.[15-20] Yet women are joining the specialty of emergency medicine (EM) without established pathways

for professional development to mitigate existing barriers. The disparity of female faculty in academic EM subsequently results in fewer female role models and mentorship opportunities for women, despite the well-established benefit of these relationships in career development and academic productivity.[13, 15-18]

Increasingly, EM has been host to national movements raising awareness around gender disparities and promoting new

platforms in which to address them.[18-24] However, few examples in the literature describe comprehensive departmental residency or post-residency programs that provide opportunities for female physicians to establish mentorship relationships and obtain leadership positions in academic medicine.[17,18,25,26]

OBJECTIVES

We set out to design and implement a program for female residents, faculty, and local alumnae from our EM training program to enhance social support, leadership training, and professional mentorship opportunities. Once implemented, we sought to evaluate the first year of our "Women's Night" initiative using a SWOT (strengths, weaknesses, opportunities, threats) analysis.[27]

CURRICULAR DESIGN

We used a six-step approach to curriculum development, starting with the pre-established problem of gender disparities in academic EM and the subsequent need to proactively address those disparities with enhanced professional development as our problem identification/general needs assessment.[28] Prospective participants, including female faculty, alumnae and residents were invited to join an ad hoc committee that then completed a targeted, departmental needs assessment through group discussion. A primary goal to "cultivate solidarity and mentorship among female residents, alumnae and faculty through a Women's Night program" was established. Specific objectives for the Women's Night program included a) completing a professional development activity at each meeting, and b) maintaining unstructured time for social interaction and networking.

The Women's Night program launched in 2016 and comprised six evening events. All female residents, faculty and local alumnae were invited. Female residents were scheduled off from clinical duties, with the exception of those on off-service rotations (e.g., intensive care unit), whereas faculty could request the night off. This night was part of any given resident's time off, and participants worked the same number of shifts as non-participants and male residents.

Faculty or chief residents hosted the 2-3 hour events in their homes or restaurants, and two female faculty members split the cost of each event. Professional development activities were organized by Women's Night program leaders. (See Appendix for list of topics.) We conducted the SWOT analysis as our evaluation of the program.

IMPACT & EFFECTIVENESS
Survey

An end-of-year, institutional review board (IRB)-approved survey to evaluate the program was sent to anyone invited to the events over the prior academic year. Data were collected from June–July 2017 via a REDcap (Research Electronic Data Capture) survey.[29] Participants completed questions designed to evaluate the program using a SWOT format.[27,30] Our SWOT analysis used a classic four-question template of open-ended questions requesting participant reflection on programmatic strengths, weaknesses, opportunities, and threats. Finally, participants were asked to reflect on whether and how Women's Night had "influenced" them. Survey questions were drafted by two members of the study team (DMM, AGM) and consensus was reached by iterative review.

Data Analysis

The study team was comprised of two female attending EPs, two male attending EPs and three female resident EPs. Qualitative content analysis using a consensual qualitative approach was undertaken with a primary coding team (DMM, PS, KC, AGM) generating initial codes and themes. A secondary audit team (PML, AF, HSK) reviewed all original data and thematic structure to evaluate for omissions or oversimplifications.[32]

RESULTS

Forty-eight participants were invited to Women's Night events, of whom 35 attended one or more events. Five invitees were ineligible because of study involvement. Of the 43 remaining physicians, 32 (74.4%) completed the survey (24 who had attended events and seven who had not). All respondents were female, with 40.6% residents, 37.5% faculty, and 34.4% alumnae. (Several of the faculty are also program alumnae.)

The primary team arrived at an initial 20 codes, resulting in seven themes. Audit team review identified one additional theme resulting in a final framework of eight themes, presented in the table. Due to overlapping data in the "weaknesses" and "threats" domains, the themes were consolidated. Additionally, responses to the question of how the events "influenced" participants aligned with the "strengths" themes.

Strengths

Overarching themes inside the "strengths" category were *dedicated space, networking community*, *solidarity, and forward guidance*. Respondents noted that creating a *dedicated space*, provided "protected time" to discuss "tough topics specific to women in EM in a non-judgmental atmosphere," allowed learning "from other women's experiences," and fomented dialogue. This space subsequently facilitated *networking and community* building. Residents particularly mentioned *forward guidance* noting "women's night has inspired me to seek female mentees in my next job." It additionally fostered optimism about careers in academic medicine and made "me more confident as a female provider." Community-building inside a protected space ultimately resulted in an overarching sense of *solidarity* among participants who felt the events provided an "opportunity to build each other up," ultimately helping to "develop plans and approaches moving forward." This

solidarity influenced participant well-being by "validating concerns" and addressing them together.

Weaknesses and Threats

Responses to "weakness" and "threats" overlapped and resulted in three themes: two internal factors, *participation* and *structure of the events,* and one external factor, *optics*. Scheduling issues and participant engagement were noted as barriers to *participation*. Limited time off and difficulty of "devoting free time to these events," which were "another evening away" from family and friends in a career that already requires working nights and weekends. Participants observed that if not well *structured,* the events could become "redundant" or lapse into negativity and "complaining." There was concern about enforcing balanced time for social networking and professional development activities so one did not circumscribe the other. Finally, the *optics* of these events were felt to be a threat with multiple respondents reporting the events were perceived as "girl talk" or "lady's night" and framed as "special treatment," running the risk of further ostracizing women. While having a *dedicated space* was noted as a strength, others noted that one "can't change the culture or system without including the majority."

Opportunity

Expansion was the primary "opportunity" theme. Some respondents desired greater inclusivity, such as promoting "inter-group dialogue" by including nurses and male physicians at occasional sessions. Increased breadth of topic areas (i.e., financial, research), professional development activities and mentorship were suggested. Expansions into other venues, time frames and scheduling modalities, or ability to bring children to events were recommended as growth opportunities.

DISCUSSION

This evaluation of an applied educational and mentoring model for female EPs found the program was an overall positive experience for both individuals and the local female EP community. The themes above illustrate not only an enhanced feeling of wellness and solidarity as a result of program participation, but also a change in self-perception, confidence, and optimism that have potential to foment long-term change for female physicians. By including alumnae and faculty as core participants along with residents, opportunities for longitudinal professional development and dynamic mentorship pathways emerge.[32,33]

Despite these successes, tension exists between the strengths, weaknesses, threats, and opportunities. The greatest program strengths were driven by a "safe space" format and solidarity building, yet these strengths are simultaneously viewed as possible weaknesses or threats given the siloed format and the optics of "exclusivity" created by this protected environment. Additionally, the main opportunity noted by respondents was a focus on expansion that runs the risk of inadvertently degrading cited strengths, thus emphasizing the care with which this

feedback must be implemented.

Although data were collected in our isolated departmental context, we suspect that these challenges are not unique and similar programs could learn from our SWOT analysis to build stronger mentorship programs in their own organizations. To that end, we have included the full three-year curriculum to date (Appendix). Our program format and curricular content comprise an easily applied model, which uses existing intellectual and social capital to serve female physicians at all levels.

LIMITATIONS

This single-center study was conducted over one year with a small sample size of mixed career level EPs. The survey format, rather than interview, may have resulted in limited, superficial responses. Additionally, by surveying invited participants, not just those who attended regularly, we lose some depth of analysis of the participant experience but gain insight into the threats and weaknesses faced by the program. Implicit bias from personal values of the study team may have influenced the thematic analysis. To combat this potential bias, we used consensual coding including male study-team members. Finally, "outcome" data related to physician wellness and other experiences of gender in the workplace were not evaluated.

CONCLUSION

This evaluation of the Women's Night curriculum demonstrates it was a positive addition to the department, providing longitudinal opportunities for professional development. Sharing not only the program strengths, but also identified weaknesses, threats, and opportunities for improvement allows others to learn from this experience and implement similar models.

Address for Correspondence: Alison G. Marshall, MD, Temple University, Lewis Katz School of Medicine, Department of Emergency Medicine, 3401 North Broad Street, Philadelphia, PA 19140. Email: alison.marshall@temple.edu.

Table. Themes identified in participant responses with representative quotes.

Domain	Theme	Sample quotes
Strengths		
	Dedicated space	• "Safe space to discuss the realities of being a female physician and have an avenue to ask questions/gain mentorship from female physicians who have been in our shoes." • "Open atmosphere; able to talk about tough topics specific to women in EM in a non-judgmental atmosphere and learn from other women's experiences."
	Networking community	• "Form stronger relationships with excellent female role models." • "The emphasis on professional development and happiness based on understanding the differences and challenges faced by women." • "Networking with like-minded professional women"
	Solidarity	• "In a general sense, it has definitely improved my wellness, and I definitely feel it has improved solidarity and attitudes among the women physicians at our institution, promoting a culture of supportiveness." • "Listening to other women bearing their vulnerabilities is interesting and lends itself for the opportunity to help buttress our sisters' confidence and understanding of our positions in the EM community." • "Makes the residency feel smaller and creates a tight knit community that has similar experiences and setbacks."
	Forward guidance	• "Moving forward I think women's night has inspired me to seek female mentees in my next job. It's so important to have mentors and these nights made me realize that I wish I had sought those relationships earlier in residency." • "A lot of concerns about my future were validated by faculty members and it was reassuring to have a way to discuss these concerns and ways to approach different issues." • "I'm more hopeful about my future in academics. It sounds crazy, but knowing that highly accomplished attendings still feel inadequate made me feel a lot better about myself and gave me a lot more confidence."
Weaknesses and threats		
	Participation	• "We work nights and PM shifts which take us away from family and friends. This is another evening away." • "Scheduling is difficult--both having shifts scheduled and devoting free time to these events."
	Structure of events	• "When the events are less structured, we have a tendency to lapse into just spending the time complaining." • "If I had to choose a weakness, I would say trying to balance the time for social interaction and formal professional discussion; ideally would be 50-50."
	Optics	• "Perception by non-participants that it is exclusionary or lack of recognition of importance of women's night (ie, lack of recognition of gender gap and the benefit of focused mentoring)." • "Perceived as 'lady's night,' or 'girl talk' by others." • "A few men expressed that these events were set up because women can't deal with the pressures of being a 'real doctor'. While I understand that these individuals have this opinion whether or not we have women's night, the fact that we had these nights led to this viewpoint being openly discussed in the workplace. It seems like almost every time we had a women's night, a comment like this would come up."
Opportunities		
	Expansion	• "Continue expanding conversation with different topics and evolving the nights into long-term mentorships that creates projects that residents can collaborate with attendings on during residency." • "One thing that is often brought up is the relationship of the female nurses in the ED…to female residents/attendings vs male. I think this relationship could be greatly improved if 1-2 times per year, we had an event that included the rest of the female staff…not just the physicians." • "Consider inter-group dialogue/inclusion with select male residents."

REFERENCES

1. Bennett, CL, Raja, AS, Kapoor, N, et al. Gender differences in faculty rank among academic emergency physicians in the United States. *Acad Emerg Med*. 2019;26(3):281-5.

2. Wiler, JL, Rounds, K, McGowan, B, et al. Continuation of gender disparities in pay among academic emergency medicine physicians. *Acad Emerg Med*. 2019;26(3):286-92.

3. Levine RB, Lin F, Kern DE, et al. Stories from early-career women physicians who have left academic medicine: a qualitative study at a single institution. *Acad Med*. 2011;86(6):752-8.

4. Linzer M, Levine R, Meltzer D, et al. Ten bold steps to prevent burnout in general internal medicine. *J Gen Intern Med*. 2014;29(1):18-20.

5. The State of Women in Academic Medicine: the Pipeline and Pathways to Leadership, 2015-2016: Association of American Medical Colleges. Available at https://store.aamc.org/downloadable/download/sample/sample_id/228/. Accessed August 15, 2018.

6. Cydulka RK, D'Onofrio G, Schneider S, et al. Women in academic emergency medicine. *Acad Emerg Med*. 2000;7(9):999-1007.

7. Brafman R CE, Cydulka R, MacConaghy L, et al. Revisiting the status of women in academic emergency medicine. Society for Academic Emergency Medicine (SAEM) Annual Meeting; 2014; Dallas, TX.

8. Madsen TE, Linden JA, Rounds K, et al. Current status of gender and racial/ethnic disparities among academic emergency medicine physicians. *Acad Emerg Med*. 2017;24(10):1182-92.

9. Cheng D, Promes S, Clem K, et al. Chairperson and faculty gender in academic emergency medicine departments. *Acad Emerg Med*. 2006;13(8):904-6.

10. Watts SH, Promes SB, Hockberger R. The Society for Academic Emergency Medicine and Association of Academic Chairs in Emergency Medicine 2009-2010 Emergency Medicine Faculty Salary and Benefits Survey. *Acad Emerg Med*. 2012;19(7):852-60.

11. Doximity. 2018 Physician Compensation Report: Second Annual Study. 2018. Available at: https://info-tf.doximity.com/hubfs/Downloadable_Guides/doximity_second_annual_physician_compensation_report_round9FINAL.pdf. Accessed August 15, 2018.

12. Peckham C. Medscape Emergency Medicine Physician Compensation Report 2018. 2018. Available at https://www.medscape.com/slideshow/2018-compensation-overview-6009667. Accessed August 15, 2018.

13. Straus SE, Straus C, Tzanetos K. International campaign to revitalise academic medicine career choice in academic medicine: systematic review. *J Gen Intern Med*. 2006;21(12):1222-9.

14. DeFazio CR, Cloud SD, Verni CM, et al. Women in emergency medicine residency programs: an analysis of data from Accreditation Council for Graduate Medical Education-approved residency programs. *AEM Educ Train*. 2017;1(3):175-8.

15. Laver KE, Prichard IJ, Cations M, et al. A systematic review of interventions to support the careers of women in academic medicine and other disciplines. *BMJ Open*. 2018;8(3):e020380.

16. Levinson W, Kaufman K, Clark B, et al. Mentors and role models for women in academic medicine. *West J Med*. 1991;154(4):423-6.

17. Welch JL, Jimenez HL, Walthall J, et al. The Women in Emergency Medicine Mentoring Program: an innovative approach to mentoring. *J Grad Med Educ*. 2012;4(3):362-6.

18. Lin, MP, Lall, MD, Samuels-Kalow, M, et al. Impact of a women-focused professional organization and academic retention and advancement: perceptions from a qualitative study. *Acad Emerg Med*. 2019;26(3):303-16.

19. Choo EK, Kass D, Westergaard M, et al. The development of best practice recommendations to support the hiring, recruitment, and advancement of women physicians in emergency medicine. *Acad Emerg Med*. 2016;23(11):1203-9.

20. Kuhn GJ, Abbuhl SB, Clem KJ. Recommendations from the Society for Academic Emergency Medicine (SAEM) Taskforce on Women in Academic Emergency Medicine. *Acad Emerg Med*. 2008;15(8):762-7.

21. FemInEM. Available at www.feminem.org. Accessed August 15, 2018.

22. Academy for Women in Academic Emergency Medicine, Society for Academic Emergency Medicine. Avaialable at https://www.saem.org/awaem. Accessed August 15, 2018.

23. American Medical Women's Association, American College Emergency Physicians. Available at https://www.amwa-doc.org. Accessed August 15, 2018.

24. Women in Emergency Medicine Committee, American Academy of Emergency. Available at https://www.aaem.org/get-involved/committees/committee-groups/women-in-emergency-medicine. Accessed August 2018.

25. Bhatia K, Takayesu JK, Arbelaez C, et al. An innovative educational and mentorship program for emergency medicine women residents to enhance academic development and retention. *CJEM*. 2015;17(6):685-8.

26. Parekh, KP, Overbeeke T, Halsey-Nichols RM. Implementation of a departmental female emergency medicine physician group. *West J Emerg Med*. 2019;20(1):98-9.

27. SWOT analysis: discover new opportunities, manage and eliminate threats. Available at https://www.mindtools.com/pages/article/newTMC_05.htm. Accessed August 25, 2018.

28. Kern DE, Thomas PA, Hughes MT.(2009). C*urriculum Development for Medical Education: A Six-Step Approach*. 2nd ed. Baltimore, MD: Johns Hopkins University Press.

29. Harris PA, Taylor R, Thielke R, et al. Research electronic data capture (REDCap)--a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform*. 2009;42(2):377-81.

30. Leigh D. SWOT Analysis. In: K.H. Silber WRF, R. Watkins, D. Leigh, J.L. Moseley, and J.C. Dessinger, ed. *Handbook of Improving Performance in the Workplace*: Volumes 1-32010.

31. Hill CE. (2012). *Consensual Qualitative Research: A Practical Resource for Investigating Social Science Phenomena* (1st ed). Washington, DC: American Psychological Association.

32. Files JA, Blair JE, Mayer AP and Ko MG. Facilitated peer mentorship: a pilot program for academic advancement of female medical faculty. *J of Womens Health*. 2008;17(6):1009-15.

33. Seritan AL, Bhangoo R, Garma S, et al. Society for Women in Academic Psychiatry: a peer mentoring approach. *Acad Psychiatry*. 2007;31(5):363-6.

Exploring Action Items to Address Resident Mistreatment through an Educational Workshop

Max Griffith, MD*
Michael J. Clery, MD, MPH†
Butch Humbert, MD‡
J. Michael Joyce, MD§
Marcia Perry, MD¶
Robin R. Hemphill, MD, MPH§
Sally A. Santen, MD, PhD§

*Michigan Medicine/St. Joseph Mercy Ann Arbor, Department of Emergency Medicine, Ann Arbor, Michigan
†Emory University School of Medicine, Grady Memorial Hospital, Department of Emergency Medicine, Atlanta, Georgia
‡Indiana University School of Medicine, Department of Emergency Medicine, Indianapolis, Indiana
§Virginia Commonwealth University School of Medicine, Department of Emergency Medicine, Richmond, Virginia
¶Michigan Medicine, Department of Emergency Medicine, Ann Arbor, Michigan

Mistreatment of trainees is common in the clinical learning environment. Resident mistreatment is less frequently tracked than medical student mistreatment, but data suggest mistreatment remains prevalent at the resident level. To address resident mistreatment, the authors developed an Educational Advance to engage emergency medicine residents and faculty in understanding and improving their learning environment. The authors designed a small-group session with the following goals: 1) Develop a shared understanding of mistreatment and its magnitude; 2) Recognize the prevalence of resident mistreatment data and identify the most common types of mistreatment; 3) Relate study findings to personal or institutional experiences; and 4) Generate strategies for combating mistreatment and strengthening the clinical learning environment at their home institutions. Design was a combination of presentation, small group discussion, and facilitated discussion. Results were presented to participants from a previously administered survey of resident mistreatment. Public humiliation and sexist remarks were the most commonly reported forms. Faculty were the most frequent perpetrators, followed by residents and nurses. A majority of respondents who experienced mistreatment did not report the incident. Session participants were then asked to brainstorm strategies to combat mistreatment. Participants rated the session as effective in raising awareness about resident mistreatment and helping departments develop methods to improve the learning environment. Action items proposed by the group included coaching residents about how to respond to mistreatment, displaying signage in support of a positive learning environment, zero tolerance for mistreatment, clear instructions for reporting, and intentionality training to improve behavior. [West J Emerg Med. 2020;21(1):42–46.]

BACKGROUND

Mistreatment in medical education is common;[1,2] however most reporting to date has focused on mistreatment experienced by medical students.[3,4] Studies have linked medical student mistreatment with increased rates of burnout,[2] and symptoms of post-traumatic stress.[5] In addition to its effects on learners' psyches, mistreatment in the medical learning environment is troubling as it may contribute to poor outcomes for patients.[6]

The American Association of Medical Colleges (AAMC) Graduation Questionnaire (GQ) has tracked medical student mistreatment since it first included questions about mistreatment in 1991.[1] The GQ asks about experiences with sixteen mistreatment behaviors, such as public humiliation,

discriminatory comments based on race, gender, ethnicity or sexual orientation, and being threatened with physical harm.[7] There is no comparable tool for tracking rates of resident mistreatment. The existing literature on mistreatment experienced by residents is sparse but suggests that issues with the learning environment persist throughout medical training.[8,9]

As trainees at teaching hospitals, residents' professional identities are shaped by their medical learning environments.[10] The learning environment has been conceptualized as a combination of personal, physical, social and cultural factors, which, when supportive, helps learners thrive, and when unsupportive, contributes to depression and burnout.[11] Improving the clinical learning environment by reducing resident mistreatment is an important goal for the wellbeing of the next generation of physicians, and by proxy, their patients. To address resident mistreatment, we developed an Educational Advance to engage emergency medicine (EM) residents and faculty in understanding and improving their learning environment.

OBJECTIVES

We designed a small-group session using an approach based on the six-step approach to curricular development described by Kern et al which includes problem identification and general needs assessment, needs assessment for targeted learners, goals and objectives, educational strategies, implementation, and evaluation/feedback.[12] A general needs assessment had previously been conducted in the form of a survey about resident mistreatment at three institutions demonstrating a high rate of mistreatment.[13]

For a second needs assessment for targeted learners – in this case EM residents, faculty and staff – we separated out mistreatment data as reported by EM residents only. We found that the rates and types of mistreatment reported by EM residents were generally similar to the combined data from residents across all specialties.

We identified the following goals and objectives for this session: 1) Develop a shared understanding of mistreatment and its magnitude; 2) Recognize the prevalence of resident mistreatment and identify the most common types of mistreatment; 3) Relate study findings to personal or institutional experiences; 4) Generate strategies for combating mistreatment and strengthening the clinical learning environment at their home institutions.

As part of a quality improvement project, these sessions were assigned Institutional Review Board "not regulated" status.

CURRICULAR DESIGN

For educational strategy, a didactic format was chosen to provide background on the definition and scope of resident mistreatment, as well as an interactive small group component with facilitated discussion to draw on the diverse perspectives of participants. The conceptual framework was constructivist,

with each participant building their own understanding from personal experience and discussion with others.

Section 1: As an introduction, in order to develop shared understanding of mistreatment, participants were asked about past experiences with mistreatment. Responses were wide-ranging, from the perceived disrespect of referring to a resident by first name in front of patients rather than by their title of doctor, to publicly berating a resident for failing a line placement, accusing them of incompetence and blaming them for the patient's poor outcome in front of the care team and patient family. This conversation established that mistreatment may be blatant or subtle, is subjective, and likely depends on the observer's past experiences with discrimination or marginalization, as well as the power dynamics between the involved individuals.

The introduction was followed by presentation of data from a previous study which surveyed residents across multiple specialties at three institutions.[13] The survey queried residents whether they had experienced various categories of mistreatment, with options similar to those found in the AAMC GQ. Residents were also asked whether or not they reported the mistreatment, their reasons for not reporting, and who the perpetrators of mistreatment were (e.g. faculty, other residents, or nursing staff). Public humiliation and sexist remarks/names were the most commonly reported forms of mistreatment. Additionally, residents reported faculty were the most frequent perpetrators of mistreatment, followed by other residents, and nurses. A minority of respondents who experienced mistreatment reported the incident to their institution or program. Reasons for not reporting were "Did not seem important enough," "I did not think anything would be done about it," "I resolved the issue myself," and "I did not know what to do." Following the presentation, participants engaged in small group discussions about participants' personal or witnessed experiences with resident mistreatment.

Section 2: The session facilitators provided a brief review of institutional practices for addressing resident mistreatment, outlined in Table 1. Participants were then asked to brainstorm and share strategies to combat mistreatment so that together they might develop strategies to take back to their programs.

Implementation involved identifying appropriate settings for this session to take place. This session was facilitated twice in two separate settings: as part of the weekly educational conference for an EM residency program and as a didactic at the Society for Academic Emergency Medicine annual meeting in 2019.

Evaluation and feedback were gathered through an electronic evaluation form that all participants were encouraged to complete.

IMPACT/EFFECTIVENESS

At the conclusion of each of the two sessions, participants were asked to complete an electronic evaluation of the sessions' effectiveness. Twenty-five participants completed evaluations (9/10 at SAEM and

Table 1. Practices for addressing mistreatment at the institutional level with tips for successful implementation.

Systems for reporting all instances of mistreatment

      Conduct needs assessment to quantify the problem and identify problem areas

      Anonymity may facilitate reporting

Unified messaging defining mistreatment & behavioral expectations

      Avoid ambiguity with a single, clear message backed by unequivocal action

Communication and behavioral training for residents and faculty

      Increase self-awareness through role playing and simulation with feedback

Establish positive culture

      Provide well-defined professionalism policies/procedures

      Include domains of mistreatment on annual evaluations

      Introduce concepts during onboarding, reinforce periodically

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16/28 at the residency conference) for an overall response rate of 71%. Respondents included 13 residents and 12 attendings/fellows. One hundred percent responded "yes" to the question, "Was this workshop effective in raising awareness of the problem of resident mistreatment?" Similarly, 100% responded yes to the question, "Did this workshop help your department to come up with ways to improve the learning environment?"

Participants were asked whether they would make any changes to the way they approached learners, trainees or other staff in the learning environment. Examples of free responses were wide-ranging and included, "Encourage [residents] to provide feedback to others if they feel there is an improper interaction," "introspection of my own handling of resident communication," "I will be more respectful about privacy when providing evals," and "Will consider signage and emphasizing the chain of command"

The institutional interventions that were proposed to address resident mistreatment approach the issue from multiple standpoints: personal (coaching residents), physical (supporting signage), social (training), and cultural (zero tolerance policy). Further research is required to determine whether any of these proposed interventions would reduce rates of resident mistreatment, though the variety of approaches offers multiple avenues to address a common problem.

Resident and faculty participants also included feedback for how to improve future iterations of this session. Ideas included providing more specific tools for how to combat mistreatment, as well as incorporating interactive activities to help participants build skills to address mistreatment.

Session facilitators wrote down action items that emerged from the group discussion on strategies to combat mistreatment, detailed below. We provide the interventions in this Educational Advance to help others who might use a similar discussion session to begin the conversation about how to address mistreatment at their own programs.

A zero-tolerance policy for episodes of mistreatment was identified as essential. Given that residents under-report mistreatment due to concern that nothing will be done, it is important to demonstrate that there are real repercussions for those who mistreat residents. This should be placed in departmental policy as well as faculty manuals. The emergency department or other clinical setting may display a prominent sign stating abusive behavior will not be tolerated. If anyone displays abusive behavior to the resident, she may point out the sign as a clear and official reminder. This is a visible reminder to all faculty, staff and residents, but also to patients and families (a significant source of mistreatment beyond the scope of this paper).

In order to effectively address resident concerns about mistreatment, instances of mistreatment must be consistently and thoroughly documented. Session participants recommended instructing residents to document very clearly what was said or done, and by whom, in order to equip the institution with the necessary information to make an intervention. This must be done in a manner that feels safe for the resident and, depending on who is involved, may require using resources outside of the department. Policies should be in place to define when this is appropriate. Similarly, some residents had reported not knowing what to do with their concerns about mistreatment. For this reason, we highlighted the importance of detailing an explicit chain of command so that residents know who to approach with concerns. In addition, any institutional mechanisms, online reporting or ombudsperson should also be publicized so residents are aware of their existence and how you can use them to report mistreatment.

Faculty can coach residents about how to respond to mistreatment. As an example, a resident was publicly berated by an attending for failing a line placement. It was

emphasized that residency leadership has the responsibility to defend the resident after the fact, and it is also important that the resident displays professionalism in the moment. Feedback and expectations should be provided to the involved faculty, but repeated behaviors must be addressed.

Finally, participants recognized the potential to develop intentionality through training. Microaggressions, increasingly recognized as a form of discrimination in the medical workplace,[14] may be unintentional or stem from lack of awareness on the part of the perpetrator. Multiple discussants identified systems their programs had developed to reduce, or at least acknowledge, microaggressions in the clinical environment. One example was an institutionally-supported code word that anyone could speak when they perceived a microaggression, empowering people to speak out. Another example involved an acronym that was taught to encourage mindfulness about interpersonal interactions. Based on our discussions, the need for training on self-reflection and thoughtful communication cannot be understated.

A limitation to this study is the level of impact. Participants reported they would change their approach to interactions with others as a result of this workshop; however, this reflects a hypothetical change in behavior which is subject to desirability bias. Further studies might explore perceived changes in program culture following the workshop. Participants were also self-selected, suggesting they already had an interest in tackling this problem. Future workshops will need to target all members of the learning environment. While we gathered data about participants status as resident or fellow/attending, we did not ask about demographic factors such as gender, ethnicity or age. With more participants, it would be informative to analyze for differences according to demographic groups. Additionally, participants responded that this session helped them come up with departmental solutions to improve the learning environment, but we have no information about how many ideas generated during this session were followed by departmental action or whether these actions were effective. It is our hope that this or similar sessions will provide the foundations for future interventions which will be measured and reported on.

Mistreatment of residents is common and detrimental to resident training and may have a negative impact on healthcare team dynamics and patient care. Residencies have a responsibility to foster a productive learning environment though there are many possible approaches. In conclusion, through two small group sessions, we were able to develop a better shared understanding of mistreatment and generate a list of action items to take on the issue. We have described an interactive educational session which can be applied in other settings to generate ideas – a first step to addressing this problem for residency programs.

Address for Correspondence: Max Griffith, MD, Michigan Medicine / St. Joseph Mercy Ann Arbor, Department of Emergency Medicine, 1500 E. Medical Center Dr., Ann Arbor, MI 48109. Email: mgrif@med.umich.edu.

REFERENCES:

1. Mavis B, Sousa A, Lipscomb W, et al. Learning about medical student mistreatment from responses to the medical school graduation questionnaire. *Acad Med*. 2014;89(5):705-11.
2. Cook AF, Arora VM, Rasinski KA, et al. The prevalence of medical student mistreatment and its association with burnout. *Acad Med*. 2014;89(5):749-54.
3. Breed C, Skinner B, Purkiss J, et al. Clerkship-Specific Medical Student Mistreatment. *Med Sci Educ*. 2018;28(3):477-82.
4. Hasty BN, Miller SE, Merrell SB et al. Medical student perceptions of a mistreatment program during the surgery clerkship. *Am J Surg*. 2018;215(4):761-6.
5. Heru A, Gagne G, Strong D. Medical student mistreatment results in symptoms of posttraumatic stress. *Acad Psychiatry*. 2009;33(4):302-6.
6. Riskin A, Erez A, Foulk TA, et al. The impact of rudeness on medical team performance: a randomized trial. *Pediatrics*. 2015;136(3):487-95.
7. Association of American Medical Colleges. Graduation Questionnaire Survey. 2017. Available at: https://www.aamc.org/system/files/reports/1/2017gqallschoolssummaryreport.pdf. Accessed 18 May 2017.
8. Nagata-Kobayashi S, Maeno T, Yoshizu M, et al. Universal problems during residency: abuse and harassment. *Med Educ*. 2009;43(7):628–36.
9. Fnais N, Soobiah C, Chen MH et al. Harassment and discrimination in medical training: A systematic review and meta-analysis. *Acad Med*. 2014;89(5):817–27.
10. Spencer J. Abc Of Learning and Teaching In Medicine: Learning And Teaching In The Clinical Environment. *BMJ*. 2003;326(7389):591-4.
11. Gruppen LD, Irby DM, Durning SJ et al. Conceptualizing Learning Environments in the Health Professions. *Acad Med*. 2019. In press.
12. Kern DE, Thomas PA, Hughes MT. *Curriculum Development for*

Medical Education: A Six-Step Approach. 2015. Baltimore, MD: The Johns Hopkins University Press.

13. Hammoud MM, Appelbaum N, Wallach PM, et al. Mistreatment in Our Learning Environments: Reports by Residents and Students. Presentation at: AAMC National Meeting; November 2018; Austin, TX.

14. Bleich MR. Microaggression and Its Relevance in Health Care. *J Contin Educ Nurs.* 2015;46(11):487-8.

An Innovative Feedback Tool Leading to Improved Faculty Feedback and Positive Reception by Residents

Raquel Harrison, MD*
Alina Tsyrulnik, MD†
David Brian Wood, MD‡
Ryan F. Coughlin, MD†
David Della-Giustina, MD†
Katja Goldflam, MD†

*Bridgeport Hospital, Department of Emergency Medicine, Bridgeport, Connecticut
†Yale University School of Medicine, Department of Emergency Medicine, New Haven, Connecticut
‡St. Joseph Medical Center, Department of Emergency Medicine, Stockton, California

Introduction: In 2012 the Accreditation Council for Graduate Medical Education implemented trainee milestones as tools for clinical competency committees to use for evaluation, feedback, remediation, and promotion purposes. Prior to this innovation, there has not been an adequate method to capture, organize, and graphically illustrate the evaluations by attendings in a simple, fast and organized fashion.

Methods: We created a novel, web-based, mobile-friendly evaluation tool to help fill this identified gap. The survey-based program creates a milestone-based evaluation, takes only a few minutes to complete, and easily collates the results in a graphic format creating an individualized "dashboard." The dashboard is then used by both trainees and their evaluators as a feedback platform.

Results: With the implementation of the dashboard, educational leadership has noted an increase in the number of submitted evaluations of residents and the amount of face-to-face feedback given by attendings to residents. A post-implementation survey of the residents revealed that they found the dashboard-provided feedback more helpful than prior modes of feedback, although the number of evaluations was still too few.

Conclusion: The use of our feedback dashboard is useful to multiple targeted end-users, including general faculty evaluators, program leadership, and the residents themselves for gathering formative feedback that is specific and timely. This tool is adaptable and likely generalizable to other residency programs and specialties. [West J Emerg Med. 2020;21(1):47–51.]

INTRODUCTION

The Accreditation Council on Graduate Medical Education (ACGME) requires residency leadership to evaluate residents and inform the residency clinical competency committee (CCC), in order for them to evaluate each resident using the ACGME milestone framework for assessment (essential competencies defined by each specialty). Additionally, the CCC should seek to provide formative feedback to residents for goal-directed self-improvement and to encourage reflective conversations.[1] Feedback should be ongoing, dynamic, encourage self-reflection, and provide a structure for desired performance.[2]

Emergency medicine (EM) is a unique clinical environment. The rapid pace of clinical care provides the resident with a rich *in vivo* context for observational learning from undifferentiated patients, procedures, resuscitations, and challenging patient-care team interactions. Unfortunately, there is a lack of satisfaction across EM residents regarding quantity and quality of real-time feedback.[3] Previous data suggest that visual aid modalities may help reinforce delivery of constructive feedback.[4] To our knowledge, dashboards have been described as opportunities

to visualize data for CCCs and semi-annual performance evaluations but not to increase transparency of information to learners on an ongoing basis.[5] This study group sought an innovative way to improve assessment satisfaction and quality, verbal feedback, and to understand resident performance on both individual and group levels using a survey-driven dashboard.

OBJECTIVES

The objectives of this educational innovation were threefold. The first was to develop a resident evaluation tool that would allow ease of use by the attending physicians. This tool would increase attending participation in feedback and encourage the timeliness of feedback as the evaluation was completed, preferably at the end of the associated clinical shift. Second, we sought to develop a feedback tool that was thorough enough to evaluate the resident using the ACGME Milestone framework. Finally, we aimed to develop a dashboard that could summarize and display the feedback in a clear and easy-to-read format that would be available to the resident in real time.

CURRICULAR DESIGN

The study presented was performed at a four-year, academic EM residency program with 15 residents per class. Although the residents rotate at two sites, a university and a community hospital (each with its own faculty), the study was done with only the university faculty (52 total faculty) evaluating residents on their performance at the main site (university hospital). The description of this feedback and assessment innovation received exemption from the institutional review board.

Approximately three years ago, a need for improved compliance with evaluation of resident clinical performance was identified within the department (Table 1). Two focus group sessions were conducted: one with faculty, to communicate possible reasons for poor compliance; and one with residents, to understand their perceptions of the quality of evaluations received. The faculty focus group included nine faculty members from different sections within the department (department of EM sections include: administration, education, emergency medical services, global health, research, and ultrasound). The resident focus group included nine members from the rising postgraduate year (PGY) 2 and rising PGY 3 residency classes.

After analyzing concerns discussed during these focus groups, two internal surveys were created to further understand the problem within the department on a broader scale and sent to the faculty and residents (Appendix A and B respectively). The response rate for the faculty survey was 38 out of 52 (73%), and that for the residents was 33 out of 60 (55%). As these surveys were created de novo, based on focus groups, there was no validation process for them. From the survey results, an evaluation tool was developed that faculty could access via a mobile device. This tool used a survey system available within our university, Qualtrics, a licensed survey design system that allows online survey design and randomization of survey questions.

A simplified "beta" version of the tool was initially tested by the residency leadership team for approximately two months. Minor changes were made, and it was then distributed to the faculty as a whole (referred to as "Version 1" in Table). After sending an access link via e-mail, faculty were introduced to the tool during a faculty meeting and encouraged to "add a shortcut to the homescreen" on their mobile device for ease of mobile access. Less than 10 minutes of training was required to familiarize users with the tool. Additionally, a QR (quick response) matrix barcode was posted in the faculty workroom to visually remind them of the feedback tool and to allow them an additional method of easy access to the tool. The residents were surveyed after six months to assess satisfaction with the new evaluation system (Appendix C). The response rate to the survey was 43% (26 out of 60 residents).

Because "Version 1" of the survey tool provided proof of concept, modifications were then made to the survey to capture more information. Currently, the Qualtrics-based evaluation tool is a web-based survey form easily accessed on a mobile device or computer, taking only a few minutes to complete. This process is initiated by attending physicians, but residents are also encouraged to prompt attendings to use the tool.

In an effort to maximize the clinical applicability of the 23 EM milestones, they were subdivided into procedural and non-procedural subcategories. Further, within each milestone the verbiage of the individual levels was truncated to extract only the clinically relevant aspects of the competencies (Figure 1). Language was reviewed and created via consensus effort discussion among the residency leadership group.

When using the platform, the evaluator is given two

Table 1. Timeline of survey tool development.

June 2016	Focus groups: faculty and residents
July 2016	Departmental surveys / needs assessment of faculty and residents
July 2016	Test version using residency leadership only
September 2016	Version 1 launched
September 2017	Current evaluation tool
September 2018	Dashboard launched

MS1- Emergency Stabilization of the Critically Ill Patient (check all that apply).

☐ Recognizes abnormal vitals

☐ Recognizes need for intervention

☐ Prioritizes management for stabilization

☐ Frequently reassess and recognizes need for further investigation

☐ Discusses protocols for managing crtically ill patients

Figure 1. Sample question from survey tool based on emergency medicine milestone 1.

randomized questions from a pool of 17 questions that represent the non-procedural milestones. The evaluator is not forced to place the resident on a scale, but rather check all competencies within each milestone that were met. The evaluator is then prompted with a list of possible milestone procedures that may have been supervised. If observed, they can evaluate the procedure performed based on the milestone competencies. More than one procedure can be evaluated during a single evaluation. The evaluation finishes with two qualitative questions that can be dictated or typed if using a mobile device: "1. strengths of shift (cite example);" and "2. items to work on/medical topic to focus on (cite example)." A prompt is then provided to assess whether verbal feedback was provided to the resident and whether positive, constructive, or both were discussed.

The data collected from these evaluations were mapped in real-time into a visually simplified dashboard (part of Qualtrics Vocalize functionality) that allows residents and residency leadership to identify trends of success and deficiency, and to access specific qualitative feedback (Figure 2).

Figure 2 shows a visual representation of compilation of all feedback given for an individual or a group of residents over a time period that can be selected. An additional feature of the dashboard is the ability to include evaluation data from other sources, such as evaluations of residents by nurses. Those sources can use a different set of evaluation questions, as they do at our institution, as long as they use the Qualtrics survey tool. Access to the survey is granted via an e-mailed link to nurses. The use of this software was donated for the pilot of this project by Qualtrics.

Figure 2. Sample of dashboard screenshot.

IMPACT / EFFECTIVENESS

Compliance with evaluations, as measured by the number of faculty filling out at least one evaluation, increased from approximately 18 out of 52 (34.6%) before "Version 1" implementation to 45 out of 56 (86.5%) thereafter (p<0.001). Additionally, 26 out of 60 residents (43%) responded to a survey

six months after the dashboard was in use to assess satisfaction with this tool and reported finding feedback via the dashboard more specific and more "useful" in comparison to the other evaluation system (Medhub) used at our institution. They cited receiving more written feedback with the new system, although the majority felt like the amount of verbal feedback remained static (Figure 3 and Appendix C).
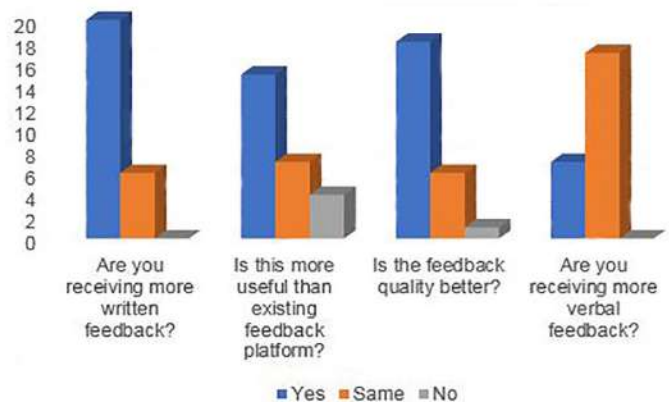
Figure 3. Resident survey results.
Graphical representation of responses by residents to a survey assessing their satisfaction with the dashboard six months after its use was initiated (Appendix C).

Between "Version 1" implementation and the current version, attending physicians have self-identified an increase in the amount of verbal feedback that is being communicated. Analysis of the prompt: *"Did you have a face-to-face discussion regarding this feedback with the resident?"* revealed an improvement in the answer "No" from 39.4% (n= 494) during the "Version 1" phase to 31.52% (n = 1364) in the current model (p = 0.001). The amount of "constructive" feedback also increased from 32.92% (n = 494) to 43.91% (n = 1364) (p<0.001) (Figure 4).

There is a general sense that the dashboard was well received among the residency leadership and the CCC members, as it allowed them to review residents during meetings and easily compare them to their peer group in order to assure proper progress through residency. It is particularly useful in CCC meetings (projected on the conference room screen), and during individual meetings with residents. Based on the small response rate to the post-deployment resident survey (43%), the residents reported that they interacted with the dashboard less frequently than we anticipated. Residents who routinely read their evaluations reported that the information was more helpful in real time, but still thought that the overall number of individual evaluations by faculty were too few.

In summary, this Qualtrics-based survey tool has improved faculty engagement in evaluation and feedback while providing more specific information to the residents. Compared to prior dashboards described in publication,[5] the

Version 1 tool (2017-2018)   Current tool (2018-2019)

28%   25%

39%   32%

6%   6%

27%   38%

■ No   ■ Yes- both positive and constructive   ■ No   ■ Yes- both positive and constructive feedback
■ Yes- the constructive ■ Yes- the positive feedback   ■ Yes- the constructive feedback ■ Yes- the positive feedback
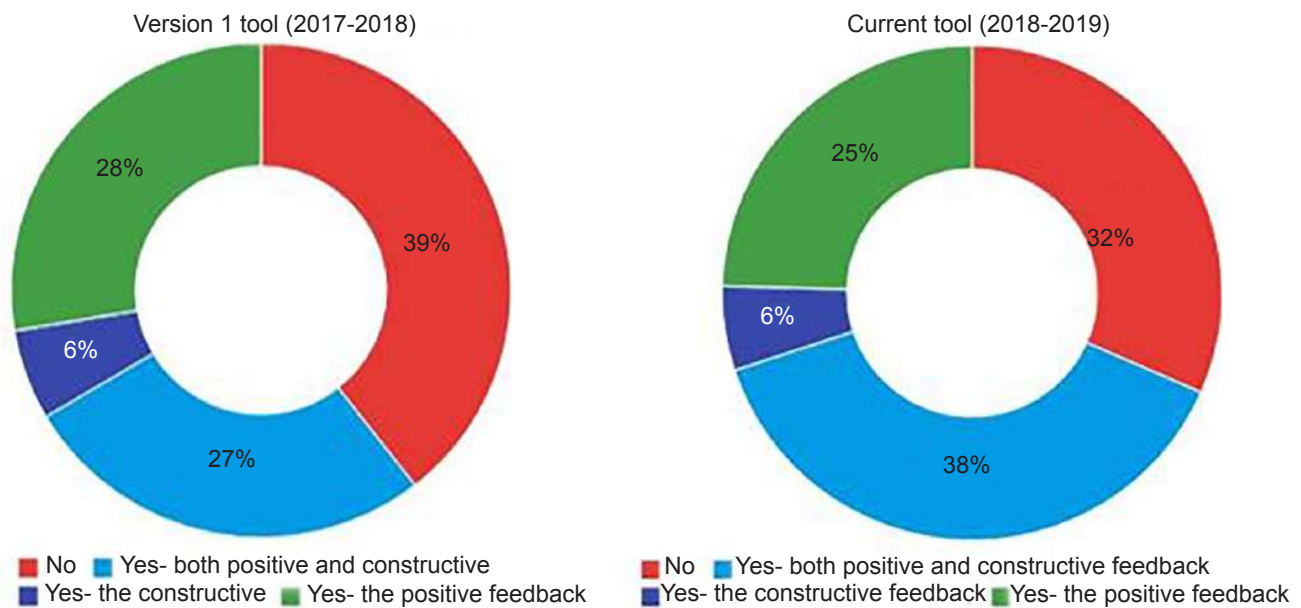
Figure 4. Did you have a face-to-face discussion regarding this feedback with the resident? Demonstrated decrease in "No feedback given" and increase in "Constructive feedback given."

tool presented here is a survey-based program that creates a milestone-based evaluation (including the ability to select procedures observed), takes only a few minutes to complete, and easily collates the results in a graphic format creating an individualized "dashboard." In addition, its application is not only for use by the CCC, but as feedback to residents on their performance. Because the tool is based on a survey system, a similar tool could likely be implemented within other residencies (without need for embedded coding knowledge) that are striving to engage more faculty; it would also be relevant to other procedural specialties that are observation-rich and where more frequent, smaller evaluations better inform the whole understanding of resident performance.

Through this new platform, and an effort to evaluate its effects, there is preliminary evidence suggesting improvement in the culture of feedback in our department by making a few key changes. We created a tool that can be accessed on a mobile device, is simple to use, and in which data collection is brief, asking the evaluator to complete what they are able to within the structure of their time constraints. This allows accumulation of data over time, even if small in amount, which was an improvement at this program. By taking advantage of randomization and the ability to select any procedure that was observed, we have been able to collect the breadth of information required to properly assess milestones despite each individual evaluation remaining brief. In addition, the dashboard displays the information in an easily understandable format and allows the residency leadership and CCC to identify trends for individuals and groups of residents quickly. Lastly, by providing a prompt toward feedback at the beginning, and by simply asking at the

end of the form whether the faculty members have engaged in face-to-face conversations with their residents, the number of conversations over time (as self-reported by the evaluators themselves) has significantly increased.

LIMITATIONS

The authors acknowledge several limitations to this study. First, there are no baseline formal measurements of written and face-to-face evaluations and their frequency before the intervention. There is potentially a pre-existing upward trend in evaluation numbers in response to resident feedback. The assumption made by this group is that the frequency and rate of increase in feedback was unacceptably low. The measured improvement in feedback frequency could be due to a larger focus on this problem area or the discussions on how to use the new tool, rather than the implemented changes themselves. The evaluation platform and dashboard were implemented at a single center and used only by faculty at the university residency site. Furthermore, the surveys used by the team before and after implementation were not validated and had relatively low response rates. The post-implementation data collected focused on the residents' perception of the feedback they received after its used, but not on the raw numbers of evaluations per resident per specific time period.

CONCLUSION

While we can report a trend of improved feedback frequency and quality, improving the culture of feedback requires significant evidence of sustained and well-integrated change. This is a direction for future study as well as an effort to evaluate similar tools at other institutions and across specialties.

Address for Correspondence: Alina Tsyrulnik, MD, Yale University School of Medicine, Department of Emergency Medicine, 464 Congress Ave, New Haven, CT 06519. Email: alina.tsyrulnik@yale.edu.

REFERENCES

1. Cantillon P, Sargeant J. Giving feedback in clinical settings. *BMJ.* 2008;337:a1961.

2. (2014). *Understanding Medical : Evidence, Theory and Practice.* 2nd ed (T. Swaniwick, K. Forrest, B.C. O'Brien, Eds). Hoboken; New Jersey:Wiley Blackwell.

3. Yarris LM, Linden JA, Gene Hern H, et al. Attending and resident satisfaction with feedback in the emergency department. *Acad Emerg Med.* 2009;16 Suppl 2:S76-81.

4. Brehaut JC, Colquhoun HL, Eva KW, et al. Practice feedback interventions: 15 suggestions for optimizing effectiveness. *Ann Intern Med.* 2016;164(6):435-41.

5. Friedman KA, Raimo J, Spielmann K, et al. Resident dashboards: helping your clinical competency committee visualize trainees' key performance indicators. *Med Educ Online.* 2016;21:29838.

Critical Electrocardiogram Curriculum: Setting the Standard for Flipped-Classroom EKG Instruction

William P. Burns, MD*
Nicholas D. Hartman, MD, MPH†
P. Logan Weygandt, MD, MPH‡
Shanna C. Jones, MD§
Holly Caretta-Weyer, MD, MHPE¶
Kristen Grabow Moore, MD, MEd‖

*University of Wisconsin, BerbeeWalsh Department of Emergency Medicine, Madison, Wisconsin
†Wake Forest School of Medicine, Department of Emergency Medicine, Winston-Salem, North Carolina
‡Johns Hopkins Medicine, Department of Emergency Medicine, Baltimore, Maryland
§Oakland University William Beaumont School of Medicine, Department of Emergency Medicine, Rochester, Michigan
¶Stanford University, Department of Emergency Medicine, Palo Alto, California
‖Emory University, Department of Emergency Medicine, Atlanta, Georgia

Introduction: Electrocardiogram (EKG) interpretation is integral to emergency medicine (EM).[1] In 2003 Ginde et al. found 48% of emergency medicine (EM) residency directors supported creating a national EKG curriculum.[2] No formal national curriculum exists, and it is unknown whether residents gain sufficient skill from clinical exposure alone.

Methods: The authors sought to assess the value of this EKG curriculum, which provides exposure to critical EKG patterns, a framework for EKG interpretation when the diagnosis is not obvious, and implementation guidelines and open access to any interested residency. The Foundations of Emergency Medicine (FoEM) EKG I course launched in January 2016, followed by EKG II in July 2017; they are benchmarked to post-graduate year 1 (PGY) and PGY2 level learners, respectively. Selected topics included 15 published critical EKG diagnoses and 33 selected by the authors.[5] Cases included presenting symptoms, EKGs, and Free Open Access Medical Education (FOAM) links. Full EKG interpretations and question answers were provided.

Results: Enrollment during 2017-2018 included 37 EM residencies with 663 learners in EKG I and 22 EM residencies with 438 learners in EKG II. Program leaders and learners were surveyed annually. Leaders indicated that content was appropriate for intended PGY levels. Leaders and learners indicated the curriculum improved the ability of learners to interpret EKGs while working in the emergency department (ED).

Conclusion: There is an unmet need for standardization and improvement of EM resident EKG training. Leaders and learners exposed to FoEM EKG courses report improved ability of learners to interpret EKGs in the ED. [West J Emerg Med. 2020;21(1)52-57.]

BACKGROUND

Electrocardiogram (EKG) interpretation is integral to the practice of emergency medicine (EM).[1] Few studies have been published regarding perceived EKG interpretation abilities of graduating residents from either EM program directors (PD) or residents. In 2003, Ginde et al. found 36% of EM residencies did not have formal EKG curricula and that 48% of EM PDs endorsed the creation of a national EKG curriculum.[2] Limited evidence suggests that EKG interpretation ability improves over the course of EM residency training and accuracy for rarer EKG diagnoses remains poor.[3] Further, limited evidence indicates that EM

resident performance on assessments of EKG interpretation is low and EM residents have reported feeling that their EKG training is inadequate.[4,5]

No universally adopted or mandated EKG curriculum for EM residents currently exists and it remains unknown whether residents gain sufficient skill to transition to independent practice from clinical exposure alone. There is no standardization of EKG interpretation instruction at the undergraduate medical education level. It is likely that new EM residents enter training with highly variable EKG interpretation capabilities and a study of first month internal medicine residents found low overall performance and that nearly all felt their training was insufficient.[6] This free and open access EKG curriculum was developed to address this gap.

OBJECTIVES

The primary objective of this effort was to create a high quality, open-access, free EKG curriculum that would provide exposure to critical EKG patterns, a framework for EKG interpretation when the diagnosis is not obvious, and implementation guidelines with the intent to reach all interested residency programs in a standardized fashion.

The primary aims of assessment were the site leaders' perceptions of appropriateness and satisfaction, as well as individual learner perceptions of satisfaction with the curriculum. Also assessed were learners' satisfaction with the EKG I and EKG II courses and their perception of the effect of this curriculum on their interpretation of EKGs in the clinical environment. Finally, an attempt was made to study both leaders' and learners' perceptions of learners' preparedness to interpret EKGs in the clinical environment at the start of residency.

CURRICULAR DESIGN

This curriculum developed in response to a perception of variability in EM residents' exposure to EKG interpretation instruction prior to the start of residency among the primary author's postgraduate year (PGY)1 peers. Utilization of Kern's Six Steps for Curriculum development allowed the evolution from what was initially an informal peer to peer educational intervention to a formalized curriculum that could be disseminated.[7]

Initially, a literature review was completed by the primary author and no available curriculum was identified that focused on EM resident learners. A targeted needs assessment was completed among PGY1 and PGY2 EM residents at the original institution. Specifically, they were surveyed regarding their formal EKG education prior to residency (lecture, small group, independent learning, elective), their preferences for future EKG education, and their comfort with specific aspects of EKG interpretation and diagnostic categories. The primary goals of the curriculum are to provide exposure to common and critical EKG patterns, a framework for EKG interpretation when the diagnosis is not obvious, and offer

implementation guidelines and open access to any interested residency program in order to minimize the burden of work for residency leadership and faculty and to maximally engage adult learners.[8]

The foundation of the case topics are 15 critical EKG diagnoses as defined by Hartman et al.[5] The primary author and two editors collectively identified 39 potential additional topics. Based on the relevance of each topic to EM practice 33 of the 39 topics were selected. Disagreement on inclusion was resolved by consensus of the majority. The EKG I course contains 24 cases divided into six units addressing fundamental concepts and is designed for PGY1-level learners. However, some programs are also using the curriculum for rotating medical students, PGY2 remediation, PGY1-4 EKG seminars, and/or advanced practice provider education. The EKG II course also contains 24 cases divided into six units addressing advanced content for PGY2-3 residents (Table 1). Each unit summary contains general approaches to EKG interpretation for common ED presentations such as syncope or ischemia as well as relevant example EKG images. The unit summaries support flipped classroom implementations by allowing learners to review summary content in advance of classroom sessions.[9]

Care was taken with regard to the selection of EKG images that best represent the learning objectives of the case and minimize diagnostic uncertainty. Images were selected by the consensus of the case author(s) and the two editors. Optional discussion questions and answers are also provided. An example discussion question for a case of Wolff-Parkinson-White with atrial fibrillation is provided below.

Question: "What medications are contraindicated in this situation?"

Answer: "Beta-blockers, calcium channel blockers, adenosine, and amiodarone are all incorrect choices as AV-nodal blockade can lead to preferential conduction down the accessory pathway with subsequent hemodynamic collapse, often from ventricular fibrillation."

Free Open Access Medical Education (FOAM) content links are provided for all cases. The majority of FOAM links were sourced from the "Life in the Fast Lane" blog on the basis of its accessible explanations and broad content. When similar content is available on "Dr. Smith's ECG Blog" site, links are also provided given the explanations provided are generally more in-depth.

Standardized interpretation stems and answers were modeled after the "Rule of Fours" as described by Dr. Gerard Fennessy which includes: history/clinical picture, rate, rhythm, axis, P waves, QRS morphology, T waves, U waves, PR interval, QRS width, ST segments, QT interval.[10] Full EKG interpretations and answers to all discussion questions are provided to instructors. Figure 1 represents an example of the case layout.

Table 1. EKG I and EKG II Courses.

EKG I Course		EKG II Course	
Unit I	Approach to Ischemia: STEMI	Unit VII	Approach to Fasicular Blocks
Case 1	Anterolateral STEMI	Case 25	Bundle Branch Blocks
Case 2	Inferior STEMI	Case 26	Left Anterior Fascicular Block
Case 3	Posterior STEMI	Case 27	Left Posterior Fascicular Block
Case 4	Left Bundle Branch Block STEMI	Case 28	Bi/Trifascicular Blocks
Unit II	Approach to Ischemia: Mimics	Unit VIII	Approach to Complex Ischemia
Case 5	Benign Early Repolarization	Case 29	Diffuse STD with aVR elevation
Case 6	Left Ventricular Aneurysm	Case 30	High Lateral STEMI
Case 7	Hyperkalemia	Case 31	DeWinter ST/T complex
Case 8	Pericarditis	Case 32	Right Ventricular Infarct
Unit III	Approach to Syncope	Unit IX	Miscellaneous Ischemic EKGs
Case 9	Brugada	Case 33	Pulmonary Embolism
Case 10	Long QT	Case 34	Cerebral T-waves
Case 11	Wolff-Parkinson-White	Case 35	Wellen's Waves
Case 12	Hypertrophic Obstructive Cardiomyopathy	Case 36	New Right Bundle Branch and Left Anterior Fascicular Blocks
Unit IV	Approach to Bradyarrhythmias	Unit X	Potassium Derangement
Case 13	2nd Degree AV Block Type I	Case 37	Hypokalemia
Case 14	2nd Degree AV Block Type II	Case 38	Mild/Moderate Hyperkalemia
Case 15	3rd Degree AV Block	Case 39	Severe Hyperkalemia
Case 16	Ventricular Escape Rhythm	Case 40	Wide Complex Bradycardia
Unit V	Approach to Tachyarrhythmias: Narrow Complex	Unit XI	Miscellaneous EKGs
Case 17	Supraventricular Tachycardia	Case 41	Antidromic Atrioventricular Reentrant Tachycardia
Case 18	Atrial Fibrillation with Rapid Ventricular Response	Case 42	Arrhythmogenic Right Ventricular Cardiomyopathy
Case 19	Atrial Flutter with Rapid Ventricular Response	Case 43	Digoxin Toxicity EKG Findings
Case 20	Multifocal Atrial Tachycardia	Case 44	Accelerated Idioventricular Rhythm
Unit VI	Approach to Tachyarrhythmias: Wide Complex	Unit XII	Approach to Paced Rhythms
Case 21	Ventricular Tachycardia	Case 45	Normal Atrioventricular Paced
Case 22	Wolff-Parkinson-White	Case 46	Normal Ventricular Paced
Case 23	Hyperkalemia	Case 47	Pacemaker-mediated Tachycardia
Case 24	Sodium Channel Blockade	Case 48	Failure to Capture

Foundations EKG I and II courses contain 48 unique cases including life threats and mimics.
STEMI, ST-elevation myocardial infarction; *AV,* atrioventricular; *EKG,* electrocardiogram.

Open access to all necessary course materials and best practice guidelines for implementation are provided to any interested EM residency via the Foundations of Emergency Medicine (FoEM) website www.foundationsem.com. The website contains a course schedule and links to unit summaries as well as case challenges for learners. The leader section, which provides access to EKG interpretations and answers, is password protected. Also, the provision of learner and leader specific PDFs minimizes the risk of inadvertent disclosure of answers. Leaders have the option of providing challenges either in advance of learning sessions or at the start of learning sessions. Providing the challenges in advance allows residents to attempt interpretation independently and at their own pace, while providing it during the session allows for an element of surprise that both prevents learner cooperation and mirrors the unpredictability of the clinical environment. Additionally, sites have the option of completing the review in small group settings with multiple instructors or a large group setting with a single instructor. Both courses may be implemented in either a longitudinal (15-minute review of single EKG) or workshop style (60-minute review of one unit/4 EKGs) approach.

From initial implementation in the 2014-2015 academic year the curriculum has been iteratively revised on an annual basis in response to learner and leader feedback. Such changes include the aforementioned unit summaries, FOAM links, and benchmarking of the EKG I and EKG II courses to PGY1 and PGY2 learners respectively.

IMPACT/EFFECTIVENESS
Impact of the curriculum was primarily assessed in March 2018 via surveys of residency leaders and participating learners at sites that implemented any FoEM content. In order to continue to refine and improve the offerings by FoEM, a survey was distributed in 2018 to learners and leaders. While primarily focusing on areas for quality improvement,

Triage EKG - Unit 1, Case 1

Foundations EKG - Unit 1, Case 1

57yM with hx of HL, DM2 c/o palpitations and SOB for the past 72 hours. Sent to the ED from PMD's office for an abnormal EKG.

HR: 95	BP: 160/110
RR: 18	O2 Sat: 96%

What is your interpretation of the EKG?

History/Clinical Picture

Rate

Rhythm

Axis

P Waves

Q/R/S Waves

T Waves

U Waves

PR Interval

QRS Width

ST Segment

QT Interval

What are the critical actions for this patient once the EKG diagnosis has been made and your clinical assessment is completed?

What EKG finding is most sensitive for ongoing ischemia?

Resource Links:

Life in the Fast Lane — great overview

Dr. Steve Smith's Blog – good case

Figure 1. Challenge electrocardiogram, standardized interpretation stem, and questions.
Challenge EKGs are provided to learners prior to Foundations meetings and contain the standardized interpretation and relevant questions.
EKG, electrocardiogram.

the impact of the curriculum on participating learners was assessed. To ensure response process validity, questions were vetted by and piloted among the FoEM leadership team. This survey was administered by the Foundations leadership; and the Emory University Institutional Review Board (IRB) deemed it IRB-exempt. The response rate for program leaders was excellent with 74 of 77 responding (96%). While learners had to self-report use of the EKG curriculum, their response rate was also acceptable at 72.2% (479/663).

Participation in the curriculum has increased rapidly alongside larger usage of Foundations of Emergency Medicine content nationally. Based on programs that registered for Foundations and completed the end-of-year survey, the number of residency programs participating in Foundations EKG increased from one program in 2014-2015 to 49 in 2018-2019 and participating resident learners increased from 15 in 2014-2015 to 1,311 in 2018-2019. Correspondingly, overall Foundations of Emergency Medicine participation increased from 1 program in 2014-2015 to 100 in 2018-2019. The last reported ACGME data regarding total EM residency programs

and total EM residents was in 2018-2019 with 247 programs and 7,940 residents.[11] During the 2018-2019 academic year, 19.8% of EM residency programs and 16.5% of EM residents were exposed to Foundations EKG as compared to 40.5% of programs that participated in any Foundations of Emergency Medicine content. Fewer than 100% of programs responded to our survey and thus these numbers may somewhat underrepresent our total impact.

Leaders and learners were surveyed regarding their satisfaction with both EKG I and EKG II (Table 2). Survey questions were designed around a five-point Likert scale (Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree). 100% of responding leaders agreed or strongly agreed that they were satisfied with both EKG I (n = 37) and EKG II (n = 22). Most learners agreed or strongly agreed that they were satisfied with both EKG I (86.7%, n = 309) and EKG II (80.3%, n = 152).

The survey also assessed appropriate benchmarking of EKG I to PGY1 learners and EKG II to PGY2 learners. Leaders were asked to rate their agreement that each course

Table 2. 2017-2018 Foundations EKG Learner and Leader Survey Results.

2017-2018 Learners Survey Results	Agree or strongly agree	Mean	N
Please respond to the following statement: At the beginning of residency, I was prepared to interpret EKGs.	27.6%	2.51	1,252
I am satisfied with the EKG I course.	86.7%	4.34	309
The EKG I course has improved my ability to interpret EKGs in the clinical environment.	85.4%	4.27	309
I am satisfied with the EKG II course.	80.3%	4.01	152
The EKG II course has improved my ability to interpret EKGs in the clinical environment.	83.2%	4.11	152

2017-2018 Leaders Survey Results	Agree or strongly agree	Mean	N
Please respond to the following statement: At the beginning of residency, compared to their classmates, interns are equally prepared to interpret EKGs.	13.5%	2.52	73
I am satisfied with EKG I course content.	100%	4.59	37
EKG I course content is appropriate for PGY-1 residents.	97.3%	4.62	37
I am satisfied with the EKG II course.	100%	4.58	22
EKG II course content is appropriate for PGY-2 residents.	100%	4.58	22

was appropriate for PGY1 and PGY2 residents respectively. They reported agreeing or strongly agreeing that both were learner-level appropriate at a rate of 97.3% (n = 37) for EKG I, and 100% (n = 22) for EKG II. Learners were also surveyed regarding the perceived effect of each curriculum. We found 85.4% (n = 309) of EKG I learners and 83.2% (n = 152) of EKG II learners agreed or strongly agreed that the respective courses had "improved my ability to interpret EKGs in the clinical environment."

An attempt was made to assess the perceptions of all FoEM leaders and learners with regard to learner preparedness to interpret EKGs in the clinical environment at the start of residency. Only 27.6% of the 1,252 learners who responded indicated that they agreed or strongly agreed with the statement: "at the beginning of residency, I was prepared to interpret EKGs." Only 13.5% of the 73 leaders who responded indicated that they agreed or strongly agreed with the statement: "at the beginning of residency, compared to their classmates, interns are equally prepared to interpret EKGs."

These preliminary data suggest that an unmet need for standardization and improvement of EKG training exists. Users of the FoEM EKG I and EKG II curricula report significant satisfaction and perceived benefits to patient care.

LIMITATIONS

This work contains important limitations to consider. First, with regard to implementation, there was no specific mandate on how the curriculum had to be provided or any method for assuring equivalent quality of in-person instruction. For example, variability between sites existed between the use of a flipped classroom approach or how many

cases were covered per week. All data was gathered from surveys which carries inherent potential for bias including self-reporting, response process validity, and unintentionally leading questions. It is also possible that respondents are biased in their evaluation of this curriculum based on their preceding experience with other EKG curricula given the variance in pre-existing EKG curricula at participating sites. Unfortunately, despite instructions to the have a single leader from each participating site complete the survey, 25% of sites ultimately submitted more than one survey. The issue of multiple surveys from one program was dealt with in the following manner: since the survey was anonymous, it was not possible to simply exclude extraneous surveys. For a given program, if discrepancies occurred between the multiple surveys, subjective responses were averaged to produce a composite result. For discrepancies in objective responses, attempts were made to assess which response was most valid in order to adjudicate. In assessing validity, complete responses and lower total participant counts were favored to minimize artificial inflation of impact.

CONCLUSION

This free, open-access, standardized, flipped-classroom, critical EKG interpretation curriculum continues to be refined. This curriculum consists of two courses, EKG I and EKG II, and is designed to target appropriate PGY-level learners, minimize the work required by instructors and residency leadership, and provide a standardized curriculum to learners. Learners who have used the curriculum report high satisfaction and improvement in their perception of their individual ability to interpret EKGs in the clinical

environment. Both leaders and learners alike believe that residents start residency with disparate abilities to interpret EKGs. Marked growth has occurred in the number of learners impacted by the curriculum and with continued growth it may set the standard for EM resident EKG education.

Address for Correspondence: William P. Burns, MD, University of Wisconsin, BerbeeWalsh Department of Emergency Medicine, 800 University Bay Dr., Madison, WI 53705. Email: wpburns@medicine.wisc.edu.

REFERENCES

1. Counselman FL, Babu K, Edens MA, et al. The 2016 Model of the Clinical Practice of Emergency Medicine. *J Emerg Med*. 2017;52(6):846-9.
2. Ginde AA, Char DM. Emergency medicine residency training in electrocardiogram interpretation. *Acad Emerg Med*. 2003;10(7):738-42.
3. Hoyle RJ, Walker KJ, Thomson G, et al. Accuracy of electrocardiogram interpretation improves with emergency medicine training. *Emerg Med Australas*. 2007;19(2):143-50.
4. Berger JS, Eisen L, Nozad V, et al. Competency in electrocardiogram interpretation among internal medicine and emergency medicine residents. *Am J Med*. 2005;118(8):873-80.
5. Hartman ND, Wheaton NB, Williamson K, et al. A Novel Tool for Assessment of Emergency Medicine Resident Skill in Determining Diagnosis and Management for Emergent Electrocardiograms: A Multicenter Study. *J Emerg Med*. 2016;51(6):697-704.
6. Eslava D, Dhillon S, Berger D, et al. Interpretation of electrocardiograms by first-year residents: the need for change. *J Electrocardiol*. 2009;42(6):693–7.
7. Thomas PA, Kern DE, Hughes MT, editors et al. Curriculum development for medical education: A six step approach. Baltimore: Johns Hopkins University Press; 2016.
8. Toohey SL, Wray A, Wiechmann W, et al. Ten tips for engaging the millennial learner and moving an emergency medicine residency curriculum into the 21st century. *West J Emerg Med*. 2016;17(3):337-43.
9. Young T, Bailey C, Guptill M, et al. The flipped classroom: A modality for mixed asynchronous and synchronous learning in a residency program. *West J Emerg Med*. 2014;15(7):938–44.
10. Fennessy G. ECG "Rule of Fours." Life in the Fast Lane. Available at: https://lifeinthefastlane.com/ecg-rule-of-fours. Accessed July 14, 2019.
11. Accreditation Council for Graduate Medical Education Data Resource Book 2018-2019. Accreditation Council for Graduate Medical Education; 2019. Available at: https://www.acgme.org/Portals/0/PFAssets/PublicationsBooks/2018-2019_ACGME_DATABOOK_DOCUMENT.pdf. Accessed October 25, 2019.

Impact of a Dedicated Teaching Attending Experience on a Required Emergency Medicine Clerkship

Todd A. Guth, MD*
Michael C. Overbeck, MD*
Kelley Roswell, MD†
Tien T. Vu, MD†
Kayla M. Williamson, MS*
Yeonjoo Yi, PhD*
William Hilty, MD‡
Jeff Druck, MD*

*University of Colorado School of Medicine, Department of Emergency Medicine, Aurora, Colorado
†University of Colorado School of Medicine, Department of Pediatrics, Aurora, Colorado
‡Saint Mary's Medical Center, Department of Emergency Medicine, Grand Junction, Colorado

Introduction: One published strategy for improving educational experiences for medical students in the emergency department (ED) while maintaining patient care has been the implementation of dedicated teaching attending shifts. To leverage the advantages of the ED as an exceptional clinical educational environment and to address the challenges posed by the rapid pace and high volume of the ED, our institution developed a clerkship curriculum that incorporates a dedicated clinical educator role – the teaching attending – to deliver quality bedside teaching experiences for students in a required third-year clerkship. The purpose of this educational innovation was to determine whether a dedicated teaching attending experience on a third-year required emergency medicine (EM) clerkship would improve student-reported clinical teaching evaluations and student-reported satisfaction with the overall quality of the EM clerkship.

Methods: Using a five-point Likert-type scale (1 - poor to 5 - excellent), student-reported evaluation ratings and the numbers of graduating students matching into EM were trended for 10 years retrospectively from the inception of the clerkship for the graduating class of 2009 through and including the graduating class of 2019. We used multinomial logistic regression to evaluate whether the presence of a teaching attending during the EM clerkship improved student-reported evaluation ratings for the EM clerkship. We used sample proportion tests to assess the differences between top-box (4 or 5 rating) proportions between years when the teaching attending experience was present and when it was not.

Results: For clinical teaching quality, when the teaching attending is present the estimated odds of receiving a rating of 5 is 77.2 times greater (p <0.001) than when the teaching attending is not present and a rating of 4 is 27.5 times greater (p =0.0017). For overall clerkship quality, when the teaching attending is present, the estimated odds of receiving a rating of 5 is 13 times greater (p <0.001) and a rating of 4 is 5.2 times greater (p=0.0086) than when the teaching attending is not present.

Conclusion: The use of a dedicated teaching attending shift is a successful educational innovation for improving student self-reported evaluation items in a third-year required EM clerkship. [West J Emerg Med. 2020;21(1):58-64.]

INTRODUCTION

The emergency department (ED) is arguably the richest clinical teaching laboratory for medical students in medical education today, secondary to the high volume of patients with a broad range of undifferentiated complaints, and varying need for evaluation, stabilization, and diagnosis.[1,2] Limited time, regular interruptions, and a lack of institutional rewards for education, as well as other barriers, contribute to the challenges of clinical teaching.[1-3] The education of medical students within the ED demands a successful balance between providing high quality, efficient medical care to patients while creating outstanding educational experiences for learners.[2-4] Currently, more than half of the medical schools in the United States require students to rotate through the ED during their undergraduate medical clerkships.[5] Most of the required clinical emergency medicine (EM) clerkships take place in the fourth year of medical school; however, many schools offer clerkships in the third year. This dichotomy of required EM clerkships has driven the creation of educational curricula focused on both third-year and fourth-year experiences in EM.[6-8] One published strategy for improving educational experiences for medical students in the ED while maintaining patient care has been the implementation of dedicated teaching attending shifts.[9] Restructuring care teams with a focus on increased faculty supervision has improved trainee experiences and improved patient outcomes without increasing length of stay.[10,11]

To leverage the advantages of the ED as an exceptional clinical educational environment and to address the challenges posed by the rapid pace and high volume of the ED, our institution developed a clerkship curriculum that incorporates a dedicated clinical educator role, the teaching attending, to deliver quality bedside teaching experiences for students in a required third-year EM clerkship. This educational innovation is described below along with an analysis of student-reported evaluation items. The overall goal of the implementation of the teaching attending presence was to create an outstanding educational experience for students rotating on the required third-year EM clerkship. The primary objectives were to improve clinical bedside teaching evaluations and overall quality of the EM clerkship as assessed through student-reported evaluation ratings.

METHODS

Third-year students are placed at one of three clinical sites for their required EM third-year clerkship: a quaternary care, university adult hospital; a quaternary, freestanding children's hospital; or a regional community hospital. In any given academic year, approximately 50% of students rotate at the university adult hospital, approximately 30% of students rotate at the children's

hospital, and 20% of students rotate at the regional community hospital. Beginning with the graduating class of 2010, up to four teaching attending shifts, included in the total number of clinical shifts (typically seven shifts), were implemented at each of the three clinical sites. For the remaining ED shifts, students were distributed into shifts with regularly scheduled ED attendings. There was a temporary loss of the teaching attending experience for a 16-month period at a single site—the university adult hospital—from April 2013 through August 2014 primarily affecting the graduating classes of 2015 and 2016.

The teaching attending experience created a new clinical shift for faculty to work specific educational shifts with third-year medical students. The teaching attending experience was implemented with the objectives of improving clinical bedside teaching, increasing the direct observation of students' clinical skills, providing medical documentation review, and allowing direct access to attendings for supervision of procedures and facilitation of the inter-professional aspects of patient care. The teaching attendings were selected faculty at each clinical who received training on the learning goals and objectives of the clerkship and on bedside teaching skills. Typically, two medical students were paired with a single teaching attending during a shift.

Using medical student-reported items gathered through the School of Medicine evaluation office, we tracked evaluation ratings for the EM clerkship since the inception of the EM clerkship for the graduating class of 2009 through and including the graduating class of 2019. The Colorado Combined Institutional Review Board granted an exempt approval for the retrospective evaluation of these medical student self-reported items. Using a five-point Likert-type scale (1 - poor to 5 - outstanding), medical students were asked anonymously through the School of Medicine evaluation office to rate the EM clerkship in terms of 1) "What was the quality of clinical teaching in this clerkship?" and 2) "What was the overall quality of the clerkship?" We collected survey responses from 1315 students over the 10-year study period with approximately 125-170 students completing the EM clerkship each academic year. Students rotating on the EM clerkship are required to fill out an evaluation for the clerkship, including these two evaluation items, as a requirement for completion of the clerkship.

We assessed the overall trends of the percentage of individual item ratings, means, and top-box proportions (the sum of ratings of 4 or 5 for the evaluation items) for each evaluation item by graphical inspection across all three clinical sites. The total number of students rotating in the clerkship and the number of students matching in EM upon graduation were also tracked. Despite the university adult hospital site being the only site to temporarily lose the

teaching attending experience, primary analyses regarding estimated odds for the frequency of ratings and top-box proportions comparisons were reported across all three sites. We used a multinomial logistic regression to evaluate whether the introduction of a teaching attending experience impacted the overall student-reported evaluation ratings. Ratings for the two evaluation items were the primary outcome of interest and the presence of the teaching attending experience was the independent variable.

Additionally, as a surrogate for an outstanding experience, top-box ratings were computed as the sum of ratings of 4 or 5 for the evaluation items. Evaluation ratings for the graduating classes of 2013, 2015, and 2017 were selected for top-box comparisons to allow for a one-year period of washout following the initial implementation of the teaching attending experience for the class of 2012 and the re-implementation of the teaching attending experience after its loss for the class of 2015. We used two sample proportion z-tests to assess the differences between top-box (4 or 5 ratings) proportions between years. P-values were determined for the three comparisons. P-values were unadjusted for multiple comparisons.

RESULTS

The percentage of individual ratings (1 - poor to 5 - outstanding) for each evaluation item across all three sites for 1) quality of clinical teaching and 2) overall quality of the clerkship are shown in Figure 1 across the 10 years of available data. Table 1 displays a numeric overview of the means and standard deviations for each evaluation item over time, as well as the total number of students rotating

in the EM clerkship and the number of students matching into EM residency during the study period. The temporary loss of the teaching attending experience occurred for a total of 16 months primarily affecting the graduating class of 2015 (12 months) with a lesser impact on the graduating class of 2016 (four months).

For the evaluation item related to clinical teaching quality, when the teaching attending was present, the estimated odds of receiving a rating 5 was 77.2 times greater than when the teaching attending was not present ($p < 0.001$; 95% confidence interval [CI], 9.86-603.35), and similarly, the estimated odds of receiving a rating 4 was 27.5 times greater than when the teaching attending was present than not ($p = 0.0017$; 95% CI, 3.46-218.58). For the evaluation item related to overall clerkship quality, when the teaching attending was present, the estimated odds of receiving a rating 5 was 13.0 times greater than when the teaching attending was not present ($p < 0.001$; 95% CI, 3.78-44.57), and the estimated odds of having a rating of 4 was 5.3 times more likely when a teaching attending was present than not ($p = 0.0086$; 95% CI, 1.53-18.22).

For clinical teaching quality, there was a significant difference in top-box ratings between the graduating classes of 2013 and 2015 (Table 2; $p < 0.001$) as well as a significant difference between top-box ratings for the classes of 2015 and 2017 (Table 2; $p = 0.029$). There was no significant difference between the classes of 2013 and the class of 2017 suggesting that the removal of the attending for the class of 2015 at the university adult hospital had a negative impact in top-box ratings during this academic year (Table 2). Similarly, for overall clerkship quality, there was a significant difference in

Table 1. Mean student-reported satisfaction with standard deviations for each evaluation item, total number of respondents, and number of students matching into emergency medicine residency programs upon graduation across graduation year.

Graduation year	Clinical teaching quality Mean-SD	Overall clerkship quality Mean-SD	Total number of respondents	Number of students matching into emergency medicine residency
Class of 2010	3.79 – 1.02	3.67 – 1.16	135	14
Class of 2011	4.32 – 0.67	4.13 – 0.79	155	17
Class of 2012	4.51 – 0.89	4.35 – 0.88	150	19
Class of 2013	4.60 – 0.69	4.32 – 0.73	168	16
Class of 2014	4.29 – 0.68	4.19 – 0.95	153	12
Class of 2015*	4.14 – 0.84	3.97 – 0.86	146	14
Class of 2016*	4.50 – 0.68	4.29 – 0.81	142	9
Class of 2017	4.37 – 0.84	4.33 – 0.83	137	15
Class of 2018	4.72 – 0.62	4.58 – 0.74	127	20
Class of 2019	4.55 – 0.73	4.48 – 0.69	137	17

*There was a loss of the teaching attending at the tertiary referral university adult hospital for 12 months for the Class of 2015 and four months for the Class of 2016.
SD, standard deviation.
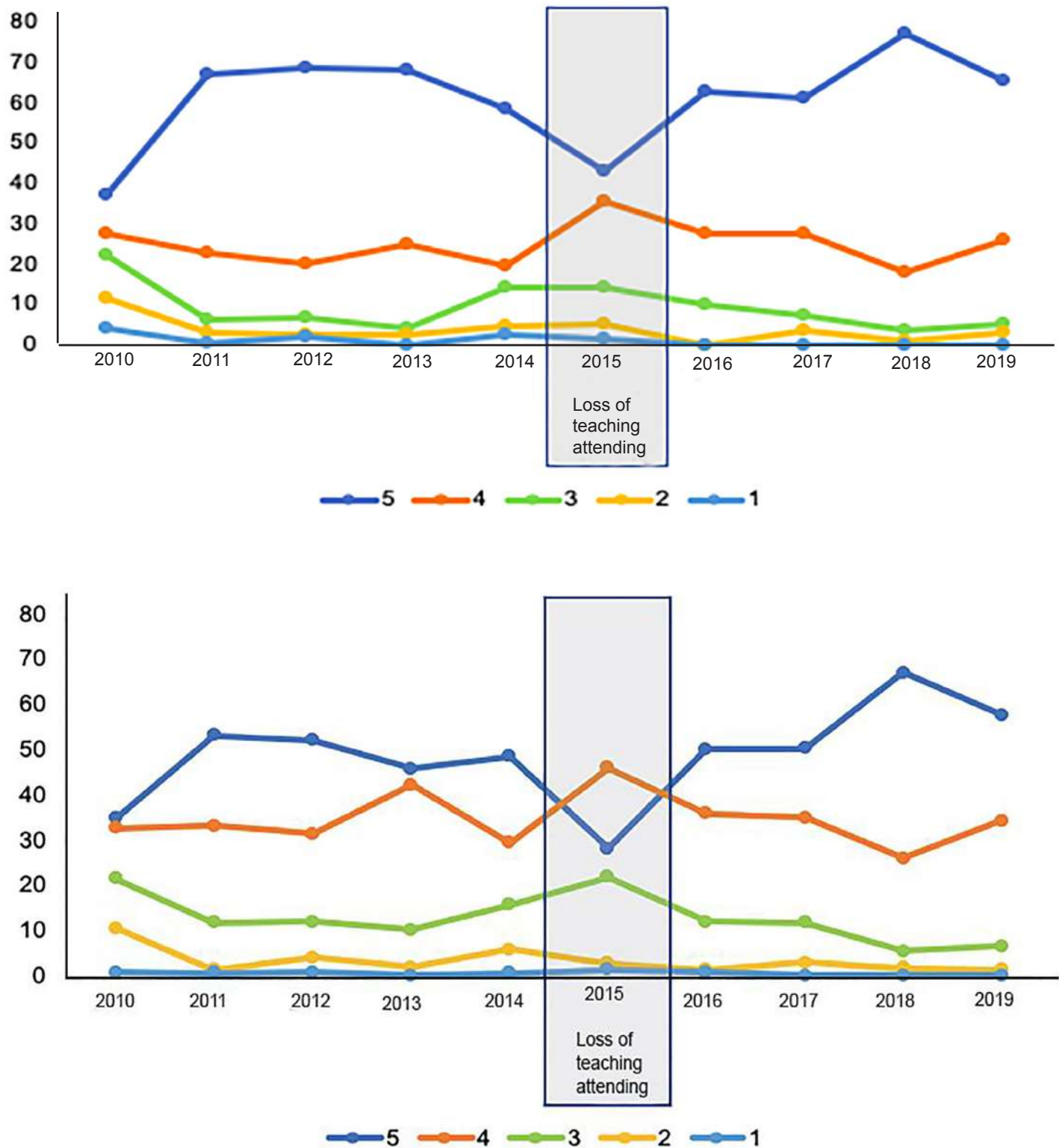
Figure 1. Percentage of ratings for evaluation items related to quality of the clinical teaching and overall clerkship quality across graduating class.

top-box ratings between the graduating classes of 2013 and 2015 (Table 1; p = 0.002) as well as a significant difference between top-box ratings for the classes of 2015 and 2017 (Table 2; p = 0.025). There was no significant difference between

Table 2. Top-box proportions and comparisons for clinical teaching quality and overall clerkship quality for the graduating classes of 2013, 2015, and 2017.

	Class of 2013	Class of 2015	Class of 2017
Clinical teaching quality: top-box proportions	0.93	0.79	0.84
Comparisons		p-value	
Class of 2013 to Class of 2015		<0.001	
Class of 2015 to Class of 2017		0.029	
Class of 2013 to Class of 2017		0.25	
Clerkship quality: top-box proportions	0.88	0.74	0.85
Comparisons		p-value	
Class of 2013 to Class of 2015		0.002	
Class of 2015 to Class of 2017		0.025	
Class of 2013 to Class of 2017		0.6	

the graduating classes of 2013 and 2017 suggesting that the removal of the attending for the class of 2015 had a negative impact in top-box ratings during this year (Table 2). Top-box ratings for the graduating classes of 2013, 2015, and 2017 across all three clinical sites and as a composite are represented graphically in Figure 2.

DISCUSSION

With the exception of the temporary loss of the teaching attending experience for some of the learners in the graduating classes of 2015 and 2016, the addition of a teaching attending experience to the EM clerkship for the graduating class of 2011 has had a significant positive impact on student reported evaluation items through the class of 2019. The temporary loss of the teaching attending experience, primarily for the graduating classes of 2015, at the adult university site and its resultant negative association on the student-reported evaluation items also supports the ongoing effectiveness and impact of the teaching attending experience. The data we provide here reinforces the inference that dedicated teaching attending experiences have a positive association on student-reported evaluation items. Moreover, this dataset adds to the current body of evidence by providing a larger breadth of data using 10 years of evaluation data from over 1000 medical student respondents.

Teaching attendings receiving dedicated training that develops bedside teaching skills and provides clear educational expectations can impact student perceptions of their educational experience. The commitment to provide a teaching attending experience for medical students represents a substantial investment in medical student education in terms of attending physician time and departmental resources. Medical students clearly appreciate these investments into their education by rating the EM clerkship as outstanding.

LIMITATIONS

The primary outcome of student-reported satisfaction is low-level evidence for the impact of an educational intervention based upon the Kirkpatrick level of evidence model,[12] and, therefore, is the main limitation of this study. Moreover, these two evaluation items have not been previously validated. More robust outcomes on the impact of the educational interventions on the Kirkpatrick model should be considered. These additional data might include impacts of student clinical skills assessments, patient throughput, patient satisfaction, and possibly patient clinical outcomes. We did include data related to the numbers of students matching into EM residency upon graduation, but we recognize that the numbers of students matching into any residency training program is influenced by a multitude of factors beyond the presence or absence of a teaching attending experience. While the graduating class of 2016 did have the lowest numbers of students choosing to enter EM residency programs over the 10-year period, we could not determine whether this was a direct causative effective of teaching attending loss during their EM clerkship.

Second, because these data were analyzed in a retrospective fashion without a specific experimental design, there were multiple, confounding variables that could have influenced these student-reported evaluation items. Third, while collected at three different clinical sites, this data represents student-reported evaluation ratings for an EM clerkship experience at a single institution. Fourth, while our data represents improvements in student evaluation items, the impact of the teaching attending experience may not translate into actual student learning improvements and true educational value. Nevertheless, the range of student evaluation items across multiple years of data since the implementation of the teaching attending experience, during the hiatus of the teaching attending experience, and the re-implementation of the teaching attending experience make this dataset intriguing and relevant.
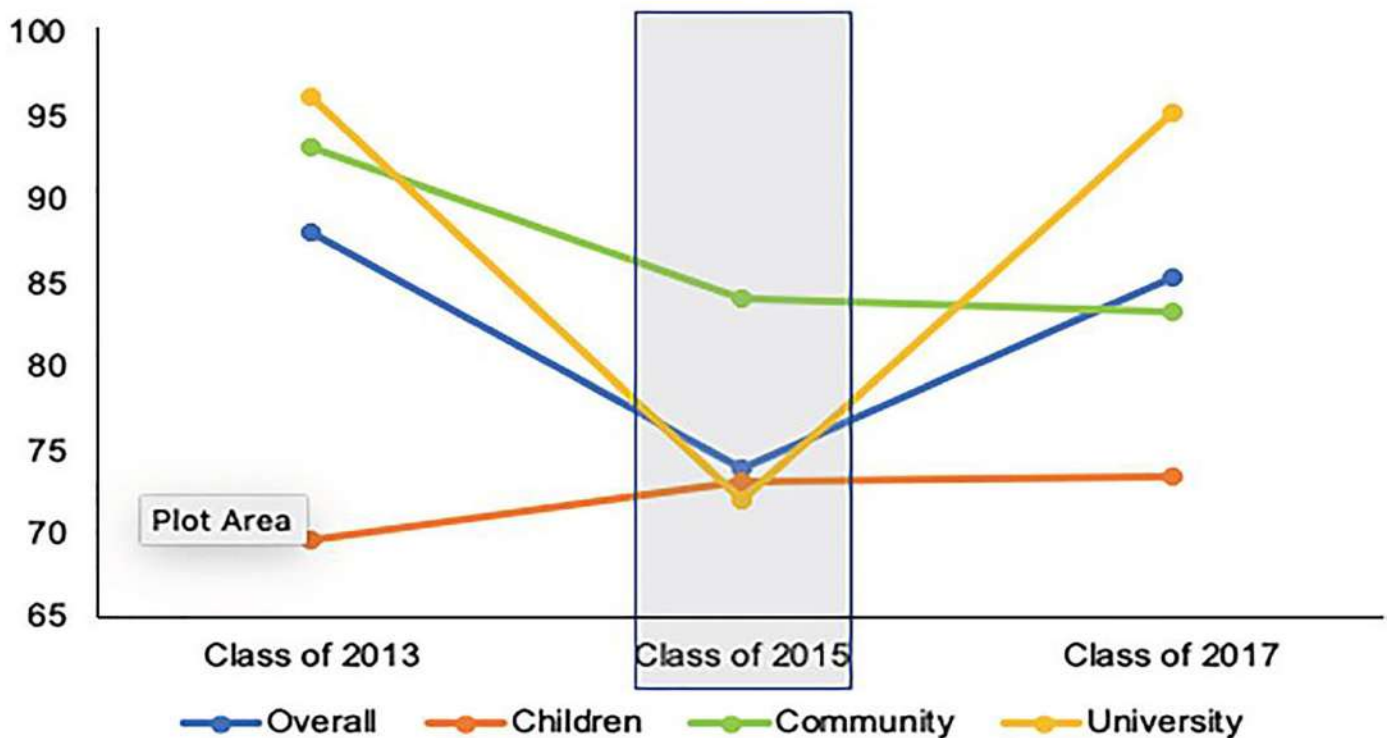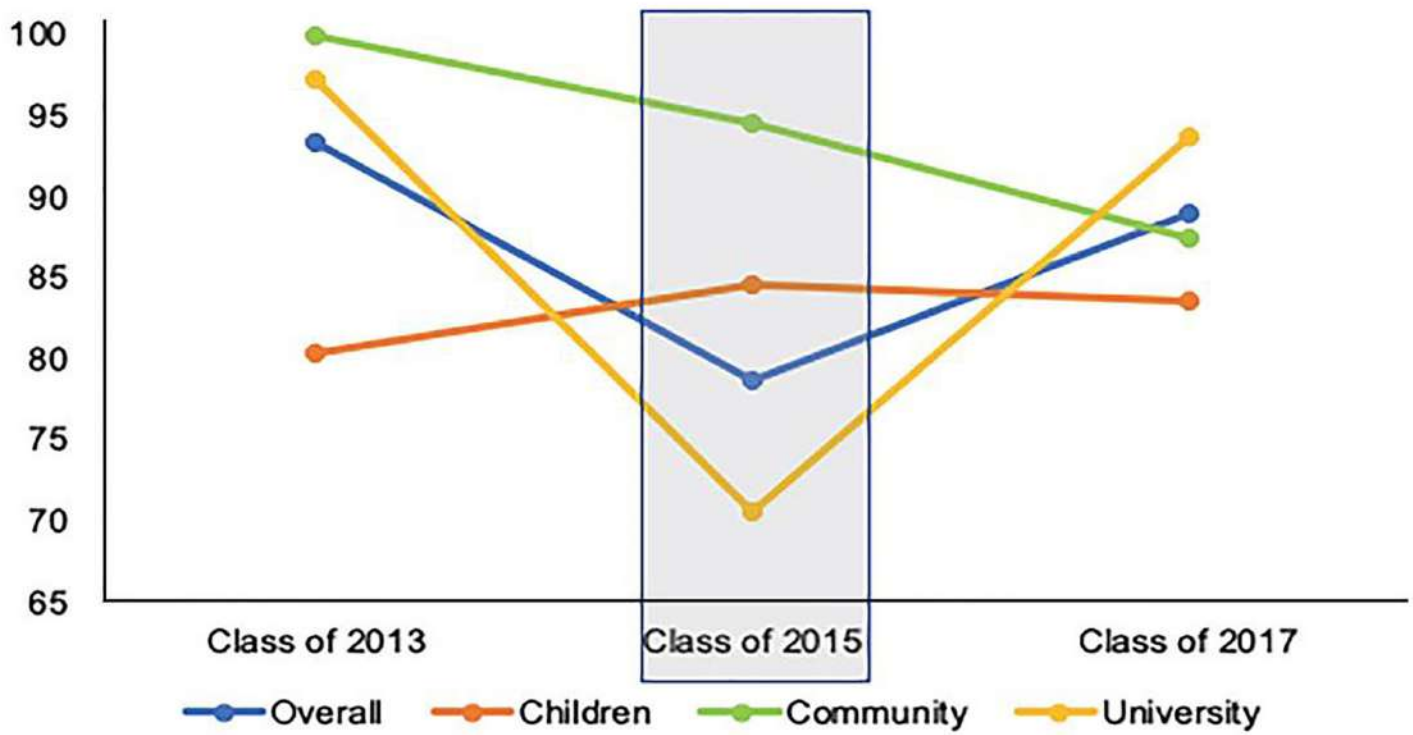
Figure 2. Top-box proportions of ratings for the classes of 2013, 2015, and 2017 for each clinical site and overall for quality of clinical teaching and overall clerkship quality.
Overall – composite results at all three clinical sites.
Children – quaternary care, freestanding children's hospital.
Community – regional community hospital.
University –quaternary care, university adult hospital.

CONCLUSION

Despite the limitations, the evaluation items related to overall clerkship quality and clinical teaching quality represent a reasonable surrogate of the overall educational experience for medical students on a required EM clerkship. Based on the analysis of the reported evaluation items, the use of a dedicated teaching attending experience demonstrates an association with improved clinical bedside teaching evaluations and an improved rating for the overall quality of the EM clerkship. The teaching attending experience may be a successful and sustainable educational innovation for EDs willing to make the commitment to create a teaching attending experience for medical students.

Address for Correspondence: Todd A. Guth, MD, University of Colorado School of Medicine, Department of Emergency Medicine, 12401 E. 17th Avenue, Aurora, CO 80045. Email: todd.guth@CUAnschutz.edu.

REFERENCES

1. Aldeen AZ, Gisondi MA. Bedside teaching in the emergency department. *Acad Emerg Med.* 2006;13(8):860-6.
2. Penciner R. Clinical teaching in a busy emergency department: strategies for success. *CJEM.* 2002;4(4):286-8.
3. Bandiera G, Lee S, Tiberius R. Creating effective learning in today's emergency departments: how accomplished teachers get it done. *Ann Emerg Med.* 2005;45(3):253-61.
4. Irby DM, Wilkerson L. Teaching when time is limited. *BMJ.* 2008;336(7640):384-7.
5. Wald DA, Lin M, Manthey DE, et al. Emergency medicine in the medical school curriculum. *Acad Emerg Med.* 2010;17 Suppl 2:S26-30.
6. Coates WC. An educator's guide to teaching emergency medicine to medical students. *Acad Emerg Med*. 2004;11(3):300-6.
7. Mulcare MR, Suh EH, Tews M, et al. Third-year medical student rotations in emergency medicine: a survey of current practices. *Acad Emerg Med*. 2011;18 Suppl 2:S41-7.
8. Tews MC, Wyte CM, Coltman M, et al. Developing a third-year emergency medicine medical student curriculum: a syllabus of content. *Acad Emerg Med*. 2011;18 Suppl 2:S36-40.
9. Cassidy-Smith TN, Kilgannon JH, Nyce AL, et al. Impact of a teaching attending physician on medical student, resident, and faculty perceptions and satisfaction. *CJEM*. 2011;13(4):259-66.
10. Smalley CM, Jacquet GA, Sande MK, et al. Impact of a teaching service on emergency department throughput. *West J Emerg Med*. 2014;15(2):165-9.
11. Berger TJ, Ander DS, Terrell ML, et al. The impact of the demand for clinical productivity on student teaching in academic emergency departments. *Acad Emerg Med*. 2004;11(12):1364-7.
12. Kirkpatrick DL. Techniques for evaluation of training programs. *J Amer Soc Train Dir*. 1959;13:21-2.

#DidacticsRevolution: Applying Kotter's 8-Step Change Management Model to Residency Didactics

Mary R. C. Haas, MD*
Brendan W. Munzer, MD*
Sally A. Santen, MD†
Laura R. Hopson, MD*
Nathan L. Haas, MD*
Daniel Overbeek, MD*
William J. Peterson, MD*
James A. Cranford, PhD*
Robert D. Huang, MD*

*University of Michigan Medical School, Department of Emergency Medicine, Ann Arbor, Michigan
†Virginia Commonwealth University Health System, Department of Emergency Medicine, Richmond, Virginia

Introduction: Leading change effectively is critical to advancing medical education. Residency didactics often require change in order to meet stakeholder's needs. Kotter's change management model (KCMM) is an 8-step method for implementing change that can be applied to educational initiatives. This innovation improved an emergency medicine residency didactics curriculum through application of KCMM.

Methods: An initiative to improve residency didactics curriculum was titled the "Didactics Revolution" and implemented according to KCMM: establish a sense of urgency, form a powerful guiding coalition, create a vision, communicate the vision, empower others to act on the vision, plan for and create short-term wins, consolidate improvements and produce still more change, and institutionalize new approaches. Data from the Annual Program Review was utilized to assess the impact of the KCMM strategy.

Results: The percentage of residents who agreed or strongly agreed that lectures provide a valuable learning experience increased from 39.1% in the year prior to 88.0% in the year during the implementation (p < .001), and remained relatively high at 73.5% in the year following. The percentage of residents who agreed or strongly agreed that they felt well-prepared for the written boards increased from 60.9% in the year prior to 92.0% in the year during the implementation (p = .01) and remained high at 73.5% in the year following.

Conclusion: Residency didactics can be improved through the use of KCMM, a change management model originally developed in the corporate context. [West J Emerg Med. 2020;21(1):65–70.]

BACKGROUND

While not all changes lead to improvement, all improvement requires change.[1] As learners' needs evolve, medical education curricula will necessitate change.[2] Effective change management is thus critical for the advancement of medical education.[3]

A common curricular area necessitating change and continuous development is residency didactics. Weekly didactics are required by the Accreditation Council for Graduate Medical Education (ACGME) to supplement clinical learning experiences for residents.[4] However, traditional podium-based, hour-long didactics often fail to engage

learners when compared to interactive, shorter educational sessions that encourage active learning.[5-10] Specific changes rooted in education theory that have previously been implemented to improve didactics include shorter, more focused lectures, diverse, interactive teaching formats, and interleaving of both topics and formats.[11]

Implementing changes to didactic curricula can be challenging and requires an approach that engages and meets the needs of various stakeholders. Several models for change have been described, most frequently in the business literature.[12-22] John Kotter, a Harvard Business School Professor and expert on change leadership, designed an 8-step model for leading change.[23-24] Although Kotter's change management model (KCMM) was originally described in the corporate context, it has been applied previously to human service and educational organizations.[25-27] KCMM incorporates themes that underlie effective change management strategies, including entering and contracting change activities, diagnosing areas for improvement and expansion, planning and implementing, and evaluating and institutionalizing change.[28] With its simple 8-step approach and ability to engage stakeholders in the change process, KCMM provides a valuable framework for approaching curriculum change within medical education.

OBJECTIVE

The objective of this innovation was to improve the residency didactics curriculum through application of KCMM.

METHODS

KCMM was implemented to improve the didactic curriculum at an academic, four-year emergency medicine (EM) residency program that includes 64 residents and 27 core faculty (Figure 1).

Establish a Sense of Urgency: An assistant program director (APD) took the lead in recognizing and communicating the need for change. The APD held focus groups with both faculty and residents. The groups identified residents as the key stakeholders and reviewed their perspectives and needs. These discussions confirmed examples of the need for change, including a trend toward attendees sitting in the back of the lecture hall distracted by laptops and smartphones, and the perception that many lectures were too long and overly broad. The lead APD also administered a needs assessment survey with proposed lecture topics and speakers to allow residents to select those of the most interest and value. At the Annual Program Review, the results were shared to promote ongoing discussion and generate buy-in. The change initiative was boldly named the "Didactics Revolution" (DR) and was widely publicized as part of Program Improvement Plans to create excitement and encourage participation. These initiatives increased awareness of existing dissatisfaction with didactics, which drove momentum for change.

Create a Powerful Guiding Coalition: In order to engage stakeholders, the lead APD created a formal committee called the "Didactics Revolution Committee" (DRC) and recruited specific individuals representing well-respected educators and residents most vocally expressing the desire for change. Five core faculty and 20 EM residents joined. The DRC met monthly after conference to review the current state of the project, provide feedback, brainstorm future developments, and communicate the vision to the rest of the residency. Resident members were selected as "czars" of different lecture types, tasked with ensuring speaker availability, maintaining topic lists, and championing the DR. The program director was aware and supportive of the DRC.

Create a Strategic Vision: The lead APD and DRC generated the vision of replacing stereotypical boring lectures with more engaging and valuable didactics. Inspiration for specific changes to implement was drawn from the needs assessment survey and focus groups previously mentioned, as well as another EM residency program's efforts to similarly transform the didactic curriculum.[11] Initiatives included shortening and narrowing the scope of lectures, creating more interactive and engaging lecture formats, gamifying educational activities, and utilizing social media and technology as educational tools.

Communicate the Vision: The power of the DRC was harnessed to disseminate the vision of making conference more valuable and engaging. An email about the initiative was distributed to the residency. Members of the DRC made announcements at residency and faculty meetings. Resident "czars" of the DRC communicated the vision to speakers who signed up to deliver lectures, providing guidance for content to cover, lecture duration, slide design and supplemental materials. Branding initiatives included the deliberately chosen title of the "Didactics Revolution" with an associated logo designed to reflect the goal of challenging the status quo.

Empower Others to Act on the Vision: Changes inspired by the survey, focus groups, and efforts of other residency programs were implemented by removing existing barriers. To support speakers in delivering more engaging lectures, most lectures were shortened from 60 to 15-30 minutes and covered narrower topics through the following series: Visual Diagnosis, electrocardiogram (ECG) of the Week, Rapid Fire Radiology, Case of the Week, and Top 5 Differential Diagnoses.[11] All residents were encouraged to sit in the front of the auditorium to maximize participation. To transform social media and mobile technology from a distraction into a learning tool, conference content was shared via the residency blog and Twitter account with the hashtag #EMConf. An online, interactive multiple-choice platform entitled Kahoot! incorporated 5 board-review style questions weekly to encourage retention. Lastly, gamification was employed through a knowledge competition entitled "Residency House Cup."

Leading a Didactics Revolution
using the Kotter conceptual model for driving change in med ed

The Kotter 8-step change management model was originally designed to help leaders execute change in the corporate world. This innovation improved residendy didactics by applying Kotter's model to curricular change.

1 Establish a sense of urgency

Identify areas for improvement through needs assessments and focus groups.

An assistant program director (APD) coins the "Didactics Revolution" and champions the effort.

2 Form a powerful guiding coalition

Recruit faculty educators and residents to lead the change initiative.

3 Create a vision

Define the revolution's vision: to replace stereotypical boring lectures with more engaging and valuable didactics

Incorporate branding.

4 Communicate the vision

Form a committee and empower members to have their voices heard.

Appoint content 'czars' to champion recurrent lecture types.

5 Empower others to act on the vision

Address previously identified challenges through implementing practical changes rooted in education theory: shorter lectures of narrower scope and more interactive formats, gamification and use of technology as an educational tool rather than a distraction.

6 Plan for and create short-term wins

Compare the new and old model in order to recognize and communicate early successes to the committee.

Acknowledge success in the form of national abstracts/presentations.

7 Consolidate improvements and produce still more change

Provide feedback loops to presenters using Educational Autopsies to reinforce good presenting habits and identify areas for improvement.

8 Institutionalize new approaches

Plan for long-term implementation of the pilot curriculum

Create a pipeline of incoming leaders to maintain momentum for ongoing culture change.

Adapted from the model described in: Kotter JP. *Leading Change.* Boston, MA: Harvard Business Review Press, 1996

Figure 1. Method of improving EM residency didactics utilizing Kotter's change management model (KCMM).

Plan for and Create Short Term Wins: The DRC seized and publicized opportunities for success during the early implementation process. New content was developed alongside old content. At monthly meetings, the DRC compared the two models to recognize improvements and gain confidence to try additional innovations. Resident and faculty champions were rewarded for success through the acceptance of presentations detailing the initiative at national meetings. A poster presentation entitled **"**An Emergency Medicine Residency Didactics Revolution: The Use of a Multidisciplinary Team and Branding to Inspire and Support Curricular Change" was presented at the 2017 Council of Emergency Medicine Residency Directors (CORD) Academic Assembly. A component of the DR called "Educational Autopsy" was featured in a poster presentation entitled "Highlighting Themes in Emergency Medicine Didactics Using the Educational Autopsy" at the 2017 Society for Academic Medicine (SAEM) Annual Meeting.

Consolidate Improvements and Produce Still More Change: Feedback was sought and continuously incorporated to push for ongoing improvement. The DRC implemented "Educational Autopsy" (EA), a 30-minute session run by a member of the residency leadership following each conference day. During EA, conference attendees dissected each presentation for strengths and weaknesses and assessed whether it reflected the strategic vision. Feedback was emailed to individual speakers. General themes were reviewed at each DRC meeting. This resulted in the addition of new sessions, removal of old sessions, and the implementation of lessons learned from others by DRC members developing future presentations.

Institutionalize New Approaches: The infrastructure for ongoing progress toward meeting the strategic vision was implemented by developing a two-year conference curriculum based on lessons learned during the initial pilot year. The state of didactics remains in a continuous process of reevaluation and improvement. New leaders are identified within the younger classes and encouraged to become more involved in content creation, promoting sustainability and institutionalization of the curricular change.

IMPACT/EFFECTIVENESS

Yearly, the residency participates in an annual program review process, which includes a survey administered to all residents and faculty. Data from the annual program review survey were collected for the academic years preceding (2015-2016, n = 23, response rate = 36.5%), during (2016-2017, n = 25, response rate = 39.7%), and after (2017-2018, n = 34, response rate = 53.1%) a year of implementation of the DR. The Institutional Review Board determined that the use of this data for research was exempt. Residents evaluated six items (e.g., "Lectures provide valuable learning experience")

on a scale of 1 = strongly agree to 5 = strongly disagree. To facilitate interpretation, percentage of residents who responded "strongly agree" or "agree" to each item was compared across all three years.

The percentage of residents who agreed or strongly agreed that a) small group sessions provide valuable learning experiences; b) simulation sessions provide valuable learning experiences; and c) they were confident in their ability to critically appraise the medical literature was relatively high in the year prior to DR, and did not show any statistically significant changes in the year during or in the year following DR implementation. By contrast, the percentage of residents who agreed or strongly agreed that lectures provide a valuable learning experience increased from 39.1% in the year prior to DR to 88.0% in the year during DR implementation (χ^1 [1] = 12.3, p < .001, absolute benefit increase = 48.9), and remained relatively high at 73.5% in the year following the DR (χ^1 [1] = 6.6, p = .01, absolute benefit increase = 34.4). In addition, the percentage of residents who agreed or strongly agreed that they would be well-prepared for the written boards increased from 60.9% in the year prior to DR to 92.0% in the year during DR implementation (χ^1 [1] = 6.3, p = .01, absolute benefit increase = 31.1) and remained relatively high at 73.5% in the year following the DR (χ^1 [1] = 1.0, p = .36). Finally, the percentage of residents who agreed or strongly agreed that they would be well-prepared for the oral boards increased from 56.5% in the year prior to the DR to 80.0% in the year during DR implementation and dropped to 61.8% in the year following the DR, but these changes were statistically nonsignificant. See Table 1.

Limitations of the data include relatively low response rates, and that the survey was not specifically designed to assess the impact of the application of KCMM to residency didactics. Nonetheless, results suggest that the didactic curriculum was more engaging and effective following the change initiative. While learner opinion about curricular effectiveness is useful, future study should investigate if KCMM results in improved learning outcomes, such as in training exam scores or medical knowledge milestones. Assessing for an increase in conference attendance was considered as another potential marker of increased engagement, but not utilized given the 70% minimum attendance rate that provides a natural ceiling.

The DR initiative focused primarily on improving didactic experiences specifically, which may explain why no statistically significant changes were identified for learner perceptions about degree of preparation for oral boards, ability to appraise medical literature (which may correlate to quality of journal club), or the value of simulation and small group learning experiences. Assessing impact of change management initiatives targeted toward these educational components represents an area of future study. Additionally, with three of the four items that did not show statistically significant increases, level of agreement was relatively high in the year

Table 1. Percentage of residents who responded "Agree" or "Strongly Agree" by item.

Year	2015 (Prior)	2016 (During)	2017 (After)
Survey response rate	36.5%	39.7%	53.1%
Q1. Small group sessions provide valuable learning experiences.	82.6%	88.0%	82.4%
Q2. Simulation sessions provide valuable learning experiences.	100.0%	96.0%	91.2%
Q3. Lectures provide valuable learning experience.	39.1%	88.0%	73.5%
Q4. I am confident in my ability to critically appraise the medical literature.	73.9%	80.0%	79.4%
Q5. I feel that I will be well prepared for the written boards.	60.9%	92.0%	73.5%
Q6. I feel that I will be well prepared for the oral boards.	56.5%	80.0%	61.8%

prior to DR. This suggests a ceiling effect whereby there was less room for change. By contrast, levels of agreement with the two items that showed statistically significant increases were relatively lower in the year prior to DR, allowing more room for improvement.

The use of KCMM for improving the didactic curriculum had several advantages. It provided an easy, step-by-step guide for leaders to approach an area of weakness. It engaged learners in the process of improving their own educational experience. It also encouraged stakeholders to embrace, rather than fear, change. Challenges included the substantial time commitment required of busy residents and faculty to implement this intensive approach. The authors also noted a drop off in improved learner perceptions from the year during the DR to the year following. This may reflect the difficulty in sustaining momentum of change initiatives, where excitement often starts out high but requires significant and ongoing dedication, time, and effort to maintain.

Although originally developed in the corporate context, KCMM provides a valuable framework for leading change in medical education. KCMM can be applied at other programs to restructure didactics or other curricular areas.

Address for Correspondence: Mary R. C. Haas, MD, Department of Emergency Medicine, University of Michigan Medical School, 1500 E. Medical Center Drive, Ann Arbor, MI 48109. Email: calderom@med.umich.edu.

REFERENCES

1. Langley GJ, Moen RD, Nolan KM, et al. *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance*. San Francisco, CA: Jossey-Bass Publishers; 2009.

2. Association of American Medical Colleges (AAMC). Policy priorities to improve our nation's health: how medical education is changing. 2018:1-3. Available at: https://www.aamc.org/download/472906/data/howmedicaleducationischanging.pdf. Accessed April 1, 2019.

3. Gale R, Grant J. AMEE medical education guide no. 10: managing change in a medical context: guidelines for action. *Med Teach*. 1997;19(4):239-49.

4. Common Program Requirements 2017. ACGME. Available at: https://www.acgme.org/Portals/0/PFAssets/ProgramRequirements/CPRs_2017-07-01.pdf. Accessed December 15, 2018.

5. Hake RR. Interactive-engagement versus traditional methods: a six-thousand-student survey of mechanics test data for introductory physics courses. *Am J Phys*. 1998;66(1):64-74.

6. Littlewood K, Schilling A, Stemland C, et al. High-fidelity simulation is superior to case-based discussion in teaching the management of shock. *Med Teach*. 2013;35(3):1003-10.

7. Wolff M, Wagner M, Poznanski S, et al. Not another boring lecture: engaging learners with active learning techniques. *J Emerg Med*. 2015;48(1):85-93.

8. Freeman S, Eddy SL, McDonough M, et al. Active learning increases student performance in science, engineering, and mathematics. *Proc Natl Acad Sci USA*. 2014;111(23):8410-5.

9. Prince M. Does active learning work? A review of the research. *J Engr Education*. 2004;93(3):223-231. Available at: https://www.engr.ncsu.edu/wp-content/uploads/drive/1smSpn4AiHSh8z7a0MHDBwhb_JhcoLQmI/2004-Prince_AL.pdf. Accessed April 1, 2019.

10. Stuart J, Rutherford RJ. Medical student concentration during lectures. *Lancet*. 1978;2(8088):514-6.

11. Gottlieb M, Riddell J, Crager SE. Alternatives to the conference status quo: addressing the learning needs of emergency medicine residents. *Ann Emerg Med*. 2016;68(4):423-30.

12. Argyris, C. *On Organizational Learning*. Blackwell, London: Blackwell Publishers Inc.; 1999.

13. Bennis, WG. Changing organizations. *J Appl Behav Sci*. 1996:2(3):247-63.

14. French, WL, Bell, CH, Zawacki, RA (Eds). *Organization Development and Transformation: Managing Effective Change*. (6th Ed). Boston, MA: Irwin McGraw-Hill; 2005.

15. Harvard Business Review. *HBR's 10 Must Reads on Change Management*. (1st ed). Boston, MA: Harvard Business Review Press; 2011.

16. Hiatt JM. *ADKAR: A Model for Change in Business, Government and Our Community*. (1st ed). Loveland, CO: Prosci Learning Center Publications; 2006.

17. Katz D, Kahn RL. *The Social Psychology of Organization*. New York: Wiley; 1996.

18. Kolb DA, Froham AL. An organization development approach to consulting. *Sloan Mgmt Rev.* 1970:12(1):51-6

19. Lewin K. Frontiers in group dynamics: concept, method and reality in social science; social equilibria and social change. *Hum Relations*. 1947;1(1):4-41.

20. Lippitt R, Watson J, Westley B. *The Dynamics of Planned Change.* New York, NY: Harcourt Brace; 1958.

21. Peters TJ, Waterman RH. *In Search of Excellence*. New York, NY: Harper & Row; 1982.

22. Weisbord, MR. Organizational diagnosis: six places to look for trouble with or without a theory. *Group & Org Stud*. 1976:1(4):430-47.

23. Kotter JP. *Leading Change*. Boston, MA: Harvard Business Review Press; 1996.

24. Kotter JP. Leading change: why transformation efforts fail. *Harv Bus Rev*. 1995;73(2):59-67.

25. Henry LS, Hansson MC, Haughton VC, et al. Application of Kotter's theory of change to achieve baby-friendly designation. *Nurs Womens Health*. 2017:21(5);372-82.

26. Sidorko PE. Transforming library and higher education support services: can change models help? *Lib Mgmt*. 2008;29(4/5):307-18.

27. Wentworth DK, Behson SJ, Kelley CL. Implementing a new student evaluation of teaching system using the Kotter change model. *Studies Higher Ed.* 2018:1-13.

28. Cummings TG, Worley CG. *Organization Development and Change*. (10th Ed). Chapter 2. United States: Cengage Learning. 2015: 21-44.

Early Impact of the *Western Journal of Emergency Medicine* CDEM/CORD Special Issue in Educational Research & Practice

Jeffrey N. Love, MD, MHPE*
Sally A. Santen, MD, PhD[†]
David P. Way, MEd[‡]
Brendan W. Munzer, MD[§]
Chris Merritt, MD, MPH, MHPE[¶]
Douglas S. Ander, MD[‖]
John W. Cyrus, MA, MLIS[#]

*George Washington University, Department of Emergency Medicine, Washington, District of Columbia
[†]Virginia Commonwealth University, Department of Emergency Medicine, Richmond, Virginia
[‡]Ohio State University, Department of Emergency Medicine, Columbus, Ohio
[§]University of Michigan, Department of Emergency Medicine, Ann Arbor, Michigan
[¶]Alpert Medical School of Brown University, Department of Emergency Medicine & Pediatrics, Providence, Rhode Island
[‖]Emory University School of Medicine, Department of Emergency Medicine, Atlanta, Georgia
[#]Virginia Commonwealth University, Tompkins-McCaw Library for the Health Sciences, Richmond, Virginia

Introduction: In 2015, with a stated goal of disseminating best teaching practices and developing a community of educational scholars, the Council of Emergency Medicine Directors (CORD) and the Clerkship Directors of Emergency Medicine (CDEM) created an annual Special Issue in Educational Research and Practice (Special Issue) in cooperation with the *Western Journal of Emergency Medicine*. The intention of this study was to analyze the impact of this effort to date.

Methods: Bibliometric data was gathered on all four special issues, 2015-2019, from the Web of Science and then verified with the eScholarship website. Authorship, academic affiliation, date published, article type, and format were tabulated for descriptive analysis. Using metrics from Google Scholar, alternative scholarly impact metrics (altmetrics), and the eScholarship website, the authors identified top articles and grouped them into themes.

Results: Of the 136 articles included in the first four years of the Special Issue, 126 represented peer-reviewed publications with an overall acceptance rate of 25.0% (126/505). Authors from this cohort represented 103 of the 182 (56.6%) Accreditation Council for Graduate Medical Education (ACGME) programs in existence at the time of the inaugural issue. Multi-institutional studies represented 34.9% (44/126) of the peer-reviewed publications. Traditional and alternative publication metrics are reported to assess the impact of articles from the Special Issues.

Conclusion: The Special Issue is a proven outlet to share best practices, innovations, and research related to education. Additionally, the infrastructure of this process promotes the development of individual faculty and a community of teaching scholars. [West J Emerg Med. 2020;21(1):71-77.]

INTRODUCTION

Over the past decade, there has been a concerted effort on behalf of the Council of Emergency Medicine Directors (CORD) to increase the scholarly teaching provided by program faculty as well as to develop a community of practice related to education scholarship.[1,2] Toward this end CORD, the Clerkship Directors of Emergency Medicine (CDEM), and the *Western Journal of Emergency Medicine* (*West*JEM) came together in 2015 to create an annual Special Issue in Educational Research and Practice.

The membership of CORD and CDEM represents the leadership and core educational faculty of emergency

medicine (EM) training programs. Thus, this Special Issue was intended as a forum for best practices, innovations, and research related to education within the local and broader education communities.

Submissions are divided by topic into those most relevant to graduate medical education and undergraduate medical education with the former assigned to the CORD Editors and the latter to CDEM Editors. The Special Issue is generally published as the January issue of *West*JEM. As an open-access journal, *West*JEM provides the ability to publish as many articles as meet the editorial team's standards. All articles meeting these standards are published online, while those deemed by the editors to be the most relevant to the EM education community and/or the best examples of education scholarship are also available in a 12-15 article print version. The purpose of this study was to profile the impact of the annual Special Issue on the target community since its first release in November 2015.

METHODS
Data Collection

In order to assess the impact of the first four CDEM/CORD Special Issues in Educational Research and Practice, we collected bibliometric data from a variety of sources. First, using Web of Science (WOS) (Clarivate Analytics, formerly Thomson Reuter's), a librarian from the research team generated a list of all articles appearing in the 2015, 2017, 2018, and 2019 Special Issues. Data for each article were exported into a spreadsheet in February 2019, which included the following: author(s), article title, year of publication, affiliation, digital object identifier, and the times cited within the WOS Core Collection. We used the University of California eScholarship open-access web platform[3] to verify and enhance the exported Web of Science data. Information about authors' affiliations, article type, format of the article (print or online only), electronic publication date, number of institutions represented, and whether data was gathered from one or multiple institutions was abstracted and entered into the database.

Additional article metrics, such as the number of times that each article was cited, was exported from Scopus (Elsevier) and the web search engine Google Scholar (Mountain View, CA) to the spreadsheet. We obtained the Altmetric (London, England) scores from the *West*JEM website (https://westjem.com/) ,which reports this metric for each of its articles. Article page view and download data were obtained from the University of California eScholarship platform.

Data Analysis

The Special Issues Guest Editors provided the overall submission volume and acceptance rates. The number of articles published in each of the following submission categories was also tabulated: commentary; educational scholarship insights; original research; education advances / innovations; and

reviews. Authors' institutional affiliation data exported from Web of Science was cleaned to collapse multiple names for one institution into a single identifier as listed in the roster of Accreditation Council for Graduate Medical Education (ACGME)-accredited EM training programs as of 2016. We used institutional identifiers to calculate the number of collaborative articles and multi-institutional studies. A multi-institutional study was defined a priori as a work that gathered data across more than one institution, either medical school or residency program.

From the four existing Special Issues, we identified separately the top 10 articles from each of the following impact indices for comparisons: times cited in Google Scholar, Altmetric score, and download count. These top articles were qualitatively coded independently by two authors (BWM and DA) to identify patterns or commonalities in topic between the most highly used articles. In cases where there was not agreement on the theme, a third author (SAS) served as an adjudicator. Coding was then reviewed by the authorship group.

RESULTS
Impact on Member Programs

From 2015 to 2019, the Special Issue published 136 articles. These consist of seven commentaries, three "educational scholarship insights," 77 original research articles (67 full studies, 10 brief reports), 46 "educational advances" (31 full reports, 15 brief innovations), and three reviews. Of the 505 peer-reviewed articles submitted over this time period, 126 (25.0%) were accepted.

At the time the first Special Issue was published in November 2015, there were 182 ACGME-accredited EM training programs. The 528 unique authors of articles published represented 103 of these 182 accredited programs (56.6%). Nine additional authors came from EM programs accredited by the ACGME after 2016. The remaining authors represent non-ACGME approved EM programs from the United States (13), Europe (3), New Zealand (1), and Canada (1). Experience as lead author of a peer-reviewed publication in education was a requirement for selection as a reviewer. To date, 199 faculty have served as reviewers.

Collaborative Efforts Based on Authorship

Of the 136 published works, 130 (95.6%) were collaborative efforts, and 69 (50.7%) had two or more authors from different ACGME-accredited EM programs. Multi-institutional data gathered by author(s) from a single ACGME institution (eg national surveys) represented 5.6% (7/126) and multi-institutional authors in 29.4% (37/126) of published peer-reviewed publications for a total of 34.9% (44/126).

Published Article Performance

The top 10 articles based on Google Scholar citations, Altmetric scores, and the number of downloads are reported in Table 1. For Google Scholar citations, all but one of the articles

Table 1. Top 10 performing publications from the first four issues of the *Western Journal of Emergency Medicine* Special Issue in Educational Research and Practice (2015-2019) as determined by Google Scholar, Altmetrics, and downloads.

Rank	Title	Authors	Issue print/ online (P/O)	GS citation
1	Does the Concept of the Flipped Classroom Extend to the Emergency Medicine Clinical Clerkship?	Heitz et al.	2015 (P)	30
2	Are Live Ultrasound Models Replaceable? Traditional versus Simulated Education Module for FAST Exam	Bentley et al.	2015 (P)	25
3	Emergency Medicine Residents Consistently Rate Themselves Higher than Attending Assessments on ACGME Milestones	Goldflam et al.	2015 (O)	14
3	Coordinating a Team Response to Behavioral Emergencies in the Emergency Department: A Simulation-Enhanced Interprofessional Curriculum	Wong et al.	2015 (P)	14
5	Teaching Emotional Intelligence: A Control Group Study of a Brief Educational Intervention for Emergency Medicine Residents	Gorgas et al.	2015 (O)	11
5	Model for Developing Educational Research Productivity: The Medical Education Research Group	Perry et al.	2015 (O)	11
5	Competency Assessment in Senior Emergency Medicine Residents for Core Ultrasound Skills	Schmidt et al.	2015 (O)	11
6	Efficient and Effective Use of Peer Teaching for Medical Student Simulation	House et al.	2017 (O)	10
6	Ultrasound Training in the Emergency Medicine Clerkship	Favot et al.	2015 (O)	10
6	What is the Prevalence and Success of Remediation of Emergency Medicine Residents?	Silverberg et al.	2015 (P)	10
				Altmetric score
1	Continuing Medical Education Speakers with High Evaluation Scores Use more Image-based Slides	Ferguson et al.	2017 (O)	47
2	Getting Published in Medical Education: Overcoming Barriers to Scholarly Production	Gottlieb et al.	2018 (P)	36
3	Teaching and Assessing ED Handoffs: A Qualitative Study Exploring Resident, Attending, and Nurse Perceptions	Flanigan et al.	2015 (P)	18
4	Morbidity and Mortality Conference in Emergency Medicine Residencies and the Culture of Safety	Aaronson et al.	2015 (P)	17
5	Standardized Video Interviews Do Not Correlate to United States Medical Licensing Examination Step 1 and Step 2 Scores	Egan et al.	2019 (O)	12
6	Recommendations from the Council of Emergency Medicine Residency Directors: Osteopathic Applicants.	Stobart-Gallagher et al.	2019 (O)	11
7	What Do They Want from Us? A Survey of EM Program Directors on EM Application Criteria	King et al.	2017 (O)	9
7	Tit-for-Tat Strategy for Increasing Medical Student Evaluation Response Rates	Malone et al.	2018 (P)	9
8	Bringing the Flipped Classroom to Day 1: A Novel Didactic Curriculum for Emergency Medicine Intern Orientation	Barrie et al.	2018 (O)	8
8	Free Open Access Medical Education (FOAM) Resources in a Team-Based Learning Educational Series	Fallon et al.	2018 (O)	8
8	Show Me the Money: Successfully Obtaining Grant Funding in Medical Education.	Gottlieb et al.	2019 (O)	8
				Times downloaded
1	Continuing Medical Education Speakers with High Evaluation Scores Use more Image-based Slides.	Ferguson et al.	2017 (O)	652
2	Coordinating a Team Response to Behavioral Emergencies in the Emergency Department: A Simulation-Enhanced Interprofessional Curriculum	Wong et al.	2015 (P)	544

GS, Google Scholar.

Table 1. Continued.

Rank	Title	Authors	Issue print/ online (P/O)	Times downloaded
3	A Randomized Trial of SMART Goal Enhanced Debriefing after Simulation to Promote Educational Actions	Aghera et al.	2018 (O)	228
4	Teaching Emotional Intelligence: A Control Group Study of a Brief Educational Intervention for Emergency Medicine Residents	Gorgas et al.	2015 (O)	224
5	Novel Airway Training Tool that Simulates Vomiting: Suction-Assisted Laryngoscopy Assisted Decontamination (SALAD) System	DuCanto et al.	2017 (O)	208
6	Characteristics of Real-Time, Non-Critical Incident Debriefing Practices in the Emergency Department	Nadir et al.	2017 (O)	205
7	Replacing Lectures with Small Groups: The Impact of Flipping the Residency Conference Day	King et al.	2018 (P)	145
8	Creating a Vision for Education Leadership	Martin et al.	2018 (O)	141
9	Clinical Reasoning: Defining It, Teaching It, Assessing It, Studying It	Gruppen	2017 (P)	140
10	Teaching and Assessing ED Handoffs: A Qualitative Study Exploring Resident, Attending, and Nurse Perceptions	Flanigan et al.	2015 (P)	138

were published in the 2015 issue. The "top 10 downloads" category has articles from 2015-2018. Finally, altmetrics have representation from all four years including three articles from 2019 within two months of their publication. Only four articles are found in the top 10 in more than one of these metrics. While all four are highly rated in downloads, two are also represented in Altmetric (Ferguson et al., 2017; Flanigan et al., 2015) and the remaining two in Google Scholar Citations (Gorgas et al., 2015; Wong et al., 2015) (Table 1).

Figure 1 shows the performance of all Special Issue articles published based on year and three metrics: Google Scholar citations; altmetrics; and downloads. Google Scholar citations appear to take time to develop and gradually increase. Altmetrics on the other hand demonstrate impact early on within weeks to months and remain relatively stable from that point on. Finally, the impact demonstrated by how many times an article has been downloaded can be seen within weeks to months of publication, but like citations, the impact tends to increase over time.

In comparing online articles also selected for the print version, it appears that they have no greater impact than those not selected based on top 10 performance in Google Scholar, altmetrics, and the number of downloads (Table 2).

In coding the topics of manuscripts in the top 10 based on Google Scholar citations, altmetrics, and number of downloads from 2015-2019, the designated study authors agreed on the categorization in 23/31 (74.2%). The remaining eight articles were adjudicated by a third author. Common themes identified across metrics included didactics, novel curricula, simulation, assessment/evaluation, scholarship, quality improvement/ patient safety, recruitment/residency application, leadership, and clinical reasoning. No discernible difference between metric groups based on topic was found (Table 3).

DISCUSSION

The purpose of this study was to describe the early impact of the first four editions of the Special Issue, with particular focus on the issue's impact based on bibliometric data as well as its promotion of a culture of faculty development related to education scholarship. The CDEM and CORD leadership shared a goal of providing an education-focused Special Issue with early and lasting impact on education practice. The Special Issue was intended as a forum in which to share novel ideas, disseminate best education practices, and describe the findings of EM-based education research; early results demonstrate that the Special Issue has achieved its preliminary goals.

More than half of the articles published in the Special Issue represent original research, which perhaps may be a surprising outcome for a relatively young outlet. Acceptance rates over the first four editions of the Special Issue– at 25% – are in line with those reported by another journal early in its development,[4] and reflect what the editors and CDEM/CORD leadership believe to be a rigorous review process, with acceptance of high-quality education scholarship. As an open-access journal, *West*JEM increases visibility and the likelihood of garnering medical attention and ultimately citation counts.[5] Its open-access nature also allows the acceptance for online publication of all submissions that meet the editorial standards of the Special Issue. It also allows the editors to select articles for the print version and more prominent display, although this "special status" does not reflect the likelihood that an article will be more likely to achieve significant impact based on any given bibliometric measure.

A second goal of the *West*JEM Special Issue is to further develop and strengthen a community of education scholars in EM. This has been achieved in a number of ways. First, the Special Issue publishes a regular series of commentaries and

"education scholarship insights" oriented toward professional development in education scholarship, highlighting existing controversies, areas of active investigation, and perspective of education scholars. Second, the Special Issue's editors have assembled a cadre of associate guest editors and peer reviewers from across the EM education spectrum. These experiences are believed to be an important source of professional development in education scholarship for those who participate.[6] Perhaps most importantly, the editorial team is charged with the mission of providing formative feedback to authors through manuscript review that highlights best practices and potential avenues for improvement, thereby providing professional development for budding education scholars.[7]

With 95% of all publications representing collaboration between two or more authors and 50.7% having representation from two or more ACGME-accredited programs, the Special Issue provides a platform for a collaborative scholarly collective further facilitating the professional development of education scholars. As important, multi-institutional research tends to demonstrate greater rigor than single-site studies, and are more likely to be generalizable to the education community as a whole.[8] The representation of multi-institutional collaboration between authors and multi-site collection of research data presented in the Special Issue is a particular strength of the journal's output in education scholarship to date (34.9% of peer-reviewed publications). By encouraging and highlighting such work, the Special Issue appears to be building a connection between educators and scholars, with the goal of supporting the development of a culture of educational practice that is built upon scholarship.[9]

Traditionally, a publication's success has been based on the number of citations it receives measuring "intellectual impact." High-impact papers generally reflect areas of development and intellectual interest at the time of the publication. Consistent

with this concept, the top 10 Special Issue articles based on citations from 2015-2019 include such topics as the competency assessment, ultrasound in the emergency department, flipped classrooms, and emotional intelligence (Table 1).

There are three primary sources for traditional citation metrics: WOS; Scopus (Elsevier); and Google Scholar. Although each uses somewhat different databases, Google Scholar differs the most for its additional use of nontraditional, less academically rigorous sources such as conference proceedings, international non-English journals, course syllabi, blogs, and magazine articles.[10-12] Google Scholar is unique in being freely accessible to individuals, while the others have associated costs as proprietary offerings. Prior work has shown traditional metrics based on citations takes two to five years to provide a sense of a paper's impact that is intellectual in nature.[13-15] With nine of the top 10 articles based on Google Scholar citations between 2015-2019 published in 2015, the findings of the current study aligns with this concept (Table 1).

In 2011, altmetrics was introduced providing a different perspective on impact.[16] The altmetrics score represents a weighted approximation of the attention, which can be either good or bad, a publication receives based on various social media platforms such as Facebook, Twitter, blogs, Mendeley bookmarks, and Wikipedia.[17] The most common input to this scoring is Twitter.[18] For a number of reasons, not all possible sources are tracked, which is why a a question mark (?) and not a zero is placed in the Altmetric scoring circle if nothing is found. In 2015, Costas et al. reported that only 22.8% of health science research had an Altmetric score.[18] In this study that number was 48.3%. It is generally agreed that altmetrics measures a different type of impact compared to traditional citations with counts reflecting interest in a topic from a broader community, including impact on government/policy institutions, educators, and the general public.[17-19] As opposed to traditional
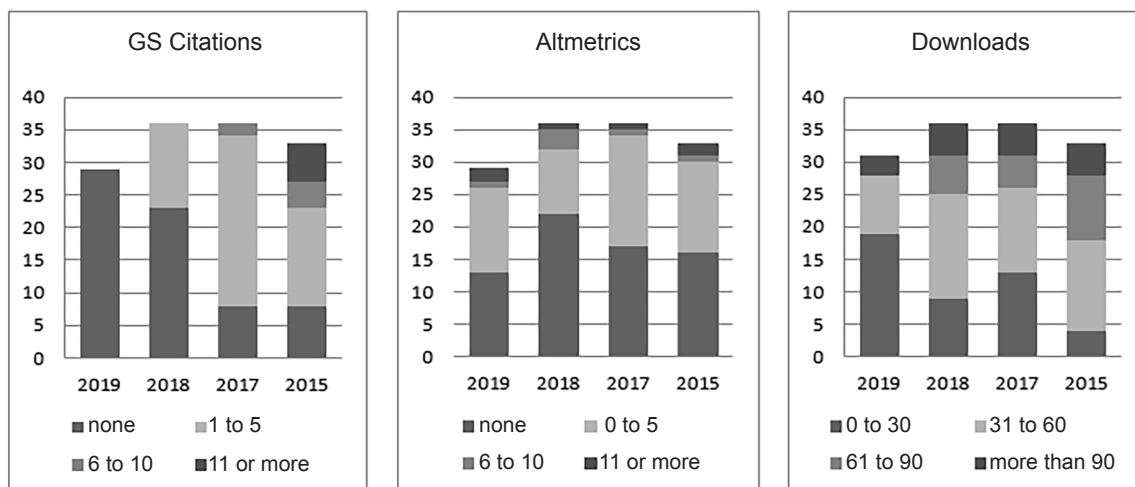
Figure 1. Distribution of performance by year of all *Western Journal of Emergency Medicine* Special Issues in Educational Research and Practice articles published based on Google Scholar citations, Altmetrics, and downloads. *GS*, Google Scholar.

Table 2. Performance of those *Western Journal of Emergency Medicine* Special Issue published articles selected for print version in addition to online publication vs those published online only from 2015-2019.

	Google Scholar	Altmetrics	Downloads	Overall	% of total for group
Print & online	4	4	4	12	23.1% (12/54)
Online only	6	7	6	19	23.2% (19/82)

Percentage calculated by dividing the representation in the top 10 by the total number of articles published in that format.

metrics, altmetrics provides a measure of immediate impact seen within days (eg, Twitter) to months (eg, Mendeley) of publication.[14,19,20] The data from the current study supports this assumption, as three of the top 10 altmetrics-measured articles are from the 2019 issue, two months after publication.

Prior work shows that there is a low but positive correlation between altmetrics scores and an article's eventual citation count best predicted by the performance of "tag and save" resources such as Mendeley.[18-19] Based on these differences from traditional metrics, one might assume that the articles demonstrating the most significant altmetrics impact would differ from those determined by traditional citations. This study found no measurable difference between the two (Table 3), although the small numbers generated may have limited our ability to determine a difference. It has been argued that altmetrics lack a sufficient validity argument based on rigorous evaluation to support its trustworthiness at the current time based on (1) lacking in underlying theory, (2) potential reporting bias, and (3) ease of gaming the system.[20,21] The value and place of altmetrics and social media in determining impact continues to evolve.[12,22,23]

The third and final metric assessed by this study was collected from web-based platforms, reporting how often a published article is downloaded. Much like altmetrics, this

impact is seen early after publication (ie, days to weeks) (Table 1). Several prior works have shown that this early measure of performance correlates with longer term citations counts and thus intellectual impact.[24,25]

LIMITATIONS

This work represents a good faith effort to represent the impact of the Special Issue and the breadth of its reach into training programs in EM. Although this analysis documents the volume and type of educational research papers in the Special Issue, the analysis did not involve comparison to education research papers published in other journals during this or an earlier time frame. It is possible that the Special Issue merely diverted papers that would otherwise have been published elsewhere.

The decision to use the percentage of ACGME-accredited EM programs in 2016 as the denominator in calculations of program authorship representation was based on the large number of programs that have been accredited over the past four years, making the denominator a "moving target." This is based in part on the inclusion of osteopathic graduate medical programs under the ACGME umbrella. This incoming group of programs represents an opportunity to broaden the Special Issue's reach even further by promoting participation of these programs as a short-range goal.

CONCLUSION AND FUTURE DIRECTIONS

The *West*JEM Special Issue in Educational Research and Practice, published annually over the past four years, has had significant impact both within and beyond the community of EM educators. The Special Issue has provided an outlet for education scholarship, discussion of current topics, debates in EM education, and dissemination of best practices. In addition, it has made significant strides in its stated goal of fostering collaboration across networks of educators and clinicians, while fostering the development of a community of practice in education scholarship.

The impact of the Special Issue is noted by its early

Table 3. Topics of the *Western Journal of Emergency Medicine* Special Issue top 10 articles from 2015-2019.

Theme	Google scholar	Altmetric	Downloads	Overall (without repeat)
Didactics	1	4	2	6
Simulation	2	0	3	4
Assessment/evaluation	3	1	0	4
Novel curricula	3	0	1	3
Scholarship	1	2	0	3
Quality improvment/patient safety	0	1	2	2
Leadership	0	0	1	1
Clinical reasoning	0	0	1	1
Recruitment/residency application	0	3	0	3
Total				27

outcomes as indicated by the altmetrics and download data presented –as well as forming the basis for future scholarship over time– as demonstrated by the citation data represented in the citation and more traditional impact data. Ongoing bibliometrics should be tracked to better understand and characterize the long-term impact of these papers in terms of citations and changes in educational practice.

Address for Correspondence: Jeffrey N. Love, MD, MHPE, 2120 L St, NW, Department of Emergency Medicine, MFA, George Washington School of Medicine, Washington, DC 20037. Email: Jlove01@gwu.edu.

REFERENCES

1. Love JN, Coates WC, Santen SA et al. The MERC at CORD Scholars Program in Medical Education Research: a novel faculty development opportunity for emergency physicians. *Acad Emerg Med* 2009;16(12) Suppl 2:S37-41.

2. Love JN, Ander DS. Building a specialty-specific community of practice in education scholarship. *West J Emerg Med.* 2015;16:799-800.

3. eScholarship Publishing. Scholarship. University of California. Available at: https://escholarship.org/publishing. Accessed October 23, 2019.

4. Arias IM. Reflections on the first five years of *Hepatology*, 1981-1986. *Hepatology.* 2006;43:S3-4.

5. McKiernan EC, Bourne PE, Brown CT et al. How open science helps researchers succeed. *eLife* 2016;5:e168800.

6. Annesley TM. Seven reasons not to be a peer reviewer - and why these reasons are wrong. *Clin Chem.* 2012;58:677-79.

7. Town L, Wise LL, Winters, TM. Committee on Research In Education, National Research Council. *Advancing Scientific Research in Education.* Washington, DC: National Academies Press; 2004:3.

8. Reed DA, Cook DA, Beckman TJ. Association between funding and quality of published medical education research. *JAMA.* 2007;298:1002-9.

9. Wenger E, Trayner B, de Laat M. Promoting and assessing value

10. Meho LI, Yang K. Impact of data sources on citation counts and rankings of LIS Faculty: Web of Science vs. Scopus and Google Scholar. *J Am Soc Inf Sci.* 2007;58:2105-25.

11. Vaughan L, Shaw D. A new look at evidence of scholarly citation in citation indexes and from web sources. *Scientometrics.* 2008;74:317-30.

12. Harzig AW, Alakangas S. Google Scholar, Scopus and the Web of Science: a longitudinal and cross-disciplinary comparison. *Scientometrics.* 2016:106:787-804.

13. Van Leeuwen T. Discussing some basic critique of journal impact factors: revisions of earlier comments. *Scientometrics.* 2012;92:443-55.

14. Lin J, Fenner M. The many faces of article-level metrics. *J Assoc Inf Sci Technol.* 2013;39:27-30.

15. Bornmann L. Alternative metrics in *Scientometrics*: a meta-analysis of research into three altmetrics. *Scientometrics.* 2015;103:1123-44.

16. The donut and Altmetric attention score. Altmetric. Available at: https://www.altmetric.com/about-our-data/the-donut-and-score/. Accessed October 23, 2019.

17. Bornmann L. Do altmetrics point to the broader impact of research? An overview of benefits and disadvantages of altmetrics. *J Informetr.* 2014;8:895-903.

18. Costas R, Zahedi Z, Wouters P. Do "altmetrics" correlate with citations? Extensive comparison of altmetric indicators with citations from a multidisciplinary perspective. *J Assoc Inf Sci Technol.* 2015;66:2003-19.

19. Haustein S, Peters I, Sugimoto CR et al. Tweeting biomedicine: an analysis of tweets and citations in the biomedical literature. *J Assoc Inf Sci Technol.* 2014;65:656-69.

20. Priem J, Costello KL. How and why scholars cite on Twitter. *J Assoc Inf Sci Technol.* 2010;47:1-4.

21. Priem J. 2014. Altmetrics. In: Cronin B. Sugimoto CR, eds. *Beyond Bibliometrics: Harnessing Multi-Dimensional Indicators of Performance.* Cambridge, MA: MIT Press; 2014;263-88.

22. Lin M, Thoma B, Trueger NS et al. Quality indicators for blogs and podcasts used in medical education: modified Delphi consensus recommendations by an international cohort of health professions educators. *Postgrad Med J.* 2015;91:546-50.

23. Sherbino J, Arora VM, Van Melle E et al. Criteria for social media-based scholarship in health professions education. *Postgrad Med J.* 2015;91:551-55.

24. Moed HF. Statistical relationships between downloads and citations at the level of individual documents within a single journal. *J Am Soc Inf Sci.* 2005;56:1088-97.

25. Brody T, Harnad S, Carr L. Earlier web usage statistics as predictors of later citation impact. *J Am Soc Inf Sci.* 2006;57:1060-72.

creation in communities and networks: a conceptual framework. Ruud de Moor Centru, Open Universiat, Netherlands, 18. Available at: https://wenger-trayner.com/documents/Wenger_Trayner_DeLaat_Value_creation.pdf. Accessed May 29, 2019.

Usability of *Learning Moment*: Features of an E-learning Tool That Maximize Adoption by Students

Andrew Chu, MD, MPH*
Dea Biancarelli, BHealthSc†‡
Mari-Lynn Drainoni, MEd, PhD†‡§¶
James H. Liu, MS‖
Jeffrey I. Schneider, MD‖
Ryan Sullivan, MD, MPH#
Alexander Y. Sheng, MD, MHPE‖

*Boston University School of Medicine, Boston, Massachusetts
†Boston University School of Public Health, Department of Health Law, Policy and Management, Boston, Massachusetts
‡Boston University School of Medicine, Evans Center for Implementation and Improvement Sciences, Boston, Massachusetts
§Boston University School of Medicine, Section of Infectious Diseases, Department of Medicine, Boston, Massachusetts
¶Edith Nourse Rogers Memorial Veterans Hospital, Center for Healthcare Organization and Implementation Research, Bedford, Massachusetts
‖Boston Medical Center, Department of Emergency Medicine, Boston, Massachusetts
#Lawrence General Hospital, Emergency Center, Lawrence, Massachusetts

Introduction: E-learning is widely used in medical education. To maximize the potential of E-learning tools, every effort should be made to encourage adoption by optimizing usability. We created Learning Moment (LM), a web-based application that integrates principles of asynchronous learning and learning portfolios into a platform on which students can document and share learning experiences that occur during clinical work. We sought to evaluate the usability of LM and identify features that optimize adoption by users.

Methods: We implemented LM in August 2016 at a busy, urban, tertiary care emergency department that hosts an emergency medicine residency, robust third and fourth year medical student clerkships as well as a physician assistant student rotation. We conducted a single-center, mix-methods study using the System Usability Scale (SUS) questionnaire and qualitative interviews. We sent e-mail invitations with subsequent reminders to all students who rotated in our emergency medicine clerkship from August 2016 to April 2017 to complete the SUS questionnaire anonymously and to participate in qualitative interviews. We employed purposive sampling to recruit students who used LM during their rotation to participate in our qualitative interviews. We conducted semi-structured interviews with 13 participants (10 individual interviews and one 3-person group interview) between January and March 2017 using an ethnographic approach and utilized a general inductive method to analyze and code for potential themes.

Results: Thirty of the seventy students invited to participate completed the SUS questionnaire (Response rate of 42.8%). The mean SUS score is 80.9 (SD 18.2, 80% CI 76.5 – 85.3). The internal consistency of the responses achieved the Cronbach's Alpha of 0.95. The participants stressed the importance of the following in the adoption of LM: maximal simplicity and usability, compatibility with learning preferences, and department-wide acceptance and integration.

Conclusion: The overall perceived usability of LM was high. Our qualitative data revealed important implications for future designers to maximize adoption: include target users in every step of the design and development process to maximize simplicity and usability; build features that cater to a diversity of learning preferences; involve the entire department and find ways to incorporate the tool into the educational infrastructure and daily workflow. [West J Emerg Med. 2020;21(1)78-84.]

INTRODUCTION

E-learning describes systems that are capable of storing, managing, or modifying educational content, while also facilitating interaction between participants as they assimilate and input data.[1] E-learning is widely used in medical education, across various specialties, educational settings, and training levels.[2]

To maximize the potential of E-learning tools, effective user-interface design is crucial to making an educational impact on the target learner population. Every effort should be made to optimize usability and reduce complexity to encourage adoption.[3] The benefits of E-learning occur when features are effectively applied, deemed useful, and compatible with learning processes of users.[4]

While the definition of usability varies according to field of research, it is generally understood as "the capacity a system has to offer to the user in carrying out of tasks, in an effective, efficient, and satisfactory manner."[1] Usability of E-learning tools has been explored in various scientific disciplines from ergonomics, computer science, to design and education.[1] In these studies, usability is often evaluated in terms of knowledge, attitudes, skills, and online activity, each of which provides an incomplete depiction of overall usability.[5-7] There is paucity of literature evaluating usability of E-learning platforms using more comprehensive, validated assessment tools within medical education; and even fewer studies identifying the features that promote adoption of these E-learning tools.

We created *Learning Moment* (LM),[8,9] a web-based application that integrates principles of asynchronous learning[10,11] and learning portfolios[12] to provide a platform on which students can document and share learning experiences that occur during clinical work. As described in our previous research, our intention was to optimize the experiential learning process for our students in the emergency department (ED).[8,9] Understanding the importance of a learner-centered model of instructional design, our goals for this study were to evaluate the usability of LM and identify features that enhance adoption by users.

METHODS
Design and Implementation

In depth description of educational goals, theoretical foundation, design, implementation, utilization, sustainability, and learner experiences of LM are detailed elsewhere.[8,9] In brief, Kolb's 4-part experiential learning model (concrete experience, reflective observation, abstract conceptualization, and active experimentation) is one of the foremost experiential learning theories.[13] Most clinical learning environments, like our ED, offers learning experiences and chances to experiment. However, they rarely provide structured opportunities for reflection and abstract conceptualization. LM fulfills these gaps to help students learn better in the clinical setting.[8,9]

Educational Research Capsule Summary

What do we already know about this issue?
While E-learning is widely used in medical education, few studies exist to evaluate the usability of E-learning tools or identify the features that promote their adoption.

What was the research question?
We sought to evaluate the usability of Learning Moment *and identify key features that optimize adoption by users.*

What was the major finding of the study?
The usability of Learning Moment *was high. Participants underscored three important themes that encouraged use and adoption.*

How does this improve population health?
Learning moment *features that promote usability and adoption, along with our design and implementation experiences, may be useful for other E-learning designers in medical education.*

LM (https://www.learningmoment.org/) allows students to conveniently record "learning moments" (defined as student self-identified learning experiences), highlighting the take-away "learning pearls." The goal of LM was to provide students with a physical and mental space to synthesize experiences into coherent thoughts, thus enhancing understanding and retention through self-reflection and abstract conceptualization.[14] By encouraging the sharing of "learning moments," LM generates a searchable and shareable repository of useful, practical, high yield educational content[8] that can be used for vicarious learning in the form of a "Community Feed."[15] Our intention was to build and support a community of practice, both live and virtual, to facilitate knowledge sharing.[16,17] A three-member faculty panel reviewed the "learning moments" to ensure content validity and Health Insurance Portability and Accountability Act (HIPAA) compliance. Experienced clinical faculty led monthly in-person "*Learning Moment* Reflection" small groups with students to further discuss and expand upon the "learning moments" logged during their rotation. Through this process, students have further opportunities to incorporate key components of Kolb's experiential learning cycle[13] (reflection and abstract conceptualization in particular) that are frequently absent in the bustle of today's clinical learning environment.

We implemented LM in August 2016 at a busy (annual volume in excess of 130,000 visits), urban, tertiary care ED

that hosts an emergency medicine (EM) residency, robust third and fourth year medical student clerkships as well as a physician assistant (PA) student rotation. Students were introduced to LM during their initial rotation orientation session. Participation in LM was entirely voluntary and did not affect their grade or evaluations in any way.

Within the first six months after implementation, 42 out of 53 (79.2%) students who rotated in our EM clerkship logged at least one "learning moment" for a total of 323 "learning moments" logged. These results, along with the distribution of number of "learning moments" logged by students are described elsewhere.[9] Students have logged more than 1000 "learning moments" after 16 months of implementation, indicating continued sustainability.[8]

Study Design and Recruitment

We conducted a single-center, mix-methods study using the System Usability Scale (SUS) questionnaire and qualitative interviews. Described as the "quick and dirty" scale that is both short and reliable, the SUS is the most widely used questionnaire for measurement of perceived usability of digital tools, including software and websites.[18,19] Having been referenced in over 1,300 articles and publications, the SUS is currently the industry standard because it is easy to administer, produces reliable results even with small sample sizes, and is a validated tool for differentiating usable and unusable systems.[18,19]

We sent e-mail invitations with subsequent reminders to all third and fourth year medical students and PA students who rotated in our EM clerkship from August 2016 to April 2017 to complete the SUS questionnaire anonymously and to participate in qualitative interviews, regardless of the extent to which they utilized the LM platform. In addition to email invitations, we employed purposive sampling to recruit medical students who used LM during their rotation to participate in our qualitative user interviews. Our Institutional Review Board deemed our study to be exempt.

Data Collection Procedures

For the SUS, we distributed the questionnaire and collected data using REDCap, an electronic data capture tool. We conducted semi-structured interviews with 13 participants, including 10 individual interviews and one three-person group interview, between January and March 2017. We conducted seven interviews in person, and six by telephone due to difficulty arranging face-to-face meetings. In person interviews were conducted in medical school classrooms and departmental conference rooms. We conducted interviews until we reached thematic saturation[20] as the last several interviews yielded no additional patterns or themes. A single researcher and coauthor (AC) conducted and audio-taped all interviews using the same interview guide (Supplemental File). Individual interviews lasted between 5 and 20 minutes with a mean and median of 15 minutes and 16 minutes respectively. The three-person group interview was 26 minutes in duration.

Data Analysis

SUS questionnaire results were compiled in aggregate and descriptive statistics were presented as frequencies. Cronbach's alpha was used to measure the internal consistency of the questionnaire items. All questionnaire data analyses were performed using SAS v9.4 (Cary, NC). For the items of the SUS, the score was calculated using Brooke's standard scoring method.[19]

After each qualitative interview was completed, the researcher and coauthor (AC) who conducted the interviews transcribed the audio recording verbatim. We reviewed all transcribed interviews to ensure accuracy. For analysis, we employed standard qualitative research methods using the principles of grounded theory.[21,22] We coded the data inductively to generate a unified, theoretical explanation of features that would optimize adoption by users. Two coauthors (Andrew Chu and Dea Biancarelli) trained in qualitative research methods coded and generated common themes through consensus and discussion. The two co-authors initially individually reviewed a subset of transcripts and met to create an initial codebook of emerging themes. Chu and Biancarelli then applied the initial codebook to another subset of transcripts, refining and finalizing the codebook for a 'better fit' for the data. They applied the finalized version of the codebook to all the transcripts using qualitative software package Nvivo (QRS International, Doncaster, Victoria, Australia). After transcripts were coded, they further convened to analyze data and determine key themes users described in regard to usability and features that optimize adoption.

RESULTS
System Usability Scale

Thirty of the seventy students invited to participate after having rotated in our EM clerkship during the study period completed the SUS questionnaire (Response rate of 42.8%). The detailed participant demographics are listed in Table 1.

Table 1. System Usability Scale questionnaire participants.

Characteristics	n (%)
Discipline	
Medical student	28 (93)
Physician assistant student	2 (7)
Level of Training (medical students)	
MS-3	13 (46)
MS-4	15 (54)
Intended Future Specialty*	
Emergency medicine	16 (55)
Other	13 (45)

MS, medical student year.

The mean SUS score is 80.9 (SD 18.2, 80% confidence interval [CI], 76.5 – 85.3). The internal consistency of the responses achieved a Cronbach's Alpha of 0.95. While the vast majority of participants answered positively ("strongly agree" or "agree") to the questions on the SUS, only 46% reported that they "would frequently use the website" (Figure 1).

Qualitative Interviews

Thirteen medical students (five in their third year (MS-3) and eight in their fourth year (MS-4)) voluntarily participated in our qualitative interviews. Five of the 13 (38%) students intended to pursue EM as their chosen field of specialty. No PA students volunteered to participate. Detailed demographics of participants are shown in Table 2.

Table 2. Qualitative interviewee characteristics (N=13).

Characteristics	n (%)
Year	
MS-3	5 (38.5)
MS-4	8 (61.5)
Gender	
Female	11 (84.6)
Male	2 (15.4)
Intended future specialty	
Emergency medicine	5 (38.5)
Other/unsure	8 (61.5)

MS, medical student year.
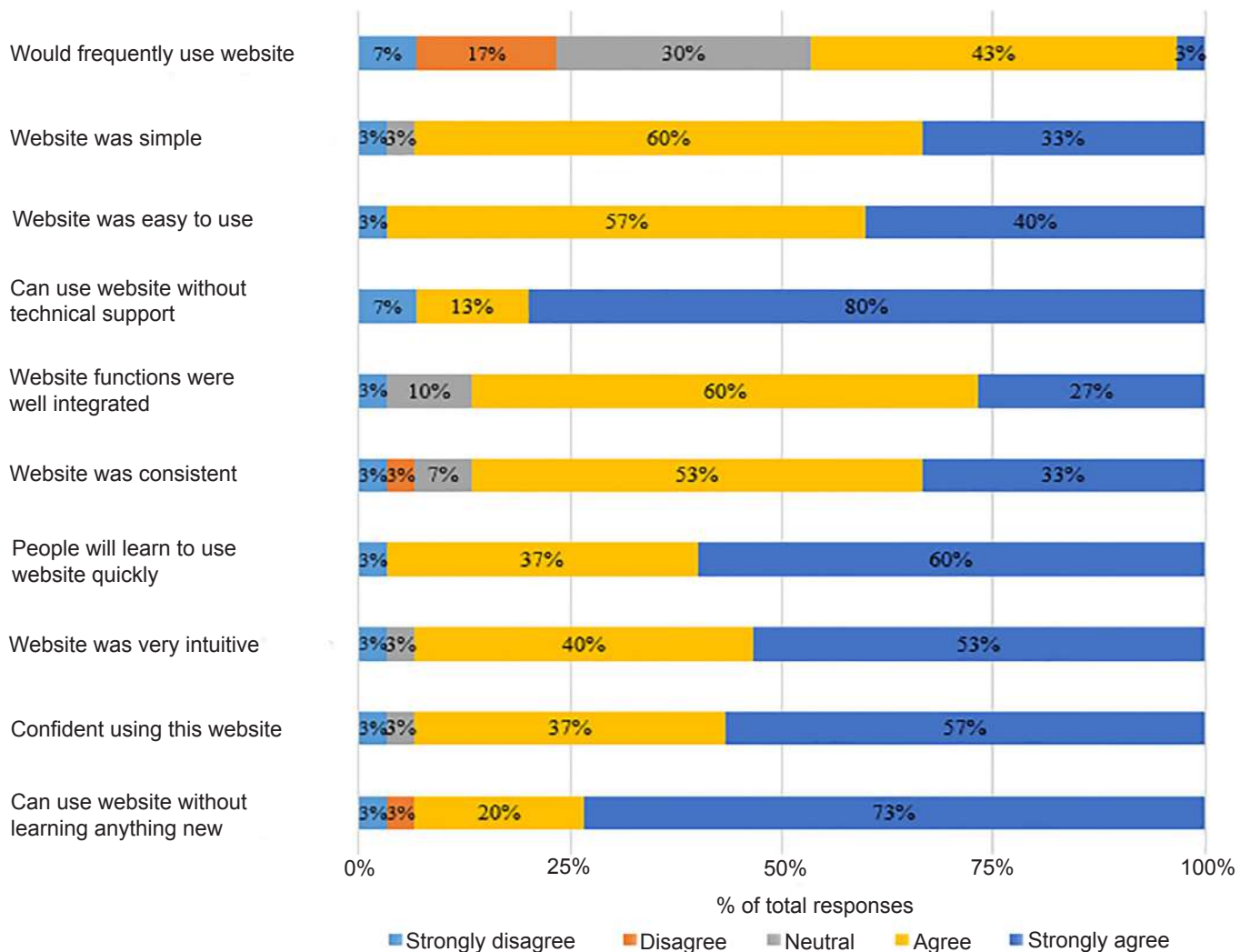
Figure 1. System Usability Scale questionnaire responses.
Cronbach's Alpha=0.95

In regard to features that increased the adoption of LM by users, our participants stressed the importance of the following: maximal simplicity and usability, compatibility with learning preferences, and department-wide acceptance and integration.

Theme 1: Maximal Simplicity and Usability

LM's simplicity of design and high usability was lauded by LM users. Student described LM as an easy-to-use and intuitive way to reinforce learning points.

> *"I like the sort of **minimalist style** you guys used. I love that. You know, it makes **it pleasant and makes it useful and easy.**"- Student 6*

Any steps perceived as extraneous felt overly burdensome and disengaged students. Attitudes were shaped by time scarcity, alternative learning tools, and competing priorities.

> *"But **[optional entry fields unrelated to the learning pearl such as location of learning, time of day, etc.] puts a burden on the user…to input all these other fields.**" – Student 5*
> *"But I felt that **it was a little cumbersome just to report [optional entry fields]at times through the website**… I just felt like there were too many questions… **Does it really matter?**" – Student 8*

Theme 2: Compatibility With Learning Preferences

Students explained that their learning preference greatly influenced whether or not they would utilize LM as an E-Learning tool. Many students embraced the brevity of clinical pearls. The concise and high-yield format of pearls was described as useful and easy to engage with by most students.

> *"I feel like **putting your thought into a concise kind of straightforward, like, bullet point helps you remember it.**" – Student 10*
> *"Sort of building off of that, **I also noticed the character limit, and it reminded me 'Oh, keep this short and sweet' and I think that helps for other people who want to go through other users' learning moments. To go through it and be like, 'Oh, that's a nice little factoid, that's a nice little tidbit.'** And then there's an area where like, 'Oh, what did the patient present with, and what was the case?' If you wanted to go through that and get more of a background, you have that ability to do that. **So it was a nice way of presenting information in a short, sweet way, and then having an area for a little more thought and background**." – Student 9*

However, others felt this approach was incompatible with their learning preference – that pearls were too short, too disconnected, and/or unrelated in subject matter.

> *"**But a lot of people posting abbreviated learning moments. It's hard to learn something so significant from a one***

sentence thing, at least through the way I learn. I just found better ways to learn, and Learning Moment is not one of them." – Student 5*
> *"The problem that would pose for me is that **learning through Learning Moment is very fragmented**, right? Like, one pearl will be about the care of an alcoholic, and the next one will be about sepsis. **I want to learn about one subject at one time and then move onto the next.**" – Student 5*

Theme 3: Department-wide Acceptance and Integration

Students perceived greater utility of LM the more it was used by their peers. Without peer engagement in LM, students became less interested in utilizing it as a learning tool. Students were more willing to use LM if valued by the entire department, especially when faculty and residents would integrate LM into daily workflow and didactics.

> *"**You need a lot of buy-in for it to be good**… if I were using that on every single rotation, or if it were in my residency and everyone in my residency was using it…I would totally use it, because I think it's a good tool. **If everybody's using it or is using it consistently throughout the year, I would totally use it.**" – Student 7*
> *"I think **the purpose of the learning moment was to encourage an environment of teaching**. So not only was it to have students and residents reflect on things that they learned during their shift. Maybe it was also to **encourage attendings and more senior providers to teach more** and provide those learning moments for students on shift."- Student 12*
> *"I think **if it was part of the curriculum where I was, it would be useful. I don't think if I was just doing it my own thing that I would use it**."- Student 2*

DISCUSSION

E-learning as an educational adjunct has gained widespread popularity in various health profession education settings.[3, 23, 24] When creating online educational programs, developers must adhere to sound educational principles that foster effective learning.[25] We designed LM on the basis of Kolb's experiential learning cycle,[13] asynchronous learning,[10] and learning portfolios[12] essentially as an E-portfolio.[9] Such web-based learning portfolios have been shown to enhance student motivation by students and teachers.[26] The online format provides additional transparency and ease of administration.[27] LM is unique among E-learning platforms in that it was created to optimize experiential learning specifically in a clinical environment.[8,9]

In addition to achieving a high degree of internal consistency of the responses with a Cronbach's Alpha of 0.95, LM's mean SUS score of 80.9 (SD 18.2, 80% CI, 76.5 – 85.3) lies in the 90th percentile when compared to other digital products. In other words, LM achieved a much higher level of perceived usability when compared to benchmarks derived from thousands of individual SUS scores and hundreds of systems, for which the average SUS score is 68, SD 12.5.[19] Considering that a

"good" SUS score is anything about a 76, the LM mean SUS score of 80.9, which received an "A" grade according to Sauro and Lewis,[19] would receive the adjective of "excellent" per Bangor et al.[28] While we acknowledge that such comparison has its limitations considering the heterogeneity within available E-learning products out there in terms of product goal, design, and audience, the SUS is nevertheless the industry standard specifically developed and validated for the purpose of comparing usability among digital products.[18-19]

Despite a robust overall SUS score, only 46% of our learners "would frequently use the website" according to the first question of the SUS (Figure 1). We believe that this may be due to the lack of significant downtime during the shift in the bustling environment of our ED for learners to document "learning moments" as well as incomplete buy-in to support LM by the department as a whole. After all, usability is necessary but not sufficient to ensure usage. Nevertheless, our actual usage data from our previous work demonstrate that LM is being used frequently.[8,9]

Our insights gleaned from the qualitative data can be invaluable for future designers who seek to maximize adoption. While the qualitative feedback for LM was overwhelmingly positive, few negative opinions that were expressed also provides invaluable lessons for us as E-learning designers.

In our qualitative user interviews, participants reiterated the importance of maximal simplicity and usability. Early in our conceptual design phase, we invited medical student and residents to brainstorm ideas that they believed would make the LM interface more user-friendly. Our efforts were rewarded with consistently positive usability results from both the SUS data and qualitative interviews.

Students favored the concise and high-yield nature of the learning pearls made available on LM. However, complaints from students regarding LM were related to the overly brief and random nature of learning pearls that were being logged and shared on our platform. In essence, LM did not accommodate their specific learning preferences. Despite the lack of evidence to support the existence of "learning styles" (e.g., visual, auditory, converger),[29] learners nevertheless have their own preferred methods of learning. And matching of pedagogy to learner preferences is still recommended.[30] In our quest to maximize simplicity and usability, we failed to anticipate the desire for some students to learn in a more comprehensive and systematic manner. Integrating the needs of various learning preferences is likely a worthwhile endeavor for future designers of E-learning.[31] For instance, additional features that sort "learning moments" into specific diseases or organ systems would better accommodate those who prefer to learn in a more systematic fashion.

Additionally, our participants noted the significant roles that department-wide acceptance and integration significantly affected adoption of LM as an E-learning tool. Similar to previously study, community engagement and interaction matters.[32] While E-learning can potentially reduce the need for in person didactics, it cannot replace face-to-face interaction, as students consider traditional teaching to be the foundation of their education.[6]

LIMITATIONS

Our study has several important limitations. First, our results are limited by a response rate of 42.8%. Similarly, the sample size for qualitative interviews was small with only 13 voluntary interview participants. Nevertheless, our qualitative interviews reached thematic saturation.[20] Students who self-selected to participate in the study may have strong positive or negative views towards LM, thus subjecting our results to participation bias. Although our recruiting e-mail describing the voluntary nature of participation, in which we stressed that participation would not affect their grade or ranking for residency application in any way, participants may have been motivated to report positive experiences with LM, thus biasing our results. The generalizability of our experience may be limited by the fact that not all E-learning tools are the same. Nevertheless, important lessons can be gleamed from LM, especially when our study is one of the first to use an industry-standard, validated tool such as the SUS in evaluation of an E-learning tool in medical education. Lastly, supplementing quantitative findings with qualitative data in a mixed methods approach as we have done in our study has been used previously and described as the best option to evaluate usability of E-learning.[1,33]

Address for Correspondence: Alexander Y. Sheng, MD, MHPE, Boston Medical Center, Department of Emergency Medicine, 800 Harrison Avenue, BCD Building, 1st Fl., Boston, MA 02118. Email: shenga@bu.edu.

REFERENCES

1. Freire LL, Arezes PM, Campos JC. A literature review about usability evaluation methods for e-learning platforms. *Work*. 2012;41(SUPPL.1):1038-44.

2. Taveira-Gomes T, Ferreira P, Taveira-Gomes I, et al. What are we looking for in computer-based learning interventions in medical education? A systematic review. *J Med Internet Res*. 2016;18(8):1-21.

3. Cheng YM. The Effects of Information Systems Quality on Nurses' Acceptance of the Electronic Learning System. *J Nurs Res*. 2012;20(1):19-31.

4. Mikalsen M, Walderhaug S. An investigation of factors influencing healthcare workers' use and acceptance of E-learning in post-school healthcare education. *Stud Health Technol Inform*. 2009;150(7465):893-7.

5. Felder E, Fauler M, Geiler S. Introducing e-learning/teaching in a physiology course for medical students: acceptance by students and subjective effect on learning. *AJP Adv Physiol Educ*. 2013;37(4):337-42.

6. Nkenke E, Vairaktaris E, Bauersachs A, et al. Acceptance of technology-enhanced learning for a theoretical radiological science course: a randomized controlled trial. *BMC Med Educ*. 2012;12(1):18.

7. Lewis CE, Tillou A, Yeh MW, et al. Web-Based Portfolios: A Valuable Tool for Surgical Education. *J Surg Res*. 2010;161(1):40-6.

8. Sheng AY, Chu A, Biancarelli D, et al. A Novel Web-Based Experiential Learning Platform for Medical Students (Learning Moment): Qualitative Study. *JMIR Med Educ*. 2018;4(2):e10657.

9. Sheng AY, Sullivan R, Kleber K, et al. Fantastic Learning Moments and Where to Find Them. *West J Emerg Med*. 2017;19(1):1-7.

10. Mayadas F. Asynchronous learning networks: A Sloan Foundation perspective. *J Asynchronous Learn Netw*. 1997;1(1):1-16.

11. Jordan J, Jalali A, Clarke S, et al. Asynchronous vs didactic education: it's too early to throw in the towel on tradition. *BMC Med Educ*. 2013;13:105.

12. Zubizarreta J. The Learning Portfolio: A Powerful Idea for Significant Learning. *Idea*. 2009;Idea Paper:1-6.

13. David Kolb. *Experiential Learning: Experience as the Source of Learning and Development*. 1st ed. Prentice Hall; 1984.

14. Bernard AW, Gorgas D, Greenberger S, et al. The use of reflection in emergency medicine education. *Acad Emerg Med*. 2012;19(8):978-982.

15. Roberts D. Vicarious learning: A review of the literature. *Nurse Educ Pract*. 2010;10(1):13-16.

16. Cruess RL, Cruess SR, Steinert Y. Medicine as a Community of Practice. *Acad Med*. July 2017:1.

17. Barnett S, Jones SC, Bennett S, et al. General practice training and virtual communities of practice - a review of the literature. *BMC Fam Pract*. 2012;13(1):87.

18. Brooke J. SUS: a "quick and dirty" usability scale". In: Jordan PW, Thomas B, Weerdmeester BA, McClelland AL, eds. *Usability Evaluation in Industry*. London: Taylor and Francis; 1996.

19. Sauro J. (2011). *A Practical Guide to the System Usability Scale: Background, Benchmarks & Best Practices*. Denver, CO: Measuring Usability LLC.

20. Guest G, Johnson L. How Many Interviews Are Enough ? An Experiment with Data Saturation and Variability. *Field methods*. 2006;18(1):59-82.

21. Glaser BG, Strauss AL. (1967). *The Discovery of Grounded Theory : Strategies for Qualitative Research*. Aldine Pub. Co.

22. Pope C, Ziebland S, Mays N. Qualitative research in health care. Analysing qualitative data. *BMJ*. 2000;320(7227):114-6.

23. Schulz P, Sagheb K, Affeldt H, et al. Acceptance of E-Learning Devices by Dental Students. *Med 20*. 2013;2(2):e6.

24. Nesterowicz K, Librowski T, Edelbring S. Validating e-learning in continuing pharmacy education: user acceptance and knowledge change. *BMC Med Educ*. 2014;14(1):33.

25. Davies S, Lorello GR, Downey K, et al. Effective learning environments – the process of creating and maintaining an online continuing education tool. *Adv Med Educ Pract*. 2017;8:447-52.

26. Driessen EW, Muijtjens AMM, van Tartwijk J, et al. Web- or paper-based portfolios: is there a difference? *Med Educ*. 2007;41(11):1067-73.

27. Webb TP, Merkley TR. An Evaluation of the Success of a Surgical Resident Learning Portfolio. *J Surg Educ*. 2012;69(1):1-7.

28. Bangor A, Kortum PT, Miller JT. An Empirical Evaluation of the System Usability Scale. *Int J Hum Comput Interact*. 2008;24(6):574-94.

29. Newton PM, Miah M. Evidence-based higher education - Is the learning styles "myth" important? *Front Psychol*. 2017;8(MAR):1-9.

30. Yardley S, Teunissen PW, Dornan T. Experiential learning: AMEE Guide No. 63. *Med Teach*. 2012;34(2):e102-15.

31. Bolan RN. Incorporating the Experiential Learning Theory Into the Instructional Design of Online Courses. *Nurse Educ*. 2003;28(February 2003):10-4.

32. Banna J, Grace Lin M-F, et al. Interaction matters: Strategies to promote engaged learning in an online introductory nutrition course. *J Online Learn Teach*. 2015;11(2):249-61.

33. Brown M, Bullock A. Evaluating PLATO: Postgraduate teaching and learning online. *Clin Teach*. 2014;11(1):10-4.

Diving In: Experiential Learning about Research

Benjamin H. Schnapp, MD, MEd University of Wisconsin School of Medicine and Public Health, BerbeeWalsh Department of Emergency Medicine, Madison, Wisconsin

"I hate research," I hear many junior physicians say. They have likely received the advice given to many novices looking to get started with scholarly work: find an experienced researcher and jump on to one of their hulking projects for a brief moment of chart abstraction, recruitment of subjects, or data analysis. Certainly, finding mentors with a track record of success is laudable, and this approach does "check the box"—fulfilling the scholarly project requirement to graduate from residency or filling up a curriculum vitae for academic promotion. It is perhaps not surprising, however, that staring at endless spreadsheets of data, stripped of nearly all context, can dissuade potential budding scholars. This approach is akin to dipping only a toe in the waters of scholarly inquiry, allowing potential researchers to experience only one tiny piece of a much larger whole and missing the chance to foster a spirit of engagement with the scientific process.

Research sprang to life for me when a mentor offered me the opportunity to craft a research project by his side. No longer was I a passive participant, executing a master plan that I didn't really understand. Instead, I got to ask my own questions, realize that many of them had already been answered, and then keep asking questions and refining. I got to devise my own plan to test my question and then go back to the drawing board when those plans didn't work. I got to experience the terror of staring desperately at a blank screen, trying to start crafting a manuscript. While none of these experiences sound appealing on first look, to me it was the difference between being the backseat passenger in the car and sitting down behind the wheel: There's no comparison to that feeling of being in charge of your own research destiny.

Kolb's experiential learning cycle suggests why it is these immersive experiences that offer the most educational yield. The cycle describes four phases of learning, "concrete experience," "reflective observation," "abstract conceptualization," and "active experimentation." Learning occurs when all four phases have been completed.[1] Tackling someone else's project certainly offers the "concrete experience" of learning how to recruit a subject or code data, essential components of successfully accomplishing a research project. It may even foster opportunities for "reflective observation" on what was learned. However, only the opportunity to pursue your own scholarly interests independently offers the

opportunity for the generation of novel ideas through "abstract conceptualization" and the refinement of those ideas in the real world through "active experimentation," and therefore the ability to complete the learning cycle and cement learning about scholarly inquiry.

When thinking about Kolb's "active experimentation," it can be easy to overlook the "active" component of this stage in the learning cycle. Junior researchers can sometimes be seduced by their one big research project idea or the outstanding multicenter studies they read in the literature, becoming frustrated and spinning their wheels unproductively when they begin to hit unanticipated roadblocks. Scholarly work is much like riding a bike, however; you cannot remove your training wheels and expect to compete in the Tour de France. My first research projects involved only the residents at my own institution and took place over a single year. The projects were never bound for *The New England Journal of Medicine,* but they established a solid foundation that I could build on with subsequent projects. There is real value in "thinking small" when starting out with research: picking a project with a shorter timeline or a more limited scope allows for more rapid experience with each stage of Kolb's learning cycle and more opportunities for experimentation and growing confidence.

Active experimentation also cannot be accomplished in a vacuum. Attempting to dive into the research pool without any swimming lessons or lifeguards deprives you of chances to benefit from the vast array of wisdom available from experienced researchers. A mentor can offer concrete help - an additional article from the literature for framing your study or modifications for your data analysis. They can also help navigate more abstract issues, such as clarifying your research question, helping you stay motivated to complete your manuscript, as well as guiding you on next steps when you've completed your project.

Ongoing mentorship while learning to become a researcher is supported by Bloom's mastery learning theory. The theory states that with the proper supervision and enough repetitions, nearly anyone can achieve a high standard of performance.[2] With an instructor to help guide the work and ensure that new ideas are on target, an apprenticing researcher can achieve true deliberate

practice, rather than continuing to make the same mistakes again and again. Mentors allows junior researchers to train with good habits as they move through the steps of completing their projects.[3] Even with mentorship however, it can be daunting to embark on new projects on your own. When struggling through a particularly vexatious problem or just trying to stay motivated to keep plugging away, research can seem isolating, as though you are the only person struggling with how to calculate a confidence interval or write a compelling introduction.

Seeking out a peer group of other junior researchers can offer insight, support and opportunities for collaboration. If an obvious peer group doesn't exist within your own institution, the Internet offers the opportunity to instantly partner with colleagues at distant sites and benefit from networking from afar via Twitter or Slack. Further, creating collaborations outside your institution offers the chance to eventually expand your research to multiple sites, increasing its potential impact. Wenger would call these peer groups focused on learning and support "communities of practice." Members of these groups engage in collective education in a shared domain,[4] in this case, research. Importantly, these communities allow for the participation of new members via "legitimate peripheral participation"; so it is not necessary to be a seasoned expert or full participant right away – you can work your way into the community of learners at a pace that feels comfortable to you, benefitting along the way from the wisdom of the crowd.

I've picked up countless lessons along the way from the projects I've completed so far. The importance of identifying allies within your institution, teaming up with accountable collaborators, choosing accomplishable goals, getting a statistician on board early, and writing your manuscript as you go are but a few of the tips that I take with me, and there is undoubtedly so much more to learn as I step into my next projects. But don't just take advice from my experiences. Dive in and turn your idea into the

next amazing research project and pick up your own lessons along the way. You'll be happily swimming the scholarly seas in no time.

Address for Correspondence: Benjamin H. Schnapp, MD, MEd, University of Wisconsin, BerbeeWalsh Department of Emergency Medicine, 800 University Bay Dr., Madison, WI 53705. Email: bschnapp@medicine.wisc.edu.

REFERENCES

1. Kolb DA, Fry RE. (1974). *Toward an Applied Theory of Experiential Learning*. Cambridge, Mass: M.I.T. Alfred P. Sloan School of Management.
2. Bloom BS. Time and learning. *Am Psych.* 1974;29(9):682-8.
3. Ericsson KA, Krampe RT, Tesch-Römer C. The role of deliberate practice in the acquisition of expert performance. *Psychological Review.* 1993;100(3):363-406.
4. Wenger E. (1999). *Communities of Practice: Learning, Meaning, and Identity*. New York, New York: Cambridge University Press.

Maggots, Mucous and Monkey Meat: Does Disgust Sensitivity Affect Case Mix Seen During Residency?

Benjamin H. Schnapp, MD, MEd*
Emily Fleming, MD*
Aaron S. Kraut, MD*
Mary Westergaard, MD*
Robert J. Batt, PhD, MBA†
Brian W. Patterson, MD, MPH*

*University of Wisconsin School of Medicine and Public Health, BerbeeWalsh Department of Emergency Medicine, Madison, Wisconsin
†University of Wisconsin, Department of Operations and Information Management, Madison, Wisconsin

Introduction: Emergency physicians encounter scenarios daily that many would consider "disgusting," including exposure to blood, pus, and stool. Physicians in procedural specialties such as surgery and emergency medicine (EM) have lower disgust sensitivity overall, but the role this plays in clinical practice is unclear. The objective of this study was to determine whether emergency physicians with higher disgust sensitivity see fewer "disgusting" cases during training.

Methods: All EM residents at a midsize urban EM program were eligible to complete the Disgust Scale Revised (DS-R). We preidentified cases as "disgust elicitors" based on diagnoses likely to induce disgust due to physician exposure to bodily fluids, anogenital anatomy, or gross deformity. The "disgust elicitor" case percent was determined by "disgust elicitor" cases seen as the primary resident divided by the number of cases seen thus far in residency. We calculated Pearson's r, t-tests and descriptive statistics on resident and population DS-R scores and "disgust elicitor" cases per month.

Results: Mean DS-R for EM residents (n = 40) was 1.20 (standard deviation [SD] 1.24), significantly less than the population mean of 1.67 (SD 0.61, $p<0.05$). There was no correlation (r = -0.04) between "disgust elicitor" case (n = 2191) percent and DS-R scores. There was no significant difference between DS-R scores for junior residents (31.1, 95% confidence interval [CI], 26.8-35.4) and for senior residents (29.0, 95%CI, 23.4-34.6).

Conclusion: Higher disgust sensitivity does not appear to be correlated with a lower percentage of "disgust elicitor" cases seen during EM residency. [West J Emerg Med. 2020;21(1)87-90.]

INTRODUCTION

Selecting a specialty is one of the most impactful choices a physician makes in his or her career, affecting lifestyle, salary, and happiness.[1] Medical students are advised to consider the value they place on patient contact, longitudinal care, research, and procedural skill.[2] More recent evidence suggests that personality may also play a role in specialty choice.[3,4] Recently, the emergency medicine

(EM) personality was found to be markedly different from that of other physicians: emergency physicians tend to be more vigilant, team-oriented, and pragmatic.[5]

Disgust is an emotion thought to have evolved to encourage humans to avoid disease transmission;[7] however, there are significant individual differences in disgust sensitivity.[8] To successfully care for patients afflicted with infections, vomiting, or anogenital issues among others,

physicians must manage their innate disgust response by donning gloves, masks and gowns, or simply by accepting the necessity of the exposure in the name of patient care. Studies have previously shown that lower disgust sensitivity correlated with a choice of nursing or medicine over pharmacology.[9] However, not all medical specialties require equal exposure to "disgust elicitors," and prior research has shown lower disgust sensitivity in those planning to choose a procedural specialty such as surgery or EM.[10]

While emergency physicians may have lower disgust sensitivity overall, it is not known whether individual differences in disgust sensitivity impact clinical performance during residency. EM residents have previously been shown to "cherry-pick" the patient cases that they see;[11] if residents with higher disgust sensitivity select fewer "disgust elicitor" cases, they could leave training with skill and knowledge gaps compared to their less sensitive peers. Additionally, medical students considering EM may find it valuable to know whether their propensity for disgust could affect their future career success. The purpose of this study was to determine whether emergency physicians with higher disgust sensitivity see fewer "disgusting" cases during training.

METHODS

This was a cross-sectional retrospective study conducted at a three-year academic, midsize city residency program in the midwest with 12 residents per year. Residents from graduation years (GY) 2018 to 2021 were eligible. Participants were asked to complete the Disgust Scale Revised (DS-R), a 25-item, validated, disgust sensitivity scale[12,13] that has been shown to have behavioral correlates (Appendix A).[14] Participants were informed that their results would be confidential, used for investigation only, and not used as part of any evaluation for residency.

We extracted the top 1000 ICD-10 billing codes for the last four years from the electronic health record (EHR). Sixty-two "disgust elicitors" were chosen from this list by a consensus group of three experienced emergency physicians based on likely physician exposure to phenomena generally regarded by the public as "disgusting," including bodily fluids, anogenital anatomy, or gross physical deformity (Appendix B). Borderline examples such as "vomiting" were excluded as the physician was not guaranteed to be exposed directly to the disgusting attribute. Similarly, broad diagnoses such as "infected lower extremities" were excluded as these were felt to represent too wide a variation in clinical presentation, from the disgust-eliciting purulent wound to the minimally bothersome early leg cellulitis.

For each resident, the "disgust elicitor" case percent was determined by querying the EHR for "disgust elicitor" cases seen as the first assigned resident over the entire course of his or her residency thus far, and then dividing by the total number of cases seen as the first assigned resident at the residency's main emergency department (ED) site. Taking over care of a patient with a "disgust elicitor" diagnosis was not counted toward a resident's total, as it was felt that the "disgust elicitor" aspect (e.g., rectal exam) was likely addressed by the first physician. We calculated a Pearson's r between resident DS-R scores and their "disgust elicitor" case percent; descriptive statistics and t-tests were calculated on resident and population DS-R scores.[15]

This study was determined to be exempt by the University of Wisconsin IRB.

RESULTS

Of 48 eligible residents, 42 (87.5%) completed the DS-R. One response was removed from the analysis per the DS-R scoring recommendations for indicating a high level of disgust to a distractor question; another was removed as the respondent could not be matched to cases. Ultimately we analyzed data from 40 residents, representing 84,822 total cases. Median DS-R in the study population was 1.18; mean DS-R was 1.20 (standard deviation [SD] 1.24), significantly less (one sample $t(39) = -4.8$, $p<0.01$; Cohen's d effect size $= .7756$, which can be interpreted as an intermediate effect[16]) than the population mean of 1.67 (SD 0.61). Individual disgust scores ranged from 0.36 to 2.28.

We identified 2191 total "disgust elicitor" cases that were seen primarily by study participants, representing 2.6% of the total cases. We found no correlation ($r = -0.04$) between "disgust elicitor" case percent and DS-R scores. See Table 1 for "disgust elicitor" cases broken down by each class. There was no significant difference ($p = 0.56$) between the mean DS-R scores for junior (graduation year [GY] 2020 and 2021) residents (31.1, 95% CI, 26.8-35.4) and for senior (GY2018 and GY2019) residents (29.0, 95% CI, 23.4-34.6).

DISCUSSION

Our study suggests that greater disgust sensitivity does not correlate with a lower percentage of "disgust elicitor" cases seen by EM residents during their training. Consistent with prior research, disgust sensitivity was lower among EM residents compared with population means.[10] Furthermore, disgust sensitivity was not significantly different between junior and senior residents.

There are several plausible explanations why there was no negative correlation between disgust sensitivity and "disgust elicitor" cases seen by EM residents. This could be due to an expectation that EM residents assign themselves to the next patient to be seen as determined by acuity or length of stay. Resident biases against "disgusting" chief complaints may be masked by the desire to conform to expectations of assigning oneself to the patient "next to be seen." However, this idea is not supported by previous findings on EM resident "cherry picking."[11] Alternatively, physicians choosing EM may already meet a threshold for tolerance of "disgusting" cases that renders preference against individual patient presentations moot.

We did not see evidence in our study for lower overall

Table 1. Total cases seen by each class, with number and percent of "disgust elicitor" cases.

	GY2021	GY2020	GY2019	GY2018
Total cases seen (95%CI)	434 (170-698)	1566 (1153-1978)	2839 (2127-3552)	3529 (2907-4152)
Number of "disgust elicitor" cases (95% CI)	13 (2-24)	43 (29-57)	71 (46-96)	89 (59-119)
Percent of "disgust elicitor" cases (95% CI)	3.0% (1.8-4.2)	2.8% (2.1-3.4)	2.5% (1.8-3.3)	2.5% (1.9-3.1)

CI, confidence interval; *GY,* graduation year.

disgust sensitivity for residents with additional years of training. A previous pilot study suggested that exposure could decrease disgust sensitivity,[17] but it is possible that disgust sensitivity is more innate than malleable. Alternatively, residents' disgust sensitivity could have been previously lowered by exposure during medical school, with floor effects preventing subsequent lowering during residency. The time course measured by this study may also have been too short to detect an effect if disgust sensitivity decreases over years of exposure to disgusting stimuli instead of weeks or months; this represents an avenue for future research.

While EM residents overall had a significantly lower disgust sensitivity than the general population, it is interesting to note that there was significant individual variation. Several residents, including two recent chief residents, had disgust sensitivity significantly higher than the population average. While this too represents an area for further study, it suggests that low disgust sensitivity is not a prerequisite for success in the field of EM. Future researchers may be interested to investigate the whether sustained exposure to "disgust elicitors" in residents with high disgust sensitivity has the potential to contribute to burnout.

LIMITATIONS

Our study has several important limitations. This was a single-site study with a relatively small sample size. The DS-R results were confidential but not anonymous due to the need to match with cases, which may have affected how willing residents were to answer honestly. Although we attempted to choose cases that guaranteed residents were exposed to a "disgust elicitor," as this was a retrospective chart review, cases were not individually probed to determine the extent of residents' actual exposure to "disgusting" stimuli. The "disgust elicitor" cases selected also may have systematically missed relevant exposures; for example, tracheostomy problems or ophthalmologic complaints may induce significant disgust in certain clinical circumstances, or in certain individuals and not in others.

The cases identified for this study were from the EHR system used at the main hospital site. Residents also rotate at several other clinical sites, including the Veteran's Affairs hospital, an unaffiliated community site, and on electives at various global health sites. As such, we were unable to

account for the complete range of clinical exposures during residency. The unpredictable nature of the ED clinical environment overall means that some residents may have had greater opportunities to see patients with "disgusting" complaints than others. Similarly, residents may have had other exposure to disgust elicitors prior to residency in careers such as nurse, ski patroller, or emergency medical technician. Other life experiences such as raising children or caring for older adults may have also exposed residents to disgust elicitors. Despite the difficulty of quantifying the nature of these experiences, it is possible that they may have exerted a global effect on our results.

CONCLUSION

Our study confirms that EM resident physicians as a group have a lower disgust sensitivity compared with the general population. However, a higher individual disgust sensitivity does not correlate with a lower percentage of "disgust elicitor" cases seen. Medical students who are considering EM but are wary because of their sensitivity to "disgust elicitors" may be reassured that low disgust sensitivity does not appear to be required for success in EM.

Address for Correspondence: Benjamin H. Schnapp, MD, MEd, University of Wisconsin, BerbeeWalsh Department of Emergency Medicine, 800 University Bay Dr., Suite 310, Madison, WI 53705. Email: bschnapp@medicine.wisc.edu.

REFERENCES

1. Peckham C. Medscape Physician Lifestyle & Happiness Report 2018. Available at: https://www.medscape.com/slideshow/2018-lifestyle-happiness-6009320. Accessed May 10, 2019.

2. Totman A. Roadmap to Choosing a Medical Specialty. In: Stanford School of Medicine Office of Academic Advising and Student Wellness; 2015.

3. Hojat M, Zuckerman M. Personality and specialty interest in medical students. *Med Teach.* 2008;30(4):400-6.

4. Jafrani S, Zehra N, Zehra M, et al. Assessment of personality type and medical specialty choice among medical students from Karachi; using Myers-Briggs Type Indicator (MBTI) tool. *J Pak Med Assoc.* 2017;67(4):520-6.

5. Jordan J, Linden JA, Maculatis MC, et al. Identifying the emergency medicine personality: a multisite exploratory pilot study. *AEM Educ Train.* 2018;2(2):91-9.

6. Jaime J, A. LJ, C. MM, et al. Identifying the emergency medicine personality: a multisite exploratory pilot study. *AEM Educ Train.* 2018;2(2):91-9.

7. Oaten M, Stevenson RJ, Case TI. Disgust as a disease-avoidance mechanism. *Psychol Bull.* 2009;135(2):303.

8. Inbar Y, Pizarro D, Iyer R, et al. Disgust sensitivity, political conservatism, and voting. *Soc Psychol Pers Sci.* 2012;3(5):537-44.

9. Consedine NS, Yu TC, Windsor JA. Nursing, pharmacy, or medicine? Disgust sensitivity predicts career interest among trainee health professionals. *Adv Health Sci Educ Theory Pract.* 2013;18(5):997-1008.

10. Consedine NS, Windsor JA. Specific disgust sensitivities differentially predict interest in careers of varying procedural-intensity among medical students. *Adv Health Sci Educ Theory Pract.* 2014;19(2):183-201.

11. Patterson BW, Batt RJ, Wilbanks MD, et al. Cherry picking patients: examining the interval between patient rooming and resident self-assignment. *Acad Emerg Med.* 2016;23(6):679-84.

12. Olatunji BO, Williams NL, Tolin DF, et al. The Disgust Scale: item analysis, factor structure, and suggestions for refinement. *Psychol Assess.* 2007;19(3):281.

13. Haidt J, McCauley C, Rozin P. Individual differences in sensitivity to disgust: a scale sampling seven domains of disgust elicitors. *Pers Individ Diff.* 1994;16(5):701-13.

14. Rozin P, Haidt J, McCauley C, et al. Individual differences in disgust sensitivity: Comparisons and evaluations of paper-and-pencil versus behavioral measures. *J Res Pers.* 1999;33(3):330-351.

15. Haidt J. Means for the DS-R. 2010. Available at: http://people.stern.nyu.edu/jhaidt/DSR-means.docx. Accessed May 10, 2019.

16. Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd Edition). Hillsdale, NJ: Erlbaum.

17. Rozin P. Hedonic "adaptation": specific habituation to disgust/death elicitors as a result of dissecting a cadaver. *Judgm Dec Mak.* 2008;3(2):191.

Efficacy of and Satisfaction with an In-house Developed Natural Rubber Cardiopulmonary Resuscitation Manikin

Sittichoke Anuntaseree, MD*
Ekwipoo Kalkornsurapranee, PhD†
Varah Yuenyongviwat, MD*

*Prince of Songkla University, Department of Orthopedics, Faculty of Medicine, Songkhla, Thailand
†Prince of Songkla University, Department of Materials Science and Technology, Faculty of Science, Songkhla, Thailand

Introduction: A barrier to cardiopulmonary resuscitation (CPR) training in low-income countries is limited resources. Our goal was to build a CPR training model of simple design that would provide a good feedback system.

Methods: We developed a low-cost, Basic Life Support training manikin made entirely of natural rubber. Our in-house manikin provides feedback when performing correct chest compression and rescue breathing. The properties of the manikin were tested using simulated chest compression in a laboratory and compared with a commercial manikin. Forty healthy nurse volunteers with CPR experience performed CPR in both types of manikins and responded to questionnaires.

Results: A tensile test in a laboratory demonstrated that both types of manikins had acceptable ranges of properties for real-situation CPR in cardiac arrest patients. There were no differences in aesthetic properties, and the manikins felt to the volunteers like a real patient when they were performing chest compression. The feedback response was clear when chest compressions and rescue breathing were performed correctly, and the overall satisfaction with the manikin was good. In addition, the mean scores in terms of the manikin feeling like a real patient when performing rescue breathing and the positive feedback from the rubber manikin were statistically higher than those for the commercial manikin (p=0.001 vs. p=0.023).

Conclusion: The in-house developed CPR manikin employing real-time feedback by simple mechanics is effective compared with a commercial manikin. The advantage of our manikin is that it is easy to build and costs substantially less than a commercial manikin. The use of an in-house developed manikin could make effective CPR training more available in limited-resource areas. [West J Emerg Med. 2020;21(1)91-95.]

INTRODUCTION

Cardiopulmonary resuscitation (CPR) is a lifesaving skill used in many situations such as drowning and acute cardiac arrest due to heart disease. Basic CPR, which is performed with chest compressions and rescue breathing, increases the chance of survival.[1] The CPR technique performed properly can save lives, especially within four minutes after the cardiac arrest.[2,3] A study reported that the early initiation of CPR by bystanders was associated with a good outcome.[4] Therefore, everyone should have the proper knowledge and skills to perform CPR, especially physicians, nurses, and paramedics.

The key to success of CPR is proper training, which provides the learner with Basic Life Support (BLS) knowledge and the opportunity to practice the needed skills. Skill development is achieved by practicing CPR on manikins that simulate the human body. Over the past 50 years, the number of CPR training sessions for the general public has increased.[5] A study reported that 65% of the population in the United

States (U.S.) had received CPR training at some point in their lifetime.[6] However, one study in Pakistan reported that only 37% of medical students had even a basic knowledge of CPR.[7] We wanted to produce a cost-effective CPR training model of simple design that could teach proper CPR with a good feedback system that responded to the correct CPR maneuvers. Our aim is to make CPR manikins more available in limited-resource areas.

METHODS
Design

We developed an in-house, low-cost, BLS training manikin made entirely of natural rubber. The manikin provides feedback when the user performs chest compressions and rescue breathing correctly. We are making this [patent-pending] intellectual property available at no charge for non-profit proposes to those who request it from us.
A durable, natural rubber film sheathes the outside of the manikin, which is the same size as an adult body from head to waist. The inside of the manikin is made from natural rubber foam that consists of two types of material: 1) the first material, in the center of the chest, is a very elastic, high-

Population Health Research Capsule

What do we already know about this issue?
Cardiopulmonary resuscitation (CPR) skill development is achieved by practicing CPR on manikins that simulate the human body.

What was the research question?
Our goal was to build a low-cost CPR training model of simple design that would provide a good feedback system.

What was the major finding of the study?
We designed an in-house developed manikin for CPR training that provides real-time feedback using simple mechanics and has a low manufacturing cost.

How does this improve population health?
The use of our in-house developed manikin could make effective CPR training more available in limited-resource areas.

Figure 1. The cardiopulmonary resuscitation manikin consists of a high-density and highly elastic rubber to serve as the heart (H), and low-density foam rubber to form the head, neck, and body (L).

density rubber that simulates the heart;; and 2) the remainder of the manikin is made of low-density natural rubber foam to form the head, neck, and body (Figure 1).

Inside the rubber that forms the heart, a twin air-space mechanism reacts to chest compressions. As chest compression is performed, the upper air space collapses. At a chest compression depth of 1-2 inches, the bottom air space collapses and releases air through a tube that leads to the outside of the manikin, and a whistle at the opening makes a sound (Figure 2).

The mouth of the manikin is open. Its back and the back of the head are flat. The neck is curved and concave with

a tilted occiput. In the innermost part of the manikin's oral cavity, a tube connects the mouth to a space at the back of the manikin's head where a whistle is installed. The whistle makes a sound while the user is blowing into the mouth of the manikin (Figure 3). The detailed process of building this manikin is described in the Appendix.
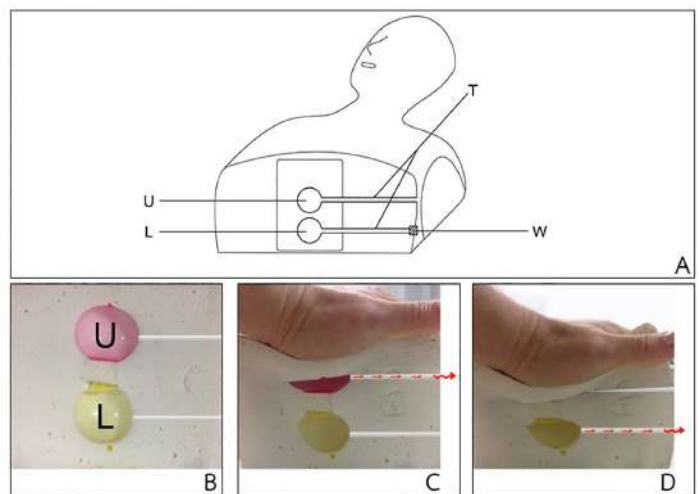
Figure 2. A, B, C, and D show the rubber foam cardiac mechanism: A) U = upper air space, L = lower air space, T = tube, W = whistle; B) cross-section of the pressure-sensing mechanism, U = upper air space, L = lower air space; C) beginning of chest compression; D) 1-2 inch depth of chest compression.
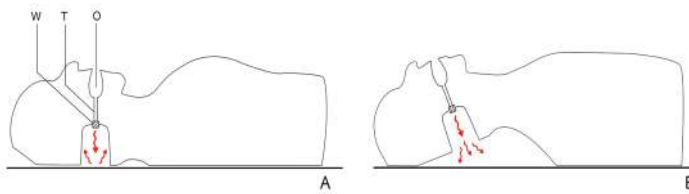
Figure 3. A and B show the mechanism that senses the breathing: O = oral cavity; T = tube; W = whistle. A) Blowing into the mouth without the chin lift maneuver limits the sound from the manikin; B) A loud whistle sound is produced when blowing into the mouth after the chin lift maneuver.

Figure 5. Tensile test results of simulated chest compression.

Compression Test

This study was approved by the Ethics Committee and the Institutional Review Board of the Faculty of Medicine, Prince of Songkla University, Thailand. The natural rubber properties of the CPR manikin were tested in a laboratory using a simulated chest compression, universal testing machine (Zwick/Roell Z010; Zwick GmbH & Co, Ulm, Germany). To evaluate the tensile strength of the materials, chest compression was performed on both a commercial manikin (Prestan Adult Manikins, Prestan Products, LLC, Ohio, USA) and the natural rubber manikin that we developed in-house. The testing demonstrated that when both manikins (Figure 4) were compressed to a depth of 1.5 inches, the materials of both were in an acceptable range of a real CPR

Figure 4. Prestan adult manikin (A) and natural rubber manikin (B).

situation in cardiac arrest patients (155-443 Newtons in males, and 123-327 Newtons in females)[8] (Figure 5).

CPR Test

Forty healthy nurses, aged 20-50 years, volunteered for the CPR test. All of them had real-life CPR experience and no morbidities that would have limited their performance of CPR on the manikins. The volunteers were randomized into two groups by opaque envelopes containing a computer-generated sequence. The first group of 20 volunteers performed CPR on the rubber manikin using both chest compression and rescue breathing at a ratio of 30:2 (5 cycles), and then did exactly the same on

the commercial manikin. The second group of 20 volunteers performed CPR following the same steps as the first group but performed CPR on the commercial manikin first and then on the natural rubber manikin. We collected data from the volunteers using a self-reported questionnaire on which they responded to questions about the appearance, response, and feedback of the two manikins, as well as the volunteers' overall satisfaction with the manikins. The questionnaire for each manikin was completed immediately after CPR on each manikin.

Statistical analysis

We performed the statistical analysis using the R software version 3.1.0 (R Foundation for Statistical Computing, Vienna, Austria). Using Student's *t*-test, we analyzed the continuous data of the rubber manikin and the imported commercial manikin to detect differences. Statistical significance was assumed if $p<0.05$.

RESULTS

The feedback data of the volunteers are shown in Table 1. There were no differences in terms of appearance with users reporting that the manikin felt like a real patient while they were performing chest compression. The volunteers also reported satisfaction with the in-house manikin's positive feedback response when chest compression was correctly performed, and they reported overall satisfaction with the manikin (p=0.42, 0.83, 0.88, and 0.12, respectively). However, the mean score regarding the manikin feeling like a real patient while performing rescue breathing was statistically significantly higher for the in-house developed manikin ($p = 0.001$), as was the mean score of positive feedback ($p = 0.023$).

DISCUSSION

Effective CPR increases the chance of survival in cardiac arrest patients by two- to three-fold if CPR is done immediately after cardiac arrest.[9–12] Participation in a CPR training program is key to successfully learn and/or improve the skills of healthcare workers. But it is also important that the general population

Table 1. Results of simulated cardiopulmonary resuscitation (CPR) from both types of manikin.

	Rubber	Commercial	P value
Appearance			
Aesthetic properties	4.18 (0.71)	4.05 (0.78)	0.42
Chest compression			
Feels like a real patient	4.15 (0.66)	4.13 (0.76)	0.83
Response when performing correct CPR	3.98 (0.77)	4.00 (0.75)	0.88
Rescue breathing			
Feels like a real patient	4.13 (0.69)	3.65 (0.77)	0.001
Response when performing correct CPR	4.18 (0.81)	3.80 (0.85)	0.023
Overall satisfaction	4.10 (0.59)	3.90 (0.71)	0.12

Data are presented as mean and standard deviation.

have the knowledge and skills to perform CPR, in the event that a bystander is the first responder. To this end, many learning tools have been introduced over the last decade including self-instruction[13] and simulation.[14] To improve the quality of training, a manikin needs to feel like a real human and provide a real-time feedback system when the learner is performing CPR.[15] Our study reports the results of the testing of the properties and performance of an in-house developed, rubber CPR manikin. The tensile strength was tested using a chest compression mechanism. Nurses with CPR experience performed chest compressions and rescue breathing on both the commercial, imported manikin and the rubber manikin.

Many manikins on the market have electronic systems to provide real-time feedback when users apply the correct chest compression force. The feedback systems include a computer monitor screen or a light that indicates correct compression. In rescue breathing, some manikins use chest expansion as a feedback response. In our study, we developed a low-cost CPR manikin of simple design. It provides real-time feedback responses via whistling sounds when the trainee performs chest compression and rescue breathing correctly. The sounds are caused simply by air passing through a whistle, a simple design that substantially reduces the cost of manufacturing. We believe that the development of this low-cost CPR manikin can expand or make CPR training more readily available in areas or countries with limited resources.

The cost breakdown of the rubber manikin can be categorized into the price of the raw materials, the fiberglass mold, and the fabrication of the rubber foam. The raw material is latex, which is not expensive and is readily available in many countries. Moreover, the fiberglass mold is simple and cheap. Lastly, the fabrication of rubber foam is not complicated; it does not require a lot of technical knowhow or technologically advanced equipment and/or facilities. Furthermore, the technology required for the production of this manikin can be easily transferred to small and medium-size enterprises. In our setting, the cost of the low-fidelity natural rubber CPR manikin under study was about 100 U.S. dollars. Meanwhile, the cost of

the commercial product used for comparison in this study was about 400 U.S. dollars.

LIMITATIONS

Some limitations of this study need to be acknowledged. First, we performed the comparison with only one type of commercial CPR manikin that was available in our hospital. The costs of other commercial products in Thailand are shown in the appendix. Second, this study could not blind the volunteers to the manikins tested (ie, they were aware of which manikin was which).

CONCLUSION

We designed a low-cost manikin for CPR training that provides real-time feedback using simple mechanics and has a low manufacturing cost. We believe that, based on this model for creating a low-cost manikin, this concept could be expanded on for other training venues.

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Address for Correspondence: Varah Yuenyongviwat, MD, Prince of Songkla University, Department of Orthopedics, Faculty of Medicine, Hat Yai, Songkhla 90110, Thailand. Email: varahortho@gmail.com.

REFERENCES

1. Zhan L, Yang LJ, Huang Y, et al. Continuous chest compression versus interrupted chest compression for cardiopulmonary resuscitation of non-asphyxial out-of-hospital cardiac arrest. *Cochrane Database Syst Rev.* 2017;3:CD010134.

2. Safar P, Bircher NG. Cardiopulmonary cerebral resuscitation. *An Introduction to Resuscitation Medicine. Guidelines by the World Federation of Societies of Anaesthesiologist*s (WFSA) (3rd Ed). 1988. London: Saunders.

3. Cole SL, Corday E. Four-minute limit for cardiac resuscitation. *J Am Med Assoc.* 1956;161(15):1454-8.

4. Krishna CK, Showkat HI, Taktani M, et al. Out of hospital cardiac arrest resuscitation outcome in North India: CARO study. *World J Emerg Med.* 2017;8(3):200-5.

5. Friesen J, Patterson D, Munjal K. Cardiopulmonary resuscitation in resource-limited health systems: considerations for training and delivery. *Prehosp Disaster Med.* 2015;30(1):97-101.

6. Blewer AL, Ibrahim SA, Leary M, et al. Cardiopulmonary resuscitation training disparities in the United States. *J Am Heart Assoc.* 2017;6(5):e006124.

7. Zamir Q, Nadeem A, Rizvi AH. Awareness of cardiopulmonary resuscitation in medical students and doctors in Rawalpindi-Islamabad, Pakistan. *J Pak Med Assoc.* 2012;62(12):1361-4.

8. Tomlinson AE, Nysaether J, Kramer-Johansen J, et al. Compression force-depth relationship during out-of-hospital cardiopulmonary resuscitation. *Resuscitation.* 2007;72(3):364-70.

9. Berg RA, Sanders AB, Kern KB, et al. Adverse hemodynamic effects of interrupting chest compressions for rescue breathing during cardiopulmonary resuscitation for ventricular fibrillation cardiac arrest. *Circulation.* 2001;104:2465–70.

10. Dowie R, Campbell H, Donohoe R, et al. 'Event tree' analysis of out-of-hospital cardiac arrest data: confirming the importance of bystander CPR. *Resuscitation.* 2003;56:173–81.

11. Gallagher EJ, Lombardi G, Gennis P. Effectiveness of bystander cardiopulmonary resuscitation and survival following out-of-hospital cardiac arrest. *JAMA.* 1995;274:1922–5.

12. van Hoeyweghen RJ, Bossaert LL, Mullie A, et al. Quality and efficiency of bystander CPR. Belgian Cerebral Resuscitation Study Group. *Resuscitation.* 1993;26:47–52.

13. Hsieh MJ, Bhanji F, Chiang WC, et al. Comparing the effect of self-instruction with that of traditional instruction in basic life support courses: a systematic review. *Resuscitation.* 2016;108:8-19.

14. Sutton RM, Niles D, Meaney PA, et al. "Booster" training: evaluation of instructor-led bedside cardiopulmonary resuscitation skill training and automated corrective feedback to improve cardiopulmonary resuscitation compliance of Pediatric Basic Life Support providers during simulated cardiac arrest. *Pediatr Crit Care Med.* 2011;12(3):e116-21.

15. Cortegiani A, Baldi E, Iozzo P, et al. Real-time feedback systems for cardiopulmonary resuscitation training: time for a paradigm shift. *J Thorac Dis.* 2018;10(2):162-3.

Post-interview Thank-you Communications Influence Both Applicant and Residency Program Rank Lists in Emergency Medicine

Corlin Jewell, MD
Tillman David, MD
Aaron Kraut, MD
Jamie Hess, MD
Mary Westergaard, MD
Benjamin H. Schnapp, MD, MEd

University of Wisconsin School of Medicine and Public Health, Berbee Walsh Department of Emergency Medicine, Madison, Wisconsin

Introduction: The National Residency Matching Program (NRMP) allows post-interview contact between residency applicants and residency programs. Thank-you communications represent one of the most common forms, but data on their value to applicants and program directors (PD) are limited. The objective of this study was to assess the effect of thank-you communications on applicant- and residency-program rank lists.

Methods: Two anonymous, voluntary surveys were sent after the 2018 NRMP Match, one to applicants who were offered an interview at a single academic site in the 2017-2018 Match cycle, and one to EM PDs nationwide. The surveys were designed in conjunction with a nationally-recognized survey center and piloted and revised based on feedback from residents and faculty.

Results: Of 196 residency applicants, 97 (49.5%) responded to the survey. Of these, 73/95 (76.8%) reported sending thank-you communications. Twenty-two of 73 (30%) stated that they sent thank-you communications to improve their spot on a program's rank list; and 16 of 73 (21.9%) reported that they changed their rank list based upon the responses they received to their thank-you communications. Of 163 PDs, 99 (60.7%) responded to the survey. Of those PDs surveyed, 22.6% reported that an applicant could be moved up their program's rank list and 10.8% reported that an applicant could move down a program's rank list based on their thank-you communications (or lack thereof).

Conclusion: The majority of applicants to EM are sending thank-you communications. A significant minority of applicants and PDs changed their rank list due to post-interview thank-you communications. [West J Emerg Med. 2020;21(1)96–101.]

INTRODUCTION

Applying for residency in emergency medicine (EM) is a highly consequential process that fourth- year medical students undergo every year in order to determine where they will undertake specialty training.[1] This, in many cases, sets the direction for the rest of their career. The current application process demands significant time and energy and, for the average applicant, costs more than $8000.[2] On average, each EM residency applicant sends out applications to 41 programs and attends 13 interviews.[3] After each interview day, many applicants set aside time for yet another task: sending thank-you communications to those programs at which they interviewed.[4]

The National Residency Matching Program (NRMP) allows post-interview contact between applicants and programs but requires that both parties follow a specific code of conduct.[5] Recognizing that applicants represent a potentially vulnerable population, the code states that programs may not engage in communication that reveals or influences rank lists. Despite this, post-interview communication has been shown on multiple occasions to influence how an applicant ranks programs.[4,6,7] Previous work has shown that most applicants were contacted in some form by programs and that they were glad to receive such communication.[8] Despite the absence of any clear evidence in favor of the practice, medical students applying to EM residency are usually advised by clerkship directors and faculty mentors to communicate their thanks to programs.[9] However, it is currently unknown whether the practice benefits applicants or programs.

While previous studies have examined the impact of post-interview contact (including return visits to an institution, or "second looks," phone/email correspondence, etc) from residency programs, no previous work has focused solely on the impact of post-interview thank-you communications in EM on both applicant and program rank lists. The goal of this study was to define current applicant thank-you communication practices, how these thank-you communications are perceived by program directors (PD), and whether applicants are influenced by responses to them.

METHODS
Study Design
This was a cross-sectional study that surveyed two separate but complementary populations. One survey was administered to all applicants to our institution's EM residency program who were offered an interview in the 2017-2018 NRMP cycle. A second survey was administered to a list of EM PDs compiled from information abstracted from a database created by members of the Council of Emergency Medicine Residency Directors (CORD). This data was further improved upon by assessing publicly available PD contact information obtained from EM residency program websites. We used survey methodology because the questions being studied could not be adequately answered by looking at reported Match data alone; so we sought to explore the opinions of the applicants and PDs.[10]

Study Setting and Population
The applicant arm of the study was conducted at a three-year academic EM residency program that currently offers 12 postgraduate year (PGY)-1 positions. All applicants who applied to our program during the 2017-2018 NRMP application cycle and received an offer to interview (regardless of whether they accepted the interview offer) were eligible to participate in the applicant arm of the study. All current allopathic EM PDs nationwide were eligible for the PD arm. Of the 220 EM

Educational Research Capsule Summary

What do we already know about this issue?
The National Residency Matching Program allows post-interview contact between residency applicants and programs and thank-you communications represent one of the most common forms.

What was the research question?
What is the effect of thank-you communications on applicant and residency-program rank lists?

What was the major finding of the study?
Many applicants and program directors changed their rank list based on post-interview thank-you communications and the responses to them.

How does this improve population health?
This study helped to provide information on the utility on sending thank-you communications, a common convention in the post-interview process.

programs that participated in the 2017-2018 NRMP Match, 163 had contact information from their PD available from the CORD data and/or from their program's website and were emailed the survey.[1] The decision to deploy the survey only to allopathic PDs was done to keep the two surveyed populations complementary to each other, as the study institution did not offer an interview to any osteopathic students during this application cycle.

Survey Development
To our knowledge, there are no prior surveys with validity evidence that answered the questions we sought to explore in our study. Therefore, two new instruments were created. The survey instruments used in our study were designed in conjunction with our university's survey center. This research organization operates with a budget of over $6 million annually and has a well-established history of surveying physicians by web.[11] The survey instrument for the applicant arm (Appendix 1) was designed to incorporate multiple-choice and Likert-scale questions to assess whether applicants sent thank-you communications, what form these thank-you communications took (email, paper, etc.), why they sent them, and what influence the responses to them had in the post-interview period. The survey instrument of the PD arm (Appendix 2) also incorporated multiple-choice and Likert-scale questions to assess how thank-you communications from applicants were received and how they affected their program's

rank list (if at all). The survey instruments were first developed and then reviewed and edited by EM education research faculty at our institution. This process of review was undertaken to enhance the content validity of the surveys. We performed two separate pilot surveys to attempt to increase clarity and reduce response biases. The applicant instrument was piloted on current PGY-1s at our training program, as they were closest to the survey's target population. The PD instrument was piloted on EM education faculty. We made final revisions based on comments from the pilot populations prior to survey distribution to enhance response process validity.

Study Protocol

Participants in both arms were invited to complete an anonymous and voluntary survey via the provided email addresses in their Electronic Residency Application Service (ERAS) application (applicants) and a database our program keeps of current residency PDs. In an effort to reduce the potential for influencing the responses from applicants or changing their own NRMP rank list, the applicant arm of the survey was distributed after the 2018 NRMP Match date. The survey was administered online using Qualtrics (Provo, UT). The overall response rate of both surveys used the second definition of response rate provided by the American Association for Public Opinion Research.[12] Participants were allowed to skip any question they did not wish to answer. Two reminder emails were sent at approximately two-week intervals. The study design was determined to be exempt by our institutional review board.

We calculated descriptive statistics using Qualtrics. A wave analysis following the final reminder email to assess for nonresponse bias was calculated on the applicant survey for the questions, "Did you send thank-you communications to any programs after interview day?," and "Did you ever adjust your rank list based on how programs responded to these thank-you communications?" A second-wave analysis following the final reminder email was performed on the PD survey for the questions of "Does an applicant ever move UP your rank list because of their thank-you communication following the interview day?" and "Does an applicant ever move DOWN your rank list because of their thank-you communication or lack of thank-you communication following the interview day?" These questions were selected as they were felt to have the most impact for readers. These wave analyses assumed a response of YES=1 and NO=0 for each question. For both sets of analyses, the responses following the final reminder email were used as a proxy for nonresponders.[13]

RESULTS
Applicant Survey

Overall, 97/196 (49.5%) applicants responded to the survey. Given that not all applicants responded to each question, the percentages reported are based on the total number of responses for each question individually. Of the

97 applicants who responded, the majority (76.8%) reported sending thank-you communications to at least one program. The nonresponse bias (NRB) for this question was calculated via wave analysis at 0.088. Nearly all of them communicated their thanks via email (87.7%), while the remaining applicants sent written letters. None of the responders communicated their thanks via phone call. Figure 1 shows the reasons applicants gave for communicating their thanks (respondents could supply more than one answer). A total of 19.2% of applicants responded that they received responses to their thank-you communications "almost always," and a further 56.2% received responses either "often" or "sometimes." The majority of applicants (56.2%) reported spending at least 15 minutes on their thank-you communications per program, and 8.3% reported spending greater than 45 minutes per program. Finally, more than a fifth (21.9%) reported that they changed their rank list based on the responses they received to their thank-you communication (NRB = 0.043).

Program Director Survey

Of the PDs surveyed, 99/163 (60.7%) responded at least partially. As with the applicant survey, the percentages are reported based on the total number of responses for each question. Of these, 39.5% reported responding to thank-you communications from applicants "often" or "always." Nearly half of them (45/91; 49.5%) also reported personalizing their responses to individual applicants (Figure 2). When asked if applicants moved up their program's rank list based on thank-you communications, 21/93 (22.6%) responded "yes" (NRB = 0.018). Of the PDs who answered "yes," 14/21 (66.7%) reported that an applicant could expect to move up six or more positions on the rank list.

A total of 10/93 (10.8%) reported that an applicant could potentially move down on their rank list based on their thank-you
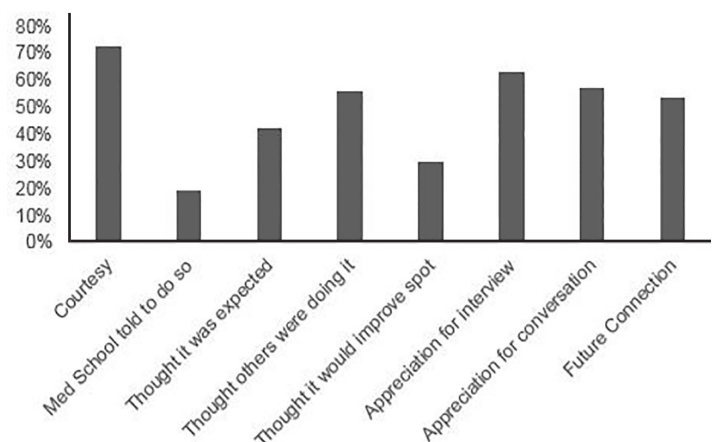
Figure 1. Reasons reported by applicants for sending thank-you communications.
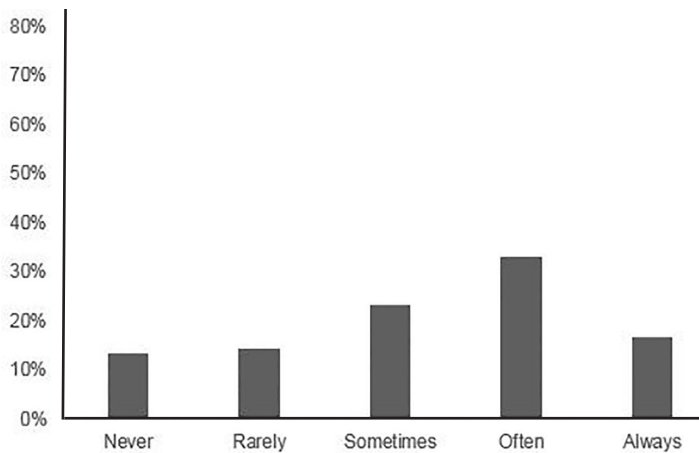
Figure 2. Reported rate of tailored responses to thank-you communications by program directors.

communications (or lack thereof) (NRB = 0.048). Of these 10 PDs, 6/10 reported that applicants could move down six or more positions. More than half of the PDs (22/26; 84.6%) who stated that applicants could change position on the rank list based on their thank-you communication considered specific content of the thank-you communication to be important (Figure 3). In this same cohort of PDs, most (18/26; 69.2%) reported that the form of the thank-you communication (email, written, etc.) "rarely" or "never" affected how an applicant moved positions on their program's rank list. However, the majority of PDs (61/78; 78.2%) reported that they preferred email, while the remainder preferred written communication (21.8%).

DISCUSSION

Within the respondents to our survey (49.5% of the survey population), who represent a single three-year academic residency program in the Midwest, most applicants reported sending thank-you communications. Within this same group, those who sent thank-you notes reported changing their rank lists based on the program's response to their notes. The most common reason for sending these thank-you communications was reported to be courtesy. Although this rationale may demonstrate positive personal character and sending thank-you communications may even portend a favorable residency outcome,[13] a large number of applicants believed that sending thank-you communications would have a positive impact on their relationship and standing with a residency program. While it is known that the majority of residency applicants are sending thank-you communications, a reported effect on both applicant and program rank lists in EM has not been shown previously.

The strategy of writing thank-you communications to programs to boost an applicant's competitiveness seems at least somewhat effective given that the specific content of thank-you communications is highly rated as a factor affecting rank list movement by PDs. There are no official "best practices"

regarding how post-interview thank-you communication should be formatted apart from the mandate from the NRMP that "Program Directors shall not solicit or require post-interview communication from applicants, nor shall program directors engage in post-interview communication that is disingenuous for the purpose of influencing applicants' ranking preferences."[5] Applicants have few resources to assist them, with unofficial "Application Guides"[14-16] from faculty and blogs, which rely on anecdotal evidence, serving as the primary guideposts. It is interesting to note that, despite the Match Code of Conduct policy of not soliciting or requiring post-interview communication form applicants, it appears that not writing thank-you communications is used in the rank list decision-making by programs, which could be construed as a policy violation.

The amount of applications and interviews per EM residency applicant is increasing, with the average allopathic United States senior applying to 41 programs and attending 13 interviews.[2] Due to the low likelihood that any individual thank-you communication influences a desired program's rank list enough to turn an applicant's non-matchable rank into a matchable one, the potential time-cost of thank-you communications initially appears unfavorable for the applicant compared to the small likelihood of potential benefits. However, a significant minority of PDs reported that an applicant's thank-you communication could significantly affect the applicant's rank position. Therefore, our data suggest that an applicant's reported goal of writing thank-you communications to give their application a boost on the rank list is grounded in some truth. Given the high stakes of the application process and the substantial time, financial, and personal investment involved in the residency application process, candidates will likely continue to send thank-you communications if there is any possibility of influencing their rank list position. Programs that do not consider thank-you communications when adjusting their rank list may potentially save applicants time and effort if they are forthcoming about discouraging thank-you communications in the post-interview period.

Nearly a quarter of applicants reported changing their rank lists due to the responses they received from thank-you communications. This proportion is similar to other previously published work on post-match applicant surveys.[7,17,18] Our survey did not specifically investigate the content of these responses and how residency applicants were using them to make rank list decisions nor how the absence of responses affected an applicant's decision to rank a program. It is possible that receiving these responses reinforces connections made during the brief interview day and could subconsciously make applicants feel as if they "fit in" better with a particular program.

"Fit" has been demonstrated previously as one of the most important factors in program selection by applicants.[19] It is also possible that applicants perceive responses to thank-you communications as an indicator that they were seen favorably by the program, despite the fact that many PDs are responding
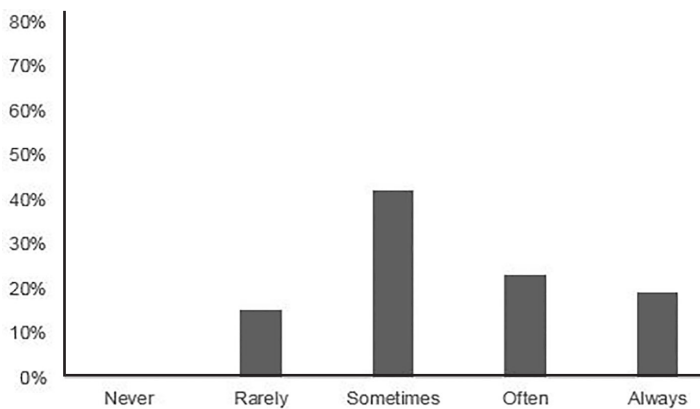
Figure 3. Reported importance placed by program directors on the specific content of thank-you communications from applicants.

to the majority of the thank-you communications sent to them. Although our study did not specifically address whether a PD was more likely to send a response to thank-you communications to a competitive applicant over a non-competitive one, this question could represent an avenue of further investigation. Conversely, if applicants are changing their rank lists based on how thank-you communications affect their perceived likelihood to match at a given program, this suggests a potentially concerning misunderstanding of the stable marriage algorithm used for the NRMP Match, another potential avenue for further research.

There is also a population of EM PDs identified by this study who view applicants that do not send thank-you communications unfavorably. It is possible that programs take a lack of thank-you communications as a statement of disinterest from the applicant, which is supported by our data from the PD survey. Given the variation in how thank-you communications are received by programs, establishing more consistent standards around disclosure of how post-interview contact may or may not affect their chances of matching may benefit applicants to EM.

LIMITATIONS

The applicant arm of the study represented responders to a single three-year academic center in the Midwest. Therefore, certain applicants, such as those desiring community/county programs or a different geographic region, may not be represented in our data, which could introduce bias. As discussed above, not all allopathic EM PDs were represented in the PD arm of the study, as a number of current PDs' contact email addresses were not available or current; therefore, they were not included in the study. Use of the survey format, although overall appropriate for the questions being studied, did not allow for two-way communication and clarification of responses. Because we did not collect demographics in our survey to preserve anonymity, we could not determine whether specific factors, such as age or geography, influenced applicants' propensity to write thank-you communications or PD responses to thank-you communications.

However, not collecting demographic data had the side effect of making it more difficult to assess for nonresponse bias.

Although we collected data from a reasonably large number of applicants, the study period was only one year and from a single institution; thus, it is possible that respondents differed systematically from non-respondents, which, by definition, increases the potential for nonresponse bias. Questions, such as those specifically asking how many spots up or down an applicant moves on their program's rank list may be limited by availability and recall bias. The response rate, particularly that of the applicant arm, was low, subjecting the study to potential bias. However, this is a well-recognized problem with online surveys targeting physician populations and our response rates are in line with many similar online surveys based on previously published data.[11,20,21] The wave analysis did not show a considerable amount of calculated NRB in the selected questions, which suggests that nonresponders did not differ significantly from responders to the surveys. However, it is possible that there is some degree of nonresponse bias present as proxies (third-wave responders) were used for nonrespondents.[13]

CONCLUSION

The majority of applicants to emergency medicine are sending thank-you communications to programs, although a considerable portion (>20%) do not send any. Based on our data a small but notable portion of both applicants and programs are willing to change their rank lists based on thank-you communications and the responses to them. Clear "best practices" are not defined by this study; however, it seems that emailed thank-you communications with attention to well-crafted content are seen favorably by a subset of PDs. Future work could focus on establishing best practices for applicants and programs and further elucidating the causes of practice variability in thank-you communications.

Address for Correspondence: Corlin M. Jewell, MD, University of Wisconsin School of Medicine and Public Health, BerbeeWalsh Department of Emergency Medicine, 800 University Bay Dr., Madison, WI 53705. Email: cjewell@uwhealth.org.

REFERENCES

1. National Resident Matching Program. (2018). National Resident Matching Program, Results and Data: 2018 Main Residency Match®. Washington, DC.

2. Blackshaw A, Watson S, Bush J. The cost and burden of the residency match in emergency medicine. *West J Emerg Med*. 2017;18(1):169-73.

3. National Match Resident Matching Program. (2017). National Resident Matching Program, Data Release and Research Committee: Results of the 2017 NRMP Applicant Survey by Preferred Specialty and Applicant Type. Washington, DC.

4. Long T, Dodd S, Licatino L, et al. Factors important to anesthesiology residency applicants during recruitment. *J Educ Perioper Med*. 2017;19(2):E604.

5. Match Communication Code of Conduct: National Resident Matching Program website. 2018. Available at: https://www.nrmp.org/communication-code-of-conduct/. Accessed March 23, 2018.

6. Camp CL, Sousa PL, Hanssen AD, et al. Orthopedic surgery applicants: what they want in an interview and how they are influenced by post-interview contact. *J Surg Educ*. 2016;73(4):709-14.

7. Grimm LJ, Avery CS, Maxfield CM. Residency postinterview communications: more harm than good? *J Grad Med Educ*. 2016;8(1):7-9.

8. Yarris LM, Deiorio NM, Gaines SS. Emergency medicine residency applicants' perceptions about being contacted after interview day. *West J Emerg Med*. 2010;11(5):474-78.

9. Tillman D. (2018). Emergency Medicine Residency Application and Interview Workshop. University of Wisconsin Berbee-Walsh Department of Emergency Medicine.

10. Phillips AW. Proper applications for surveys as a study methodology. *West J Emerg Med.* 2017;18(1):8-11.

11. Dykema J, Jones NR, Piché T, et al. Surveying clinicians by web current issues in design and administration. *Eval Health Prof*. 2013;36(3):352-81.

12. Phillips AW, Friedman BT, Durning SJ. How to calculate a survey response rate: best practices. *Acad Med*. 2017;92(2):269

13. Bohrer-Clancy J, Lukowski L, Turner L, et al. Emergency medicine residency applicant characteristics associated with measured adverse outcomes during residency. *West J Emerg Med*. 2018;19(1):106-11.

14. Phillips AW, Reddy S, Durning SJ. Improving Response Rates and Evaluating Nonresponse Bias in Surveys: AMEE Guide No. 102. *Med Teach.* 2016;38(3):217-28

15. Zhuang C, Zhang XC, Hu K, et al. 2018. Emergency Medicine Applying Guide. Available at: https://www.cordem.org/globalassets/files/committees/student-advising/2018-applying-guide-cord-cdem-emra-rsa.docx.pdf. Accessed Nov 9, 2018.

16. Overton D. 2011. Advice for Emergency Medicine Applicants. Available at: https://med.wmich.edu/sites/default/files/Advice_for_EM_Applicants_2011_3.pdf. Accessed Nov 9, 2018.

17. LifeofaMedStudent. 2016. Thank you notes after an interview: Are they a waste of time? Available at: https://lifeofamedstudent.com/2016/12/04/thank-you-notes-after-an-interview-after-an-interview/. Accessed Nov 9, 2018.

18. Berriochoa C, Reddy CA, Dorsey S, et al. The residency match: interview experiences, postinterview communication, and associated distress. *J Grad Med Educ*. 2018;10(4):403-8.

19. Cook DA, Kuper A, Hatala, R, et al. When Assessment data are words: validity evidence for qualitative education assessments. *Acad Med*. 2016; 91(10): 1359-69.

20. Love JN, Howell JM, Hegarty CB, et al. Factors that influence medical student selection of an emergency medicine residency program: implications for training programs. *Acad Emerg Med*. 2012;19(4):455-60.

21. Cull WL, O'Connor KG, Sharp S, et al. Response rates and response bias for 50 surveys of pediatricians. *Health Serv Res.* 2005;40(1):213-26.

22. Phillips AW, Friedman BT, Utrankar A, et al. Surveys of health professions trainees: prevalence, response rates, and predictive factors to guide researchers. *Acad Med.* 2017;92:222-8.

Difficult Delivery and Neonatal Resuscitation: A Novel Simulation for Emergency Medicine Residents

Jillian Elizabeth Nickerson, MD, MS*
Taryn Webb, MD†
Lorraine Boehm, MSN, BSN, RN, CCRN-K, RN-BC, WCC‡
Hayley Neher, MD, MM†
Lillian Wong, MD§
Julia LaMonica, NP§
Suzanne Bentley, MD, MPH†§

*Children's National Medical Center, Department of Emergency Medicine and Trauma Services, Washington, District of Colombia
†Icahn School of Medicine at Mount Sinai, Department of Emergency Medicine, New York, New York
‡Elmhurst Hospital Center, Simulation Center, Elmhurst, New York
§Elmhurst Hospital Center, Department of Emergency Medicine, Elmhurst, New York

Introduction: Newborn delivery and resuscitation are rare, but essential, emergency medicine (EM) skills. We evaluated the effect of simulation on EM residents' knowledge, confidence, and clinical skills in managing shoulder dystocia and neonatal resuscitation.

Methods: We developed a novel simulation that integrates a shoulder dystocia with neonatal resuscitation and studied a convenience sample of EM residents. Each 15-minute simulation was run with one learner, a simulated nurse, and a standardized patient in situ in the emergency department. The learner was required to reduce a shoulder dystocia and then perform neonatal resuscitation. We debriefed with plus/delta format, standardized teaching points, and individualized feedback. We assessed knowledge with a nine-question multiple choice test, confidence with five-point Likert scales, and clinical performance using a checklist of critical actions. Residents repeated all measures one year after the simulation.

Results: A total of 23 residents completed all measures. At one-year post-intervention, residents scored 15% higher on the knowledge test. All residents increased confidence in managing shoulder dystocia on a five-point Likert scale (1.4 vs 2.8) and 80% increased confidence in performing neonatal resuscitation (1.8 vs 3.0). Mean scores on the checklist of critical actions improved by 19% for shoulder dystocia and by 27% for neonatal resuscitation.

Conclusion: Implementing simulation may improve EM residents' knowledge, confidence, and clinical skills in managing shoulder dystocia and neonatal resuscitation. [West J Emerg Med. 2020;21(1)102–107.]

BACKGROUND

Newborn deliveries complicated by shoulder dystocia and the need for neonatal resuscitation occur rarely in the emergency department (ED), but managing these cases are essential skills for emergency physicians. Shoulder dystocia occurs as infrequently as 0.2% of vaginal deliveries in obstetrical literature.[1] Given that a small percentage of total deliveries occur in the ED, it is uncommon for emergency medicine (EM) residents to manage shoulder dystocia in the ED

during their training.[2] About 10% of neonates require support, and about 1% require resuscitation.[3] ED deliveries have a higher associated morbidity and may be more likely to require resuscitation; however, performing neonatal resuscitation in the ED is a rare event for individual providers.[4]

The Accreditation Council for Graduate Medical Education (ACGME) requires EM residents to perform 10 low-risk, normal spontaneous vaginal deliveries to graduate. There are no formal teaching requirements, however,

for difficult deliveries, such as deliveries complicated by shoulder dystocia.[5] A recent needs assessment of EM residents demonstrated a lack of knowledge and comfort in obstetrical emergencies, indicating a need for increased education in this area.[6] A survey of EM program directors (PD) supported these findings, identifying a lack of formal education in obstetrics and a concern from PDs about their graduating residents' level of preparedness for obstetrical emergencies, specifically for shoulder dystocia.[7] In a needs assessment of our own residency, we found that 75% of graduating residents lacked confidence in their ability to manage difficult deliveries.

There is no ACGME educational requirement for EM residents to learn neonatal resuscitation.[5] Although residents become certified in Advanced Cardiac Life Support and Pediatric Advanced Life Support, most do not take the Neonatal Resuscitation Program (NRP), the equivalent course for neonatal resuscitation. A recent trial showed that EM residents lack confidence in leading neonatal resuscitations.[8] A needs assessment of our residency found that all graduating residents lacked confidence in leading neonatal resuscitations.

Simulation can help fill in training deficits where clinical exposure is rare. Obstetrics and gynecology research has demonstrated the utility of simulation to teach and maintain knowledge, confidence, and clinical skills for difficult deliveries.[9,10] Pediatrics literature also shows an improvement in confidence after simulation of neonatal resuscitation.[11] A recent randomized control trial of EM residents demonstrated that a simulation curriculum could improve clinical performance of neonatal resuscitation.[8] Another study showed that simulation training could improve EM faculty knowledge of neonatal resuscitation.[12]

Only one published study has combined shoulder dystocia and neonatal resuscitation in the same simulation case. That study evaluated the feasibility and clinical accuracy of a simulation case designed for medical students that combined a shoulder dystocia with neonatal resuscitation.[13] We are not aware of any studies that combine delivery complicated by shoulder dystocia with an infant born requiring neonatal resuscitation in a simulation for EM residents despite the need for emergency physicians to integrate these two skills in real patient encounters.

The Society for Academic Emergency Medicine (SAEM) Technology in Medical Education Committee consensus group recommended precipitous and difficult vaginal deliveries, as well as newborn resuscitation, as high-priority areas of EM training.[14]

OBJECTIVES

This study seeks to evaluate whether an in situ simulation can improve EM residents' knowledge, confidence, and clinical skills in performing maneuvers to reduce a shoulder dystocia and then leading a neonatal resuscitation.

CURRICULAR DESIGN

There is no standard education that teaches EM residents how to manage difficult deliveries, such as deliveries complicated by a shoulder dystocia, or to lead a neonatal resuscitation. We conducted a needs assessment of eight graduating postgraduate year (PGY) 4 residents' confidence with these skills, and found that the majority (75%) noted feeling "not confident at all" or "barely confident" in reducing a shoulder dystocia and no residents felt "confident" or "very confident" in leading a neonatal resuscitation. From these data, we designed an intervention to address this curricular need in our program.

We developed a novel simulation session integrating a newborn delivery complicated by a shoulder dystocia with a subsequent need for neonatal resuscitation. The 15-minute simulation was run with one learner, an embedded simulation nurse, and a standardized patient in the ED setting. The "patient" was a live standardized patient actor using a PROMPT flex birthing simulator (Laerdal Medical, Stavenger, Norway) and a Code Blue Newborn (Gaumard Scientific, Miami, FL). A convenience sample of residents across all years (PGY 1-4) consented to participate and were sampled while working clinically in the ED. The learner was required to perform critical actions to reduce a shoulder dystocia to deliver an apneic neonate and then perform neonatal resuscitation per NRP guidelines (Table 1).

The simulation case was developed from prior cases in collaboration with content and simulation experts from EM, obstetrics, and neonatology. The integrated case was piloted on six participants including a resident from each PGY year, a senior EP assistant, and an attending EP. The case was adapted based on feedback from participants and simulation experts prior to study initiation.

Following completion of the simulated case, the learners were debriefed using the PEARLS Healthcare Debriefing Tool with plus/delta format by trained simulation leaders.[15] Learners reviewed standardized teaching points that emphasized key maneuvers to reduce a shoulder dystocia and critical steps to performing neonatal resuscitation from NRP. Additionally, learners received individualized feedback based on their specific questions and performance.

Residents were surveyed on knowledge and confidence before participating in the simulation and one year after they completed the simulation. We also questioned residents about the number of deliveries complicated by shoulder dystocia and the number of neonatal resuscitations they had participated in. We assessed knowledge using a nine-question multiple choice test adapted from tools used at our simulation center to evaluate knowledge from a course on shoulder dystocia for obstetrical providers and a course about neonatal resuscitation for pediatric providers. Our experts selected the questions that were most pertinent to the EM provider caring for these conditions. We assessed confidence using five-point Likert scales. We also surveyed residents about their experience

Table 1. Shoulder dystocia / neonatal resuscitation performance observation tool.

Shoulder dystocia

Identifies precipitous labor

    1: Poor: delay in examining, incomplete setup
    2: Average: examines and identifies crowning head with some delay, some hesitation in determining delivery necessity or with what supplies are necessary
    3: Excellent: quickly examines, correctly identifies head crowning, and calls for team and necessary supplies to deliver

Checks for cord

    1: Poor: requires prompting from nurse to evaluate for nuchal cord
    2: Average: some delay in assessing for nuchal cord
    3: Excellent: sweeps for cord, finds nuchal cord, reduces successfully

Identifies shoulder dystocia

    1: Poor: requires prompting from nurse or patient to identify shoulder dystocia
    2: Average: some delay in identifying shoulder dystocia, fails to note time
    3: Excellent: quickly determines and states aloud that patient has a shoulder dystocia, asks nurse to record time, tells mom to stop pushing

Calls for help

    1: Poor: failure to call services
    2: Average: some delay in calling for help, or calling for only one service
    3: Excellent: quickly calls for obstetrics and pediatrics for help

Initiates McRoberts maneuver

    1: Poor: Cannot perform suprapubic pressure even with prompting
    2: Average: can direct team to perform McRoberts but does not recall name or some difficulty with procedure
    3: Excellent: smoothly calls for McRoberts maneuver and directs team to perform appropriately

Initiates suprapubic pressure

    1: Poor: Cannot perform suprapubic pressure even with prompting
    2: Average: calls for suprapubic pressure but some delay or some difficulty with procedure or does not know directionality
    3: Excellent: smoothly and quickly calls for suprapubic pressure and can describe to team how to perform appropriately

Neonatal resuscitation

Dries and stimulates newborn appropriately

    1: Poor: fails to dry and stimulate
    2: Average: some delay or slightly clumsy, requires nudge
    3: Excellent: calls for and smoothly and quickly dries, removes wet blankets, and stimulates newborn

Adequately evaluates respirations, heart rate, and color

    1: Poor: does not complete without prompting
    2: Average: calls out need for evaluation, some delay in calculating, uses umbilical cord for heart rate
    3: Excellent: quickly calls out need for evaluation of heart rate, respirations and notes color

Identifies need for and initiates respirations correctly

    1: Poor: does not identify need for positive pressure ventilation without prompting or fails to achieve proper seal or evaluate for chest size
    2: Average: some delay, or mild deficiencies or inconsistency
    3: Excellent: quickly calls out for positive pressure ventilation, selects correct mask, correctly seals mask and bags 1 breath every 3 seconds with evaluation for chest rise

Correctly identifies need for intubation and intubates successfully

    1: Poor: unable to identify need for intubation, necessary materials, or successfully intubate
    2: Average: slight delay or some difficulty with calling for sizes of materials but ultimately successful intubation
    3: Excellent: identifies need for intubation in a timely manner, calls for correct size of blade and endotracheal tube, intubates successfully with tube at appropriate depth, evaluates for bilateral breath sounds and chest rise

Identifies need for and initiates compressions correctly when heart rate remains <60

    1: Poor: does not identify need for compressions without prompting or poor quality
    2: Average: some delay, mild inconsistency or deficiency in positioning, rate or depth
    3: Excellent: calls out for chest compressions, delivers compressions at correct rate and depth

Checklist of critical actions and scoring guide used to evaluate residents' ability to reduce a shoulder dystocia and perform a neonatal resuscitation.

participating in the simulation.

Clinical performance was scored using a checklist of critical actions. A team comprised of a fellowship-trained simulation expert, an EM attending, an obstetrical attending, and a neonatal intensivist reviewed the critical actions from our institution's shoulder dystocia management course, NRP guidelines,[16] and the checklists used in a published, integrated simulation for medical students.[13] From these tools, we developed our own checklist of critical actions (shown in Table 1) using an iterative process and focusing on the skills important for the EM provider. We used expert judgment to ensure content validity. Those rating clinical performance were trained via frame-of-reference training.[17] Sample cases were scored and compared until an acceptable inter-rater reliability was reached. All study cases were scored by two independent observers with a strong inter-rater reliability (kappa 0.84).

The simulation was repeated one year after the initial simulation with a convenience sample of two classes of residents to evaluate retention and whether the simulation impacted clinical skills. This study was approved by the Icahn School of Medicine at Mount Sinai institutional review board.

IMPACT/EFFECTIVENESS
Demographics

A total of 52 residents completed the simulation, spread across four classes of residents: PGY-1, 25% (13); PGY-2, 29% (15); PGY-3, 25% (13); and PGY-4, 21% (11). We repeated the simulation one year later with residents who were PGY-2 or PGY-3 during the initial simulation. Of the 27 eligible residents, 23 residents (9 PGY-3 and 14 PGY-4) completed the repeat simulation.

Baseline

At baseline, interns (n = 13) demonstrated a knowledge deficit compared to PGY 2-4 (n = 39) classes (53% vs 66%). We did not find a difference in scores between the senior residents. On average, prior to any teaching, residents (n = 53) scored 69% (12.5/18) for shoulder dystocia and 63% (9.5/15) for neonatal resuscitation on the checklist of critical actions. Although our numbers were small, we could not discern a difference in performance between junior and senior residents.

Perception

Overall, residents (n = 53) reported positive views of the simulation. The majority (93%) said the overall learning value of the case was "excellent" or "very good." Of the 53 residents who completed the evaluation of the simulation, 17 (32%) provided a qualitative comment. Of those, 76% (13) specifically remarked that simulation of shoulder dystocia and/or neonatal resuscitation was useful for their training. This sentiment is exemplified by one participant's comment: "This topic is incredibly scary and is something we barely have real experience with. The ability to do this scenario in a safe and controlled setting was delightful."

Knowledge

One year after completing the initial simulation and debriefing, residents (n = 23) demonstrated an increase in knowledge scores by 15% (57% pre-simulation vs 72% post-simulation). The majority (90%) scored at least one point higher on the repeat exam one year after training.

Confidence

All 23 residents reported improved confidence in managing shoulder dystocia on a five-point Likert scale with one representing no confidence and five representing extreme confidence (mean 1.4 pre-simulation vs 2.8 post-simulation). The majority (80%) reported increased confidence in performing neonatal resuscitation (mean 1.8 vs 3.0) one year after completion of the simulation.

Clinical Performance

Residents who completed the training (n = 23) had improvements in clinical performance. Shoulder dystocia critical action scores improved from 67% (12.0/18) at baseline to 86% (15.4/18). Similarly, neonatal resuscitation scores improved from 62% (9.3/15) at baseline to 89% (13.3/15) (Figure 1).

Figure 1 shows an increase in clinical scores for both shoulder dystocia (1a) and neonatal resuscitation (1b) from baseline to one year after completing the simulation for the 23 residents who completed both simulations.

Clinical Exposure

At baseline, 30% (7/23) of residents who completed both pre- and post-simulations reported that they had participated in a delivery complicated by shoulder dystocia, and 52% (12/23) reported that they had participated in a neonatal resuscitation in either a real or simulated case. On reassessment, one year after participating in the simulation of a delivery complicated by shoulder dystocia and an infant requiring neonatal resuscitation, 60% (14/23) of residents indicated that they had participated in the care of a real or simulated patient with shoulder dystocia, and 91% (21/23) indicated that they had participated in a real or simulated neonatal resuscitation. However, no participants reported participating in more than three instances of either pre- or post-intervention.

DISCUSSION

Previous literature has supported the use of simulation to train obstetrical residents to manage patients with shoulder dystocia[5,6] and EM providers to manage neonatal resuscitation.[4] Our study builds on previous literature by combining the two skills into one simulation. We also conducted the simulation in the ED setting providing a high level of fidelity to the training for EM providers.
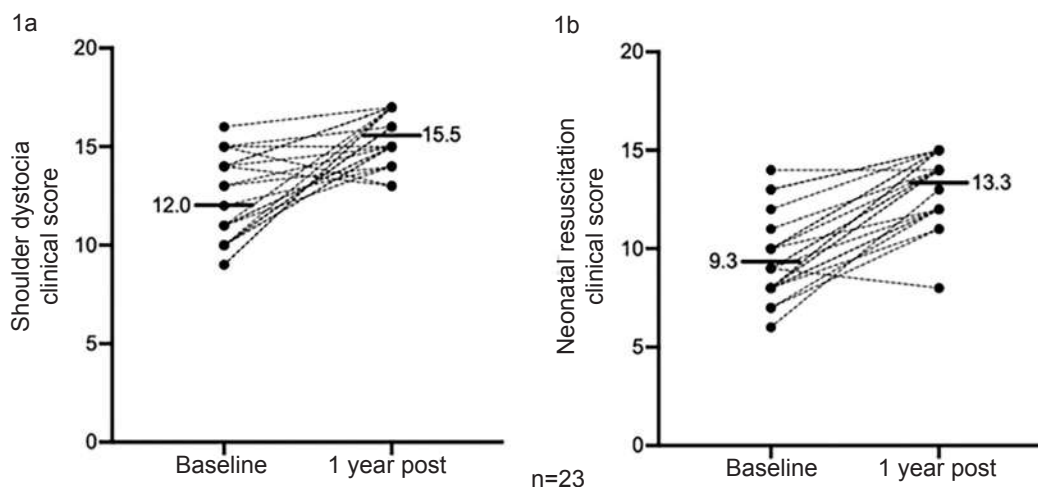
Figure 1. Changes in residents' clinical scores one year after simulation.

LIMITATIONS

The small sample size limits our ability to statistically analyze our data. We evaluated residents over time; therefore, their performance could have been impacted by exposure to patients in the ED with these conditions, outside reading, and lectures in addition to our intervention. While we adapted our tools from previously used tools, these have not been formally assessed for validity. Two independent observers graded each participant with the checklist of critical actions; however, there remains some subjectivity to the scores.

CONCLUSION

EM residents lack confidence and demonstrate knowledge deficits in managing shoulder dystocia and performing neonatal resuscitation. Implementing simulation may improve knowledge, confidence, and clinical performance in managing shoulder dystocia and performing neonatal resuscitation. By implementing simulations that combine difficult deliveries with neonatal resuscitation, a new minimum standard for education in these areas for EM residents can be established.

Address for Correspondence: Jillian Elizabeth Nickerson, MD, MS, Children's National Medical Center, Department of Emergency Medicine and Trauma Services, 111 Michigan Avenue, NW, Washington, DC 20002. Email: jnickerso2@childrensnational.org.

REFERENCES

1. Del Portal DA, Horn AE, Vilke GM, et al. Emergency management of shoulder dystocia. *J Emerg Med*. 2014;46(3):378-82.
2. MacDorman MF, Mathews TJ, Declercq E. Trends in out-of-hospital births in the United States, 1990-2012. NCHS Data Brief. 2014;(144):1-8.
3. Aronson PL, Allesandrini EA. Neonatal resuscitation. In: Fleischer GR and Ludwig S, et al (eds): *Textbook of Pediatric Emergency Medicine*. 6th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2010:32-45.
4. Brunette DD and Sterner SP. Prehospital and emergency department delivery: a review of eight years experience. *Ann Emerg Med*. 1989;18:1116.
5. ACGME program requirements for graduate medical education in emergency medicine. 2017. Available at: http://www.acgme.org/Portals/0/PFAssets/ProgramRequirements/110_emergency_medicine_2017-07-01.pdf. Accessed May 10, 2019.
6. Janicki AJ, MacKuen C, Hauspurg A, et al. Obstetric training in emergency medicine: a needs assessment. *Med Educ Online*. 2016;21:28930.
7. Robinson DW, Anana M, Edens MA, et al. Training in emergency obstetrics: a needs assessment of U.S. emergency medicine program directors. *West J Emerg Med*. 2018;19(1):87–92.
8. Lee MO, Brown LL, Bender J, et al. A medical simulation-based educational intervention for emergency medicine residents in neonatal resuscitation. *Acad Emerg Med*. 2012;19:577-85.
9. Joost van de Ven FJ, van Deursen HM, van Runnard Heimel PJ, et al. Effectiveness of team training in managing shoulder dystocia: a retrospective study. *J Matern Fetal Neonatal Med*. 2016;29(19):3167-71.
10. Grobman WA, Hornbogen A, Burke C, et al. Development and implementation of a team-centered shoulder dystocia protocol. *Simul Healthc*. 2010;5(4):199-203.
11. Hossino D, Hensley C, Lewis K, et al. Evaluating the use of high-fidelity simulators during mock neonatal resuscitation scenarios in trying to improve confidence in residents. *SAGE Open Med*.

2018;6:2050312118781954.

12. Ross J, Rebella G, Westergaard M, et al. Simulation training to maintain neonatal resuscitation and pediatric sedation skills for emergency medicine faculty. *WMJ*. 2016;115(4):180-4.

13. Alphonso A, Pathy S, Bruno C, et al. Shoulder dystocia and neonatal resuscitation: an integrated obstetrics and neonatology simulation case for medical students. *MedEdPORTAL*. 2017;13:10594.

14. Wang EE, Quinones J, Fitch M, et. al. Developing technical expertise in emergency medicine: the role of simulation in procedural skill acquisition. *Acad Emerg Med.* 2008;15:1046-57.

15. Bajaj K, Meguerdichian M, Thoma B, et al. The PEARLS healthcare debriefing tool. *Acad Med.* 2018;93(2):336.

16. Bloom RS, Cropley C. *Textbook of Neonatal Resuscitation*. 7th Ed. American Academy of Pediatrics, American Heart Association; 1987:90–4.

17. Feldman M, Lazzara EH, Vanderbilt AA, et al. Rater training to support high-stakes simulation-based assessments. *J Contin Educ Health Prof*. 2012;32(4):279-86.

Teaching Endotracheal Intubation Using a Cadaver Versus a Manikin-based Model: a Randomized Controlled Trial

Ryan Pedigo, MD*†‡
Juliana Tolles, MD, MHS*†‡
Daena Watcha, MD, MS*†
Amy H. Kaji, MD, PhD, MPH*†‡
Roger J. Lewis, MD, PhD*†‡
Elena Stark, MD, PhD§
Jaime Jordan, MD†‡¶

*Harbor-UCLA Medical Center, Department of Emergency Medicine, Torrance, California
†Los Angeles Biomedical Research Institute, Torrance, California
‡David Geffen School of Medicine at UCLA, Department of Emergency Medicine, Los Angeles, California
§David Geffen School of Medicine at UCLA, Department of Pathology and Laboratory Medicine, Los Angeles, California
¶UCLA Ronald Reagan Medical Center, Department of Emergency Medicine, Los Angeles, California

Introduction: The optimal method to train novice learners to perform endotracheal intubation (ETI) is unknown. The study objective was to compare two models: unembalmed cadaver vs simulation manikin.

Methods: Fourth-year medical students, stratified by baseline ETI experience, were randomized 1:1 to train on a cadaver or simulation manikin. Students were tested and video recorded on a separate cadaver; two reviewers, blinded to the intervention, assessed the videos. Primary outcome was time to successful ETI, analyzed with a Cox proportional hazards model. Authors also compared percentage of glottic opening (POGO), number of ETI attempts, learner confidence, and satisfaction.

Results: Of 97 students randomized, 78 were included in the final analysis. Median time to ETI did not differ significantly (hazard ratio [HR] 1.1; 95% CI [confidence interval], 0.7-1.8): cadaver group = 34.5 seconds (interquartile ratio [IQR]: 23.3-55.8) vs manikin group = 35.5 seconds (IQR: 23.8-80.5), with no difference in first-pass success (odds ratio [OR] = 1; 95% CI, 0.1-7.5) or median POGO: 80% cadaver vs 90% manikin (95% CI, -14-34%). Satisfaction was higher for cadavers (median difference = 0.5; p = 0.002; 95% CI, 0-1) as was change in student confidence (median difference = 0.5; p = 0.03; 95% CI, 0-1). Students rating their confidence a 5 ("extremely confident") demonstrated decreased time to ETI (HR = 4.2; 95% CI, 1.0-17.2).

Conclusion: Manikin and cadaver training models for ETI produced similar time to ETI, POGO, and first-pass success. Cadaver training was associated with increased student satisfaction and confidence; subjects with the highest confidence level demonstrated decreased time to ETI. [West J Emerg Med. 2020;21(1)108–114.]

INTRODUCTION

Endotracheal intubation (ETI) is a vital skill for many medical practitioners, including those in emergency medicine (EM), critical care, and anesthesia, but there is a significant learning curve in gaining proficiency.[1] The rate of successful ETI for inexperienced personnel on their first attempt using direct laryngoscopy may be as low as 50%.[2] A systematic review found that to achieve at least a 90% success rate within two attempts under optimal elective conditions, a minimum experience of 50 ETIs was required.[3] Teaching ETI to novices in settings such as the emergency department or intensive care unit is potentially unsafe for critically ill patients, as much

higher complication rates in these populations have been reported.[4] Teaching airway management to inexperienced students in a more controlled setting, such as the operating room, is not always practical because of patient safety concerns and the presence of multiple learners with relatively limited numbers of patients.[5]

Historically, many students have learned ETI on simulation manikins. The reported advantages of simulation training include the fact that it allows for simultaneous teaching of ETI to many individuals and less pressure on the student, without danger to patients.[6] However, it is unclear whether learning ETI on manikins sufficiently prepares novices for intubating patients. It is impossible for the rigid construction of the plastic manikin airway to reproduce human anatomy with high fidelity.[7] Previous studies found that the use of a fresh frozen cadaver or lightly embalmed cadaver for training ETI achieves greater realism and that learners prefer cadavers to a simulation manikin, but these studies did not assess for objective outcome data.[8,9] A previous study showed that a cadaver-based airway lab can improve the ETI success rate of critical care medicine fellows, but this study did not have a control group.[10]

The optimal model for providing ETI training to novice learners is currently unknown. The objective of this study was to compare two training models, unembalmed cadaver vs simulation manikin, on ETI procedural competency in fourth-year medical students as measured by time to successful ETI. We also sought to compare percentage of glottic opening (POGO) viewed, number of attempts needed to achieve successful ETI, as well as learner confidence and satisfaction. We hypothesized that training using an unembalmed cadaver model would be the more effective model.

METHODS
Study setting and participants

This study took place in the Gross Anatomy Laboratory in the Center for Health Sciences at the David Geffen School of Medicine at the University of California in Los Angeles between July 2015–March 2017. Fourth-year medical students enrolled in the EM sub-internship or emergency procedures elective during the study period were eligible to participate. This included students from the David Geffen School of Medicine at UCLA, as well as outside rotating students from over 20 institutions. Students with a pre-existing physical limitation that would preclude them from performing ETI were excluded.

This study was approved by the institutional review board (IRB) of the Los Angeles Biomedical Research Institute at Harbor-UCLA Medical Center. Students were consented with a standard IRB consent and were permitted to withdraw their participation at any time.

Study design

This was a prospective, randomized controlled trial. Prior to the intervention, we collected baseline

Educational Research Capsule Summary

What do we already know about this issue?
Endotracheal intubation has a substantial learning curve and various teaching modalities have been employed to teach this critical skill.

What was the research question?
Is an unembalmed cadaver or a simulation manikin a more effective model for teaching endotracheal intubation?

What was the major finding of the study?
Both unembalmed cadaver and simulation manikin were similarly effective, but learners prefer the cadaver.

How does this improve population health?
Understanding the optimal modality of teaching endotracheal intubation can improve patient outcomes for this critical procedure.

characteristics of the study subjects, including (1) self-reported number of prior ETI attempts, (2) number of successful ETI, and (3) perceived confidence in performing ETI using a 5-point Likert-type scale (1: not at all confident, 2: slightly confident, 3: moderately confident, 4: very confident, 5: extremely confident). On the day of the intervention, all students received an airway lecture from the course director (author RP) covering the general approach to airway management and appropriate patient positioning. We used stratified, permuted block randomization to randomize students to manikin or unembalmed cadaver training to ensure equal baseline ETI experience between groups.

Three categories based on number of prior ETI attempts (< 10: low experience, 10-24: medium experience, 25+: high experience) were selected based on existing learning curve data.[1] Students then received a 30-minute hands-on training session with their assigned model (unembalmed cadaver or manikin) delivered by an EM faculty member practicing direct laryngoscopy. We used new Laerdal airway management trainers as our simulation manikins, as previous studies suggested that this was rated as the most realistic and highest-performance manikin.[8,11]

To mitigate any potential differences between instructor teaching effectiveness, the instructors were also randomly assigned to the student groups via a coin toss. The instructor-led workshops were pragmatic and reflected the variation in

teaching methods that would be present in other institutions; we did not require a specific modality of bedside hands-on ETI experience. After the training session, we again surveyed students on their perceived confidence in ETI using the same 5-point Likert-type scale. Satisfaction with the training method was assessed with a 5-point Likert-type scale (1: very dissatisfied, 2: dissatisfied, 3: unsure, 4: satisfied, 5: very satisfied).

To evaluate procedural competency, we assessed student performance of ETI on an unembalmed cadaver on which neither group had previously used in training. We used an unembalmed cadaver as the testing medium for all learners to eliminate or mitigate any between-group differences in airway difficulties that could confound our results. In addition, an unembalmed cadaver has previously been shown to have a high degree of airway realism compared to patients.[8] Students performed ETI using direct laryngoscopy with a Karl Storz C-Mac with available Mac 3 and Mac 4 size attachments. Subjects did not have access to the monitor during the ETI attempt; the video screen was turned away from the subject but was recorded to obtain the necessary data. After the student verbalized that they felt their ETI attempt was successful, RP verified correct placement of the endotracheal tube (ETT). If the ETT was not placed successfully, a failed ETI attempt was noted and the student had the opportunity to attempt again. RP recorded the total number of ETI attempts.

Two reviewers (JJ and JT), who were blinded to the intervention, reviewed the video recordings with student faces and any identifying information blurred and rated the time to successful ETI and POGO achieved for all participants.

Outcome measures

The primary outcome was time to successful ETI, defined as time from picking up the laryngoscope to the time in which the student verbalized successful ETI on an unembalmed cadaver.

Secondary outcomes included the following:
1. POGO achieved

2. Number of ETI attempts

3. Changes in perceived confidence after practice session

4. Whether or not increased confidence translated into improved ETI performance

5. Satisfaction with the teaching modality.

Data analysis

The primary outcome of time to ETI success was analyzed using a Cox proportional hazards model, in which we included prior ETI experience and date of rotation as covariates in the analysis. These covariates were chosen because increased experience has been shown to decrease time to ETI (although we did mitigate this with our randomization scheme), and

there may have been differences in difficulty of cadaver airway anatomy in each different session. The mean POGO and time to ETI recorded by the two reviewers' scores was calculated. We analyzed the difference in mean reviewer POGO score between manikin and cadaver groups using a bootstrap resampling method with 10,000 iterations. Correlation coefficients and a Bland-Altman plot were used to evaluate for correlation and presence of bias in the video analysis for the POGO score and time to ETI. We compared changes in confidence score and overall satisfaction using the Wilcoxon rank-sum test with the confidence interval (CI) calculated with the Hodges-Lehmann estimator. For this analysis, CIs were rounded to the nearest integer to reflect the precision that could be expected from our sample size. We analyzed the association between student confidence and time to ETI using a Cox proportional hazards model. All analyses were conducted using the R software for statistical computing, version 3.3.1, employing the Survival package and Boot package.

RESULTS

We assessed 98 medical students for eligibility (Figure 1). We excluded one student due to illness. We randomized 97 students to cadaver or manikin training. The stratified randomization scheme was successful in distributing ETI experience similarly between the two groups. We could not obtain data for one session due to a camera malfunction; this excluded one group of eight students from the analysis. A protocol violation affected another group of 11 subjects, where the cadaver arm subjects inadvertently also practiced intubating the cadaver intended for testing; thus, we excluded data from these subjects. Data from 78 subjects were included in the final analysis. We could not judge the POGO for six of these cases, due to the camera becoming obscured.

The median time to ETI for the cadaver group was 34.5 seconds (interquartile range [IQR]: 23.3-55.8 seconds) and the median time to ETI for the manikin group was 35.5 seconds (IQR: 23.8-80.5 seconds) (Figure 2).

The time to ETI did not differ between the two groups (hazard ratio [HR] 1.1 for ETI in the cadaver group; 95% CI, -0.7-1.8). The HR in this case describes ratio of the rate of intubation per unit time between the two groups. The correlation coefficient between the two reviewers' assessments of time to ETI was 0.99. There was no difference in first-pass success between groups (odds ratio [OR]=1; 95% CI, 0.1-7.5). We performed an exploratory analysis for an interaction between learner experience and treatment group to see whether any experience-level subgroup had benefit from either a cadaver or manikin training model, but no significant effect was found.

The median difference in POGO was not significantly different between treatment groups. The cadaver group had a median glottic opening of 80% and the manikin group 90% (10% median difference; 95% CI, -14-34%). We compared the median values because the observed distribution of scores
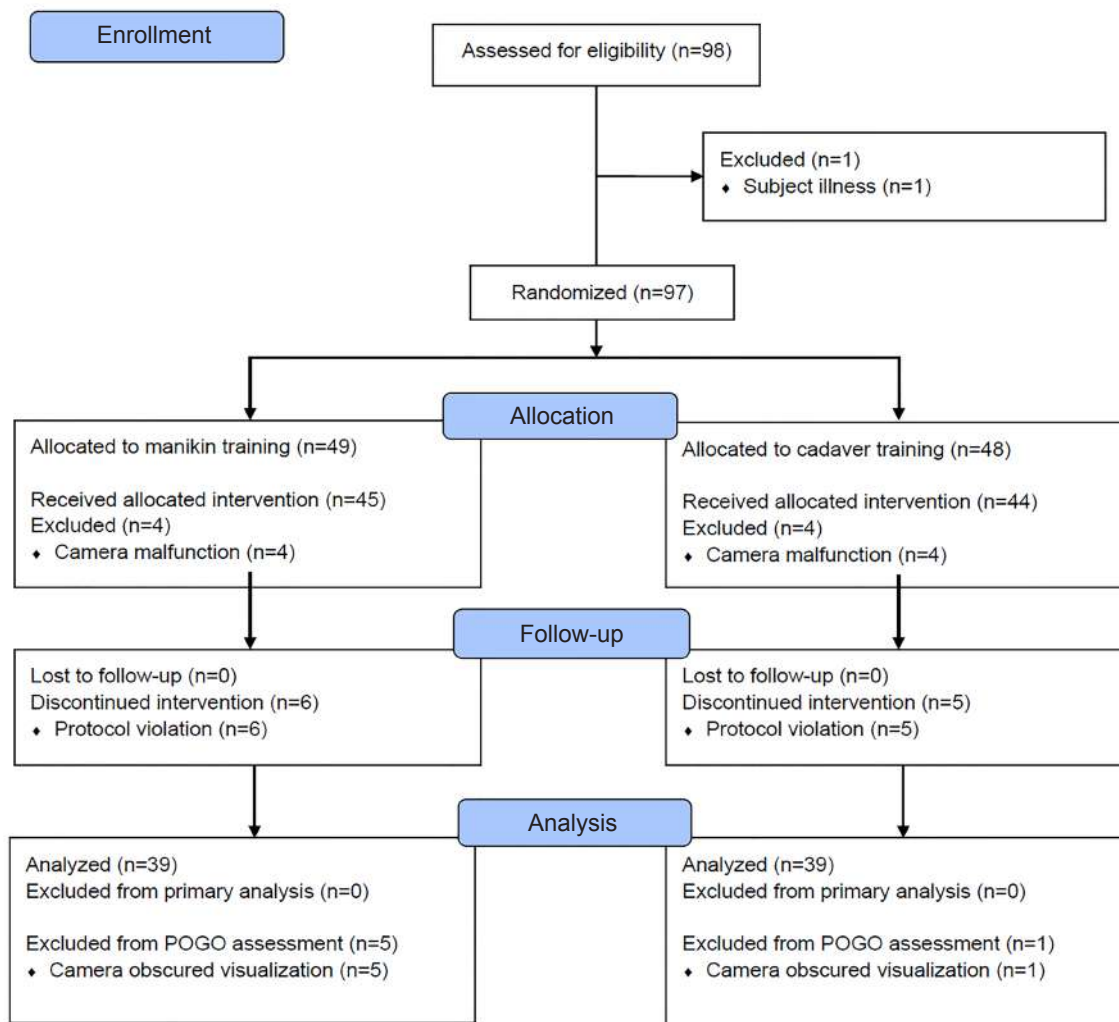
Figure 1. Consort flow diagram of study participants.

was bimodal; visual inspection of the distribution (Figure 3) also reveals the distribution of scores to be very similar. The correlation coefficient between reviewer assessments of POGO was 0.98. A Bland-Altman plot of the difference between reviewer scores vs average reviewer score did not demonstrate systematic bias (Supplemental Figure 1).

The median subject satisfaction with the training exercise was higher for the cadaver-training group (median difference = 0.5 points; p = 0.002; 95% CI, 0-1) (Figure 4). Change in subjects' confidence in ETI skills was also greater for the cadaver-training group than the manikin-training group (median difference = 0.5; p = 0.03; 95% CI, 0-1) (Figure 5). The students who rated their confidence after the teaching intervention as a 5 ("extremely confident") also demonstrated a decreased time to successful ETI (HR = 4.2; 95% CI, 1.03-17.2).

DISCUSSION

Our study is, to our knowledge, the largest randomized trial comparing unembalmed cadaver training to simulation

manikin training for ETI. Both manikin- and cadaver-based training are highly effective in teaching ETI with no difference found in outcomes of time to successful ETI, number of attempts, or POGO score. There was a relationship with prior ETI experience and time to successful ETI, which is consistent with prior literature.[1,3] We stratified by prior experience in our randomization scheme, so this did not affect our results.

Learner satisfaction was higher among those trained using a cadaver compared to a manikin. This may be due to the fact that when compared to the manikin, the cadaver provides a more realistic airway as well as normal tissue handling characteristics.[7] Additionally, the use of a cadaver for learning purposes is novel, and this may also increase satisfaction. The subject-perceived increase in confidence in ETI was also greater in those trained on the cadaver model. This is not surprising, as studies have shown that cadaver-based procedural teaching increases learner confidence in performing other procedures such as central lines, pericardiocentesis, thoracentesis, and bag-valve-mask ventilation.[9,12,13]
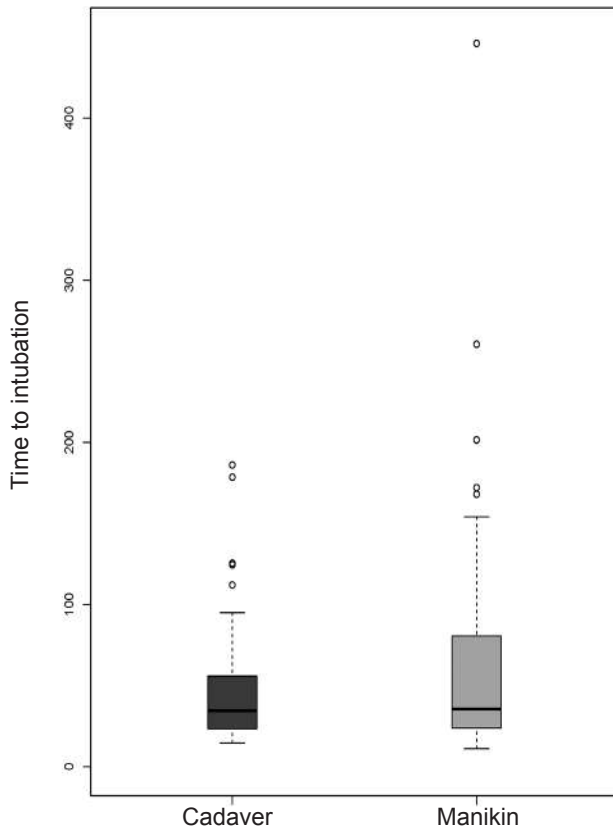
Figure 2. Time to successful endotracheal intubation after subjects were randomized to a manikin or cadaver training model.

Figure 3. Percentage of glottic opening achieved after subjects were randomized to a manikin or cadaver training model.
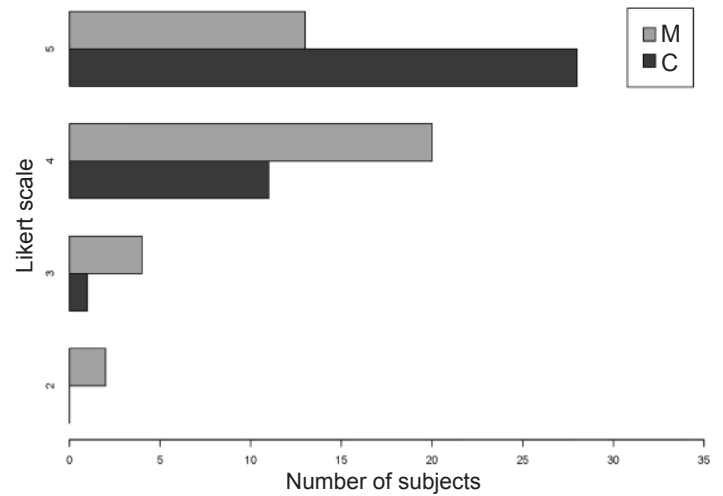
Figure 4. Subject satisfaction with each training model on a 5-point Likert-type scale.
M, manikin model; *C*, cadaver model.
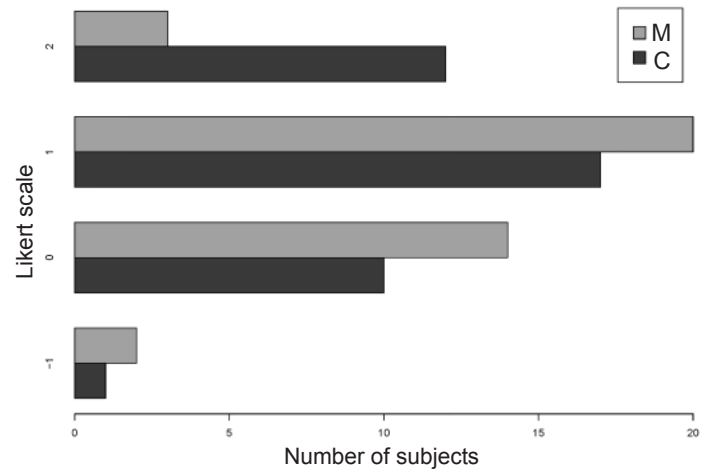
Figure 5. Subject confidence change before training model vs after training model on a 5-point Likert scale.
M, manikin model; *C*, cadaver model.

Students who self-reported their confidence as a "5" after being exposed to the training method also demonstrated a decreased time to ETI. As only four students chose this level of confidence, we would recommend further studies before using confidence as a surrogate measure for performance in ETI.

LIMITATIONS
Our study has several limitations. First, it is based upon results from a single center. However, the sub-internship enrollment comprised a large number of visiting students, and

thus our results are likely generalizable to other institutions. Our subjects were all fourth-year medical students going into a variety of specialties. It is unclear whether our results are applicable to other types of ETI learners, but it is unlikely that medical students would be intrinsically much different from other novice learners for this skill. The subjects randomized to the cadaver training were exposed to an unembalmed cadaver, which may have theoretically made them more effective at intubating the other unembalmed test cadaver.

There was limited literature to guide expected ETI times and variability of times for novice learners; therefore, an a priori power calculation was not performed. A post hoc calculation demonstrated that our sample size produced 80% power to detect a 30-second difference in time to ETI from 40 seconds average time for an experienced provider, a time chosen based on data from a randomized trial of intubation of traumatic injury patients.[14] We considered a 30-second difference in time to ETI to be the threshold of clinical significance based on time to desaturation in previous studies. For example, the ENDAO trial showed low rates of desaturation with a mean intubation time of 64 seconds when patients were preoxygenated and used apneic oxygenation in an emergent intubation setting.[15] Our study showed median intubation times of 35 seconds. This is congruent with another study evaluating EM resident ETI times, which found a mean time to intubation of 32.7 seconds when residents were standing, which is the same position used by the medical students.[16] Thus, although a smaller true difference may exist, it would be unlikely to be clinically significant, given that even the most extreme difference would be within previously-described safe apnea time limits.

Additionally, we excluded 11 subjects because of a protocol violation and eight students due to camera malfunction. However, since the students were eliminated from both groups (cadaver and manikin) on both dates, it is unlikely to have affected our results. Finally, obscuration of the camera prevented the assessment of POGO scores in seven students but did not affect the assessment of other outcomes.

CONCLUSION

Unembalmed cadavers and simulation manikins had similar effectiveness in teaching ETI to fourth-year medical students based on time to ETI and POGO score. However, students training with unembalmed cadavers had higher degrees of satisfaction and greater increases in subjective confidence levels in performing the procedure. Students who expressed the highest confidence level also demonstrated faster ETI times.

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Address for Correspondence: Ryan Pedigo, MD, Harbor-UCLA Medical Center, Department of Emergency Medicine, 1000 W. Carson St. Building D-9, Box #21, Torrance, CA 90502. Email: rpedigo@dhs.lacounty.gov.

REFERENCES

1. Konrad C, Schupfer G, Wietlisbach M, et al. Learning manual skills in anesthesiology: Is there a recommended number of cases for anesthetic procedures? *Anesth Analg.* 1998;86(3):635-9.
2. Davies PR, Tighe SQ, Greenslade GL, et al. Laryngeal mask airway and tracheal tube insertion by unskilled personnel. *Lancet.* 1990;336(8721):977-9.
3. Buis ML, Maissan IM, Hoeks SE, et al. Defining the learning curve for endotracheal intubation using direct laryngoscopy: A systematic review. *Resuscitation.* 2016;99:63-71.
4. Cook TM, Woodall N, Harper J, et al. Major complications of airway management in the UK: results of the Fourth National Audit Project of the Royal College of Anaesthetists and the Difficult Airway Society. Part 2: intensive care and emergency departments. *Br J Anaesth.* 2011;106(5):632-42.
5. Johnston BD, Seitz SR, Wang HE. Limited opportunities for paramedic student endotracheal intubation training in the operating room. *Acad Emerg Med.* 2006;13(10):1051-5.
6. Gaiser RR. Teaching airway management skills. How and what to learn and teach. *Crit Care Clin.* 2000;16(3):515-25.
7. Schebesta K, Hupfl M, Rossler B, et al. Degrees of reality: airway anatomy of high-fidelity human patient simulators and airway trainers. *Anesthesiology.* 2012;116(6):1204-9.

8. Yang JH, Kim YM, Chung HS, et al. Comparison of four manikins and fresh frozen cadaver models for direct laryngoscopic orotracheal intubation training. *Emerg Med J.* 2010;27(1):13-6.

9. Szucs Z, Laszlo CJ, Baksa G, et al. Suitability of a preserved human cadaver model for the simulation of facemask ventilation, direct laryngoscopy and tracheal intubation: a laboratory investigation. *Br J Anaesth.* 2016;116(3):417-22.

10. Wise EM, Henao JP, Gomez H, et al. The impact of a cadaver-based airway lab on critical care fellows' direct laryngoscopy skills. *Anaesth Intensive Care.* 2015;43(2):224-9.

11. Jordan GM, Silsby J, Bayley G, et al. Evaluation of four manikins as simulators for teaching airway management procedures specified in the Difficult Airway Society guidelines, and other advanced airway skills. *Anaesthesia.* 2007;62(7):708-12.

12. Hoyer R, Means R, Robertson J, et al. Ultrasound-guided procedures in medical education: a fresh look at cadavers. *Intern Emerg Med.* 2016;11(3):431-6.

13. Nematollahi S, Kaplan SJ, Knapp CM, et al. Introduction of a fresh cadaver laboratory during the surgery clerkship improves emergency technical skills. *Am J Surg.* 2015;210(2):401-3.e2.

14. Yeatts DJ, Dutton RP, Hu PF, et al. Effect of video laryngoscopy on trauma patient survival: a randomized controlled trial. *J Trauma Acute Care Surg.* 2013;75(2):212-9.

15. Caputo N, Azan B, Domingues R, et al. Emergency Department Use of Apneic Oxygenation Versus Usual Care During Rapid Sequence Intubation: A Randomized Controlled Trial (The ENDAO Trial). *Acad Emerg Med.* 2017;24(11):1387-94.

16. Le Parc J, Bischof J, King A, et al. A randomized comparison of in-hospital rescuer positions for endotracheal intubation in a difficult airway. *West J Emerg Med.* 2018;19(4):660-7.

A Multimodal Curriculum With Patient Feedback to Improve Medical Student Communication: Pilot Study

Nicole M. Dubosh, MD*
Matthew M. Hall, MD*
Victor Novack, MD, PhD†
Tali Shafat, MD†
Nathan I. Shapiro, MD, MPH*
Edward A. Ullman, MD*

*Beth Israel Deaconess Medical Center/Harvard Medical School, Department of Emergency Medicine, Boston, Massachusetts
†Soroka University Medical Center and Faculty of Health Sciences, Ben-Gurion University of the Negev, Beer-Sheva, Israel

Introduction: Despite the extraordinary amount of time physicians spend communicating with patients, dedicated education strategies on this topic are lacking. The objective of this study was to develop a multimodal curriculum including direct patient feedback and assess whether it improves communication skills as measured by the Communication Assessment Tool (CAT) in fourth-year medical students during an emergency medicine (EM) clerkship.

Methods: This was a prospective, randomized trial of fourth-year students in an EM clerkship at an academic medical center from 2016-2017. We developed a multimodal curriculum to teach communication skills consisting of 1) an asynchronous video on communication skills, and 2) direct patient feedback from the CAT, a 15-question tool with validity evidence in the emergency department setting. The intervention group received the curriculum at the clerkship midpoint. The control group received the curriculum at the clerkship's end. We calculated proportions and odds ratios (OR) of students achieving maximum CAT score in the first and second half of the clerkship.

Results: A total of 64 students were enrolled: 37 in the control group and 27 in the intervention group. The percentage of students achieving the maximum CAT score was similar between groups during the first half (OR 0.70, p = 0.15). Following the intervention, students in the intervention group achieved a maximum score more often than the control group (OR 1.65, p = 0.008).

Conclusion: Students exposed to the curriculum early had higher patient ratings on communication compared to the control group. A multimodal curriculum involving direct patient feedback may be an effective means of teaching communication skills. [West J Emerg Med. 2020;21(1):115-121.]

INTRODUCTION

The doctor-patient relationship is deemed one of the most important aspects of a medical encounter. Effective communication has clear benefits to both the patient and the provider. Patients who perceive their healthcare providers as strong communicators tend to have better expectations of their healthcare course, adhere to positive health behaviors, and report higher satisfaction.[1-4] For physicians, effective communication correlates with more positive patient interactions, decreased risk of litigation, and decreased burnout.[5,6] Effective communication can be particularly challenging in the emergency department (ED) given the chaotic environment, time and resource constraints, and lack of continuity of care. In a prospective observational study, only two-thirds of emergency physicians discussed ED course and necessary follow-up with their patients and patients frequently

misunderstood information conveyed by their provider.[7] An emphasis on fostering communication skills in the emergency medicine (EM) clerkship may improve this competency.

There is an increased focus on interpersonal skills and communication in medical education.[8] The Association of American Medical College has revised core competencies, and the Accreditation Council for Graduate Medical Education (ACGME) Entrustable Professional Activities for entering residency include interpersonal and communication skills.[9,10,11] While many medical schools include specific courses on patient-centered communication during the preclinical years, there is often a lack of dedicated teaching on this topic during the clinical clerkships. Two studies demonstrated a decline in medical students' interpersonal skills and patient-centered attitudes from the first through fourth year.[12,13] A dedicated curriculum during the clinical years may help improve students' communication skills and prevent this decline.

To address the need of improving our educational approach for physicians-in-training on effective communication, we developed and implemented a novel, multimodal curriculum incorporating direct patient feedback to teach and assess this competency in the EM clerkship. The objective of this study was to assess whether a multimodal curriculum including direct patient feedback improves medical student communication skills as measured by the Communication Assessment Tool (CAT).

Educational Research Capsule Summary

What do we already know about this issue?
Effective communication is essential for the doctor-patient relationship, yet dedicated education and assessment strategies are lacking.

What was the research question?
Does a multimodal curriculum including direct patient feedback improve medical student communication in an emergency medicine clerkship?

What was the major finding of the study?
Students exposed to the curriculum showed improved patient ratings on communication abilities.

How does this improve population health?
Medical educators should consider a curriculum involving patient feedback as a means of teaching effective communication skills. This may in turn improve patient care.

METHODS
Study Design and Setting

This was a prospective, randomized, pilot study. Our study was reviewed by the institutional review board at our institution and was determined to be exempt. We included all students enrolled in the fourth-year EM clerkship from July 2016–October 2017. The study institution is an urban, tertiary care, Level 1 trauma center with an ED census of 55,000 patients annually and home to a three-year EM residency program.

Study Protocol

We developed a multimodal curriculum to teach communication skills consisting of two parts: 1) an asynchronous video on communication skills; and 2) delivery of direct patient feedback from the CAT questionnaire to the student. We designed this curriculum using principles of curricular development described by Kern.[14] Through our needs assessment based on faculty evaluations, verbal nursing comments, and observation during simulation, we identified that students' communication skills are extremely variable. Furthermore, medical students routinely do not receive direct patient feedback. Our goal was to develop a curriculum that would expose our targeted learner group, fourth-year medical students in EM, to this critical aspect of patient care and determine its utility in teaching and assessing communication skills in this population. To add framework to our curriculum,

we included a video module based on prior work that has demonstrated efficacy of asynchronous curricula compared to traditional synchronous didactics.[15,16] We then sought to implement and prospectively assess our curriculum by looking at patient ratings of communication skills.

The undergraduate medical education team designed the video that was made available online for student access. It is approximately 13 minutes long and includes evidence-based content on the importance of effective patient-doctor communication, barriers, and techniques for success. The format of the video includes narrated slides and structured interviews from EM academic faculty and the social work team. Faculty invited to participate in the video were those who consistently received the highest teaching scores by medical students and residents.

To assess medical student communication skills, we used the CAT along with free-response comments from patients (see Appendix 1). The CAT is a 15-item questionnaire that assesses communication skills from the patient perspective and has validity evidence to support its use. The questions use a 1-5 rating scale with 1 being "poor" and 5 being "excellent" and cover multiple domains related to communication and interpersonal skills.[17] It has demonstrated utility in assessing communication skills in surgery and family medicine residents.[18,19] The CAT has also been administered to ED patients and captures the patient's perspective on the overall

team's communication skills.[20] Its utility in assessing medical student communication skills has not yet been studied, nor have any other patient communication assessment tools been shown to have validity evidence in the medical student population. Because the last question of the CAT pertains to the communication skills of the entire ED team, we omitted this item and calculated student CAT scores out of 70 points for the remaining 14 questions based on previous approaches.[20]

During the study period, trained research assistants (RA) administered the CAT survey and free-response questions to ED patients cared for primarily by a fourth-year clerkship student. We implemented a system whereby a text page notification was sent to the RA team when a student signed up for a patient on our ED's electronic tracking board. Pages were sent during the hours of 8 AM–11 PM Monday through Friday and every odd weekend day when the RA staff was available. We included patients if they could identify the medical student who cared for them by photo, did not require interpreter services, and were at baseline alert and orientated to person, place and time. Only discharged patients were included in accordance with our institution's policy regarding patient surveys.

The RA informed the patient that the purpose of the survey was to help the student better his or her communication skills. Written consent was obtained from eligible patients for the use of their de-identified survey data for research purposes. We field-tested the administration of the CAT questionnaire during the month prior to the start of the study as a training period for RAs and to ensure adequate selection of patients. In response to this field testing, we made changes specifically regarding the timing of the pages sent to the RAs in order to maximize the number of patients screened prior to discharge.

To study the effect of our curriculum, we assigned students into an intervention group or control group. Students were randomized based on clerkship month such that all students rotating in the department received the educational experience. Group assignment alternated every other month (ie, all students in July received the curriculum mid-month while all students in August received the curriculum at the end of the clerkship). All students were notified at the beginning of the clerkship that we were instituting a new communication curriculum involving collection of patient feedback. The students in the intervention group were assigned to watch the video at the end of the second week of the clerkship at which time they also were given their CAT scores and free-response patient comments from the first two weeks of the clerkship.

The clerkship directors delivered the patient's feedback to the medical student in a face-to-face meeting. Additionally, the clerkship directors discussed with them ways to improve these skills. Students in the control group were assigned to watch the video at the end of the fourth week of the clerkship and received feedback from the CAT and patient comments for the entire four-week clerkship at that time (Figure). Students in both groups were required to watch the video as part of the

Figure. Multimodal communication curriculum for emergency medicine clerkship students for intervention versus control groups.
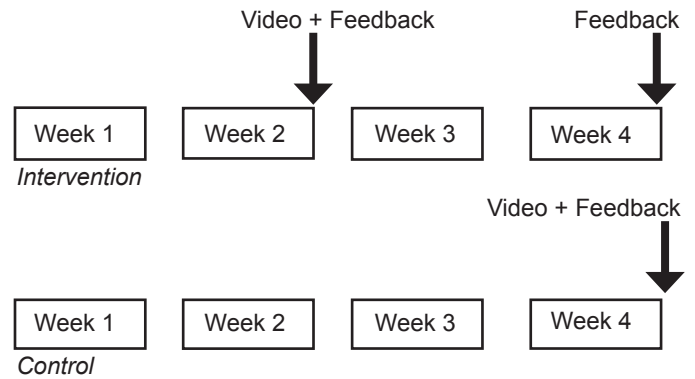
required clerkship curriculum. They were asked to verify they had viewed it via an email survey of confirmation.

Outcome Measures

We compared CAT patient questionnaire ratings for students in the intervention vs control groups during the first and second halves of the clerkship. Free-response comments from patients regarding their medical student's communication skills were also collected. Additionally, we assessed via our standard end-of-clerkship survey whether or not the students had ever received direct patient feedback previously in their medical school training. Student and patient participation in the study was voluntary. Students provided written consent for the use of their de-identified data for research purposes. By completing the survey, patients gave verbal consent for use of their de-identified data.

Outcome Measures and Data Analysis

CAT scores and free-response patient comments were de-identified and recorded in a REDCap database[21] that was stored on a secure server. Prior studies using the CAT demonstrate that a dichotomized scoring system was more useful than mean score given the ceiling effect (ie, there is an inherent skewing of mean scores toward the upper end of the 5-point scale).[17, 20, 22] Given this, we dichotomized the total score into maximal score (70 points) and sub-maximal (less than 70) as has been done previously. Categorical data were expressed as absolute numbers and percentages, and parameters with non-parametric distribution as median and interquartile range.

Differences in CAT scores between the intervention and control groups were assessed by Mann Whitney test for variables with non-parametric distribution and chi-square test (x^2) for categorical variables**.** We used generalized estimating equation logistic regression model (unstructured matrix) to compare proportions of maximal CAT score (score = 70) between intervention vs control group. This accounts for the clustering of the responses by the same medical student,

questionnaires at baseline (weeks 1-2 of the clerkship) and after intervention (weeks 3-4 of the clerkship). This statistical approach allows for adjustment of the results given the variability in number of CAT questionnaires per student and adjusts to the correlation between the different interviews of the same subject. This helps to achieve an unbiased estimate in the following hypothetical situation: one or more students in the intervention group is extremely responsive to the training and also has more questionnaires than others. P-values < 0.05 were considered statistically significant. We also calculated the percentage of students who reported receiving direct patient feedback previously in medical school. All statistical analyses were conducted using SPSS 25.0 (IBM Corp Armonk, NY).

RESULTS

We enrolled 64 students during the study period: 37 in the control group and 27 in the intervention group. All students confirmed they had watched the video. There were no major differences among gender, home vs visiting students, and percentage of students applying to EM between groups (Table 1). A total of 321 CAT questionnaires were administered. The median number of questionnaires per student was five. In the first half of the clerkship, the percentage of students with the maximum CAT score was similar between the intervention and control groups: 57.5% and 59.7%, respectively. In the second half of the clerkship, students in the intervention group achieved a maximum score more often than the control group: 62.3% and 51.1%, respectively.

In the logistic regression model, prior to the intervention (weeks 1-2), there was no difference between the groups (odds ratio (OR) [0.70], 95% confidence interval (CI), 0.44-1.13, p = 0.148). During the second half of the clerkship (weeks 3-4), the intervention group students achieved a maximum score more often than the control group (OR [1.65], 95% CI, 1.14-2.41, p = 0.008, Table 3). Representative patient feedback comments are displayed in Table 2. On the post-clerkship survey, 27% of students in our study reported receiving patient feedback previously in medical school.

DISCUSSION

We demonstrated successful deployment of a multimodal curriculum consisting of an asynchronous online video coupled with direct patient feedback to teach and assess student communication skills in an EM clerkship. To the best of our knowledge, this is the first dedicated curriculum that incorporates direct patient feedback in the clinical clerkship years.

It is interesting to note that while there was an increase in CAT scores in the intervention group during the study period, there was an overall decrease in the control group. It is difficult to discern the reason for the drop in CAT scores in the control group during the study period. One possibility is the decline parallels the trend that has been previously demonstrated in interpersonal skills across the duration of medical school.[12,13] It

Table 1. Demographic characteristics of medical students in the emergency medicine clerkship multimodal communication curriculum.

	Intervention (n=27)	Control (n=37)
Male, n (%)	16 (59)	22 (59)
Home institution medical students, n (%)	8 (30)	12 (32)
Visiting medical students, n (%)	19 (70)	25 (68)
Number of medical schools represented	16	22
Students applying to EM, n (%)	19 (70)	26 (70)

EM, emergency medicine.

is possible that at baseline all students do indeed have a decrease in communication skills over the month of a clerkship and that our curriculum mitigated this decline in the intervention group. Alternatively, this decline may have been due to a sampling error given the relatively small study population.

Undergraduate medical education curricula for teaching communication skills typically use traditional teaching modalities. Systematic, standardized techniques such as the Calgary-Cambridge Observation Guide and CLASS protocol have been previously used for framing the patient interview with a focus on optimizing communication.[23-25] Simulation is widely employed as an educational modality to improve learners' communication skills and has demonstrated feasibility through learner self-assessment surveys.[26,27] Rucker et al. developed a longitudinal communication curriculum for medical students consisting of seminars and videotaped interactions. After initiation of this curriculum, students' communication scores improved significantly on an objective structured clinical examination (OSCE).[28] The findings of our study add to the existing literature by offering another potential educational modality for teaching communication skills in the clerkship years.

In terms of assessment of communication skills, standardized patients and direct observation are commonly used modalities in EM students,[23] and there is substantial evidence demonstrating their feasibility[29,30] There are some limitations, however, with their day-to-day use. Standardized patients often require substantial scheduling efforts, nonclinical workspace, and monetary cost. These modalities may also introduce observer bias as the perception of the interaction is not made by the primary participants of the doctor–patient relationship. While the OSCE is an important means of evaluation, it still suffers from variability of rater scales.[31] Using the patient as the assessor may lessen the resource utilization and funding needs often required of these more traditional modalities. It also allows for more distinct evaluative encounters, which thereby may increase feedback. While our study used RAs, an ED attending, nurse, or tech could easily administer the CAT, as the approximate amount of time spent to

Table 2. Univariate analysis of intervention group vs control group.

	Total (n students =64, n questionnaires=321)	Intervention (n students =27, n questionnaires=150)	Control (n students=37, n questionnaires=171)	P value
Questionnaires per student (Median, IQR)	5 (3-7)	5 (3-7)	4 (3-6)	0.202
Questionnaires with maximal score at baseline (weeks 1-2) (n, %) among total questionnaires (n)	88 (58.7) (n=150)	42 (57.5) (n=73)	46 (59.7) (n=77)	0.784
Questionnaires with maximal score after intervention (weeks 3-4) (n, %) among total questionnaires (n)	96 (56.1) (n=171)	48 (62.3) (n=77)	48 (51.1) (n=94)	0.139

n, number; *IQR*, interquartile range.

administer the survey was five minutes. This strategy could avoid the extra cost of RAs and therefore allow this program to be more feasibly implemented. The breakdown of time and monetary costs can be found in Appendix 2.

On a broader scale, there is limited data regarding the use of direct patient feedback in improving communication skills in EM. In a recent prospective, randomized, pilot study of EM attending physicians, an intervention using monthly email feedback and face-to-face meetings on Press-Ganey scores did not improve provider patient-satisfaction scores compared to the control group.[32] These findings are in direct contrast with our results. Reasons for this are unclear, but there are inherent differences in the content assessed by Press-Ganey and the CAT as well as differences in motives for using these tools that may contribute. Further studies are needed to assess the effect of patient feedback on clinicians across all levels of training and practice. What is surprising is that in our post-clerkship survey, the overwhelming majority of students in our study (73%) had never received direct patient feedback in their medical school training up to this point, making our approach novel. This further highlights the potential role for this type of curriculum in undergraduate medical education.

Perhaps one of the more interesting aspects of our curriculum is the ability for incorporation into a 360-degree student evaluation. Prior studies have demonstrated successful implementation of multi-source, workplace-based assessment programs including patient feedback in various clinical settings.[33,34] The data on whether or not these lead to improved performance is mixed, although such programs generally receive positive ratings by physicians.[35] The ACGME has suggested the use of multi-source feedback and multiple evaluators for assessing trainees' competencies across multiple domains.[36] As healthcare continues to move toward a patient-centered view, this is critical to the development of future physicians. In a prospective study of pediatric residents, faculty and nurses rated the trainees higher on professionalism and interpersonal skills than did

patients and families.[37] Further investigations are needed to determine how patient ratings compare to those of faculty and other healthcare providers. Including the patients' view in student evaluations may add depth to the feedback and specific focus for improvement.

LIMITATIONS

First, this was a proof-of-concept, single-center study with a relatively small sample size that may limit extrapolation to other institutions. We believe, however, that the fact that medical students in our study come from 31 different medical schools adds heterogeneity to our population and may enhance generalizability. Second, only patients who were discharged from the ED were included in our study, as we did not want to affect the Health Care Consumer Assessment of Healthcare Providers and Systems survey administration to admitted patients.[38] This skews our patient population to those who are lower acuity, and therefore we cannot draw conclusions about medical student communication in the higher-acuity patient population. Third, the inherent ceiling effect (the nature of patients being surveyed to give high scores) we see with the CAT scores may further minimize differences between groups.

Fourth, due to the one-month nature of the clerkship, the post-intervention measures were collected immediately after the curriculum was delivered to the intervention group. A future study in which post-intervention CAT scores are collected at a later time is needed to assess for a washout effect. Fifth,

Table 3. Odds ratio for maximal Communication Assessment Tool score (score = 70) for intervention versus control group questionnaires, at baseline (weeks 1-2) and after intervention (weeks 3-4).

	OR	95% CI	P value
Weeks 1-2	0.70	0.44-1.13	0.148
Weeks 3-4	1.65	1.14-2.41	0.008

CI, confidence interval; *OR*, odds ratio.

Table 4. Representative patient free-response comments on emergency medicine clerkship students' communication skills.

"Appreciate how personable he was. He could elaborate more when he comes to the follow-up information."

"He was very attentive and took time to explain things clearly."

"He was good. But really the attending doctor gave me much more detailed information."

"She has good communication skills, she is very friendly, and she has a general concern for helping patients."

"She didn't give me all of the information I wanted to know. She seemed very nervous and a bit uncomfortable."

"She was excellent. At first I was unsure about a med student, but she actually spent a lot of time with me. She was very thorough and is an excellent physician."

"I had felt very upset about my accident, and she made me feel much better. She legitimized my concerns and feelings 100%."

"She listened attentively."

"My suggestion would be to make sure that any information he has or knows is explained to me, the patient."

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it is possible that the Hawthorne effect may have contributed both in terms of student performance and patient responses. We attempted to minimize such effect in terms of student performance by notifying all students at the beginning of the clerkship that we would be gathering patient feedback. Finally, because our curriculum is multimodal, we could not discern the extent to which the patient feedback, the video module, or the feedback discussion session with the clerkship directors had effect on the observed outcome.

CONCLUSION

A multimodal curriculum incorporating asynchronous learning and direct patient feedback is a feasible modality for teaching and assessing medical student communication skills in a fourth-year EM clerkship. Students in the intervention group attained higher patient ratings on communication skills compared to the control group. Undergraduate medical educators should consider using this novel approach in teaching and assessing communication and interpersonal skills.

Address for Correspondence: Nicole M, Dubosh, MD, Beth Israel Deaconess Medical Center/Harvard Medical School, Department of Emergency Medicine, One Deaconess Road, Rosenberg 2, Boston MA, 02215. Email: ndubosh@bidmc.harvard.edu.

REFERENCES

1. Anhang Prince R, Elliott MN, Zaslavsky AM, et al. Examining the role of patient experience surveys in measuring health care quality. *Med Care Res Rev.* 2014;71(5):522-54.
2. Hauck FR, Zyzanski SJ, Alemango SA, et al. Patient perceptions of humanism in physicians: effects on positive health behaviors. *Fam Med.* 1990;22(6):447-52.
3. Kim SS, Kaplowitz S, Johnston MV. The effects of physician empathy on patient satisfaction and compliance. *Eval Health Prof.* 2004;27(3):237-51.
4. Hojat M, Louis DZ, Markam FW, et al. Physician's empathy and clinical outcomes for diabetic patients. *Acad Med.* 2011;86(3):359-64.
5. Levinson W, Roter DL, Mullooly JP, et al. Physician-patient communication: the relationship with malpractice claims among primary care physicians and surgeons. *JAMA.* 1997;277(7):553-9.
6. Boissy A, Windover AK, Bokar D, et al. Communication skills training for physicians improves patient satisfaction. *J Gen Intern Med.* 2016;31(7):755-61.
7. Rhodes KV, Vieth T, He T, et al. Resuscitating the physician-patient relationship: emergency department communication in an academic medical center. *Ann Emerg Med.* 2004;44(3):262-67.
8. Schwartzstein RM. Getting the right medical students: nature versus nurture. *N Engl J Med.* 2015;372(17):1586-7.
9. Core Competencies for Entering Medical Students. Association of American Medical Colleges website. Available at: https://www.staging.aamc.org/initiatives/admissionsinitiative/competencies/. Accessed July 3, 2017.
10. Ten Cate O, Scheele F. Competency-based postgraduate training: Can we bridge the gap between theory and clinical practice? *Acad Med.* 2007;82(6):542-7.
11. Englander R, Cameron T, Ballard AJ, et al. Toward a common taxonomy of competency domains for the health professions and competencies for physicians. *Acad Med* 2013;88(8):1088-94.
12. Hook KM, Pfeiffer CA. Impact of a new curriculum on medical students' interpersonal and interviewing skills. *Med Educ.* 2007;41(2):154-9.
13. Hirsh D, Ogur B, Schwartzstein R. Can changes in the principal clinical

year prevent the erosion of students' patient-centered beliefs? *Acad Med*. 2009;84(5):582-6.

14. Thomas PA, Kern DE, Hughes MT, et al. (1998). *Curriculum Development for Medical Education – A Six-Step Approach.* Baltimore, MD*:* The Johns Hopkins University Press.

15. Burnette K, Ramundo M, Stevenson M et al. Evaluation of a web-based asynchronous pediatric emergency medicine learning tool for residents and medical students. *Acad Emerg Med.* 2009;16:Suppl2:S46-50.

16. Raupach T, Grefe C, Brown J et al. Moving knowledge acquisition from the lecture hall to the student home: a prospective intervention study. *J Med Internet Res*. 2015;17(9):e223.

17. Makoul G, Krupat E, Chih-Hung C. Measuring patient views of physician communication skills: development and testing of the communication assessment tool. *Patient Educ Couns.* 2007;67(3):333-42.

18. Stausmire JM, Cashen CP, Myerholtz L, et al. Measuring general surgery residents' communication skills from the patient's perspective using the communication assessment tool (CAT). *J Surg Educ.* 2015;72(1):108-16.

19. Myerholtz L, Simons L, Felix S, et al. Using the communication assessment tool in family medicine residency programs. *Fam Med.* 2010;42(8):567-73.

20. McCarthy DM, Ellison EP, Venkatesh AK, et al. Emergency department team communication with the patient: the patient's perspective. *J Emerg Med.* 2013;45(2):262-70.

21. Harris P, Taylor R, Thielke R, et al. Research electronic data capture (REDCap) – a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform.* 2009;42(2):377-81.

22. Mercer LM, Tanabe P, Pang PS, et al. Patient perspectives on communication with the medical team: pilot study using the Communication Assessment Tool-Team (CAT-T). *Patient Educ Couns*. 2008;23(2):200-3.

23. Hobgood CD, Riviello RJ, Jouriles N, et al. Assessment of communication and interpersonal skills competencies. *Acad Emerg Med.* 2009;9(11):1257-69.

24. Kurtz SM, Silverman J, Draper J. The Calgary-Cambridge Observation Guides: an aid to defining the curriculum and organizing the teaching in communication training programs. *Med Educ.* 1996;30(2):83-9.

25. Buckman R. *How to Break Bad News: A Guide for Health Care Professionals*. Baltimore, MD: Johns Hopkins University Press;1992.

26. Nelson SW, Germann CA, MacVane CZ, et al. Intern a patient: a

27. Williams-Reade J, Lobo E, Whittemore AA, et al. Enhancing residents' compassionate communication to family members: A family systems breaking bad news simulation. *Fam Syst Health.* 2018;36(4)523-7.

28. Rucker L, Morrison E. A longitudinal communication skills initiative for an academic health system. *Med Educ.* 2001;35(11):1087–8.

29. Ditton-Phare P, Sandhu H, Kelly B, et al. Pilot evaluation of a communication skills training program for psychiatry residents using standardized patient assessment. *Acad Psychiatry.* 2016;40(5):769-75.

30. Trickey AW, Newcomb AB, Porrey M, et al. Assessment of surgery residents' interpersonal communication skills: validation evidence for the communication assessment tool in simulation environment. *J Surg Educ*. 2016;73(6):e19-e27.

31. Comert M, Zill JM, Chistalle E, et al. Assessing communication skills of medical students in objective structured clinical examinations (OSCE)- a systematic review of rating scales. *PLoS One.* 2016;11(3):e0152717.

32. Newgard CD, Fu R, Heilman J, et al. Using Press-Ganey provider feedback to improve patient satisfaction: a pilot randomized controlled trial. *Acad Emerg Med.* 2017;24(9):1051-9.

33. Brinkman WB, Geraghty SR, Lanphear BP, et al. Effect of multi-source feedback on resident communication skills and professionalism: a randomized controlled trial. *Arch Pediatr Adolesc Med.* 2007;16(1):44-9.

34. Lockyer J, Vioato C, Fidler H. Likelihood of change: a study assessing surgeon use of multisource feedback data. *Teach Learn Med.* 2003;15(3):168-74.

35. Miller A, Archer J. Impact of workplace based assessment on doctors' education and performance: a systematic review. *BMJ.* 2010;341:c5064.

36. Accreditation Council for Graduate Medical Education. Advancing education in interpersonal and communication skills: an educational resource from the ACGME Outcome Project. Available at: http://www.acgme.org/outcome/assess/toolbox.asp. Accessed June 14, 2018.

37. Chandler N, Henderson G, Park B, et al. Use of a 360-degree evaluation in the outpatient setting: the usefulness of nurse, faculty, patient/family, and resident self-evaluation. *J Grad Med Educ.* 2010;2(3):430-4.

38. HCAHPS: Hospital Consumer Assessment of Healthcare Providers and Systems. 2018. Available at: http://www.hcahpsonline.org/en/quality-assurance). Accessed June 15, 2018.

The End of the Accidental Academician

Christine R. Stehman, MD   Indiana University School of Medicine, Department of Emergency Medicine, Indianapolis, Indiana

INTRODUCTION

Many medical education scholars form their careers through a unique blend of planning and accident. Although these academicians initially worked hard with focus, once they achieve the clinician part of "clinical educator," it is as if they lack a conceptual framework for the rest of their career. They have become accidental academicians with the educator part succeeding eventually, cobbled together from satisfying mandates and falling into opportunities with little of the meticulous planning that led to being a clinician. Albeit successful, the resulting career may seem disjointed, unplanned, and possibly less fulfilling than it could have been. It is hard to mentor others to achieve success using this model, resulting in more generations of accidental academicians.

Readers may argue that they did not accidentally get where they are today and a plan continues to direct their careers. But, is hindsight making that vague destination less vague? Were changes in direction well thought out or were they the result of attention-catching "squirrels" being chased until their scent was lost, with educators then wandering aimlessly until they found a new trail? Accidental academicians are not bad – I have been one myself; however, I believe that adding intention to the clinical educator career, changing accidental academicians to deliberate professionals, will make the career journey less arduous and more fulfilling.

Trede and McEwen define deliberate professionals as those who reflect on their culture, environment, and situation to understand possibilities and probabilities, and then use that information to make conscious choices for actions and relationships, while being responsible for the consequences of their choices.[1] Essentially, deliberate professionals know where they are, where they are going, what they need to get there, and that the **path might change**. They use reflection to understand how their characteristics and experiences affect their journey, building individualized opportunities according to their unique characteristics.

Post board certification, the clinical educator travels a long road, filled with slowdowns, detours, and day trips. Accidental academicians often passively go to their future, traveling without any idea of where they are going, how long

they'll be gone or what they'll do when they get "there." Deliberate professionals actively create their future by having an individualized map, specific guidance, and a plan for all parts of their journey.

The Map

A usable, individualized map consists of a starting point, an ending point, and the multiple paths between the two. Using time and introspection to create this roadmap facilitates a more successful and smooth journey. Directions are always relative to a starting point, so education scholars must understand their current position: a combination of their values, interests, and previously acquired knowledge.[2] Deliberate professionals use this information to choose a direction to travel and plan their route, allowing them to align their career and values.[3] This alignment leads to happier and more fulfilling experiences.[4-6]

Aligning a career path with vague values (ie, I want to help people) is difficult, and such values often falter when challenged.[7] Clearly defined values and goals also help make the multiple decisions along the career journey easier. The more decisions one makes, the more likely the next decision will either not get made or will result in a poor choice.[8-10] By limiting viable choices and reducing decision issues, established values smooth the deliberate professional's journey.[8-10]

Journeys also need a destination. Initially, accidental academicians are like Alice during her adventures in Wonderland, knowing they will get "somewhere" if they just travel long enough.[11] Vague end goals are more difficult and less likely to be achieved than specifically delineated goals.[12] Combining personal characteristics and micromotives to find a fulfilling end goal enhances goal achievement.[13] This end goal should be built upon multiple smaller, stepping-stone goals that have two purposes.[14] In addition to specifically delineated goals, understanding the process required to achieve goals and building goal-reaching processes that reflect and are shaped by their identity in a goal-achieving feedback loop also result in a higher likelihood of goal achievement.[15-18]

Understanding stepping-stone goals first helps deliberate professionals to avoid distracting, non-relevant projects, allowing them to travel in the same direction for long

distances.[19-20] Attempting to finish all projects, no matter what purpose they serve, results in minimal movement in any one direction.[19] Stepping-stone goals also permit deliberate professionals to refine their path. These checkpoints help education scholars avoid both hyperbolic discounting[a] and unintentionally getting too far off track.[21] These checkpoints serve as a place to reflect upon progress and adjust the endpoint and path based on how beliefs and interests have changed rather than aiming directly for an established goal without consideration of whether that goal remains the best outcome.[22] To this end, deliberate professionals combine two goal achievement strategies (plan-and-implement[b] and test-and-learn[c]) to find their individualized path to being an education scholar, strategies used to become a clinician.[23]

Guidance and How to Travel

Since no universal defined path toward becoming an education scholar exists, deliberate professionals must use travel companions to help plan their route, choose their method of travel, and plan how to choose a direction at any unexpected forks in the road.

A social network guides individualization of one's path by helping to identify one's unique qualities, micromotives, strengths and weaknesses.[18] Four types of people (their tribe[d], mentors[e], coaches[f], sponsors[g]) make up one's social network. This group provides feedback, suggests opportunities for growth and advancement, and teaches about training and resources required along the journey.[24-26] While some of these relationships occur naturally, others benefit from formalization. Deliberate professionals consciously establish these relationships, determining what each person can and is comfortable providing help with, ensuring they receive the specific guidance they need and support when the journey gets arduous.[24-25] Failure to formalize such relationships results in less guidance and fewer benefits.[56]

In addition to support and guidance, travel companions offer opportunities of varying usefulness.[26] Without a solid method for choosing which opportunities to accept, the default is often to take the easiest route (ie, saying yes) despite the choice not being beneficial.[27] This path may hold little to no interest to the education scholar, resulting in procrastination and lack of productivity.[19] Committing to these opportunities decreases the time available for more interesting and relevant areas, while delaying niche development, something that helps prevent burnout, an increasingly common downside of a medical career.[28-29] Deliberate professionals set themselves up to deal with any forks in the road before they start traveling, reducing decision- making issues and increasing productivity.[9-10]

A solid decision tree starts with a foundation of four times to definitely say yes: (1) politically, "no" is not an option (mandated yes); (2) the opportunity definitely interests the traveler; (3) participation in the opportunity directly impacts at least one established goal; and (4) participation results in working with someone who can educate and guide, leading to further success of the journey.

Some opportunities neither fit into these categories nor are an obvious "no." Setting up priorities, such as how the opportunity might impact the final goal, who is involved, when the opportunity is, or how the traveler would be involved, helps one avoid defaulting to "yes." Consider also asking and honestly answering questions about the opportunity's effect on the journey: "What will I have to give up if I say yes?"; "What could I potentially miss out on if I say no?"; "Does this align with who I want to be?"[19,30] The ultimate goal of this prioritization is to make sure travelers are not just "busy," so travelers are able to both act as well as think and question, allowing germination and growth of ideas.[31]

Discussion of prioritization of opportunities brings up questions of how one should travel on this journey, (ie, how to work productively). A full discussion of productivity techniques is beyond the scope of this commentary. Accidental academicians should reflect upon their personal characteristics to figure out which techniques will work best for them. Deliberate professionals commit to maximizing their productivity. Though physician schedules rarely permit the four-hour blocks that many productive people use, a successful approach to blocking off professional time away from clinical work considers five key issues: [32]

- Consistency: Block off time regularly, preferably at the same time of day.[33] The more often one works, even if it is just for 10 minutes, the more likely it will become a habit.[34]
- Self-awareness: Schedule this work block during their most productive time of day while employing their best techniques of blocking work within the larger time block (eg, Pomodoro technique[h], clock-time vs event-time[i]).[35-36]
- Boundaries: Both physical and scheduling boundaries help prevent interruptions and increase productivity.
- Just do it: Sit down and start working no matter the lack of motivation or ideas. To do otherwise minimizes output.[37]
- Extra time and deadlines: Understand that everything takes longer than planned and allow for extra time to complete the work involved.[38] Setting deadlines also helps avoid procrastination.[39]

Off the Beaten Path

At this point, education scholars must decide which type of trip they will take: traveling straight through with minimal stops or potentially making this a long journey starting with a nearby initial destination with time for detours, viewpoints and rest stops. The first option, without time for anything else until the job is finished, wreaks havoc on work-life integration and makes one's career less satisfying overall.[40] Downtime and detours enhance work-life integration and permit discovery and development of niches and passions.[32]

Roadblocks/getting lost

Failure, often the most disheartening part of any journey, occurs for everyone. Failure surprises those with a fixed mindset, derailing them from their travels.[41] With a growth

mindset, deliberate professionals do not take failure personally and use failure to their advantage.[41] They expect failure, understanding it is part of any learning process.[42] They reframe failure as learning ways that do not work. Finally, deliberate professionals reflect upon their failure and how it affects their career path, modifying their route as needed.[43]

Scenic route

Interesting side trips help travelers remain energized for their entire journey. A focus on completing all projects leaves little time for other opportunities. This focus towards the future may result in getting bored with the present and missing beneficial opportunities that do not align perfectly with what was planned.[44] Deliberate professionals explore intriguing opportunities that pass the decision tree described earlier. Some of the most successful people have had career journeys that involved intentionally entered backward and sideways trips.[45]

Rest stops

Deliberate professionals recognize how time outside of work enhances the quality of their work. Prominent historical figures interspersed work with activities like walks, social interactions, and naps, a practice supported by multiple research studies.[32] K. Anders Ericsson's deliberate practice needs the support of deliberate rest and sleep for practitioners to achieve expertise.[46] Deliberate rest (or play) involves detaching from work by changing context, relaxing, and engaging in interesting activities.[47-48] Each traveler's form of deliberate rest/play is different, but has the same benefits: better performance during work time; renewed energy; and increased creativity.[47-50] Switching off work, especially in the middle of a project, allows the brain to subconsciously consider the problem and arrive at more creative solutions.[32, 51-52] Deliberate professionals realize that coming up with solutions while walking, driving, or showering is not a fluke but an opportunity to be cultivated.

CONCLUSION

During their career journey, deliberate professionals create an individualized map to follow (modifying it as they go), engage guidance in various forms, and understand that time outside of work enhances their experience and productivity. The added intention that differentiates a deliberate professional from an accidental academician seems simple, but each move is deliberate: unhurriedly, carefully, and attentively studied, considered, and measured before it is taken. Practicing reflection regularly is key to understanding the interplay of all parts of the career journey. Both deliberation and reflection take time, experience, and a willingness to be wrong. No matter where education scholars are in their career journey, they can transform from an accidental academician to a deliberate professional and travel a well-planned path that expects and permits agility while enhancing productivity.

Footnotes

a. Having less motivation to do tedious tasks towards a distant reward.
b. Define a goal, figure out how to get there, and strictly follow the path.
c. Trying different options to determine which one fits.
d. A group of people connected to each other by a leader and/or ideals.
e. Provide guidance through sharing of knowledge, advice and experience.
f. Observes performances and provides feedback to improve performance.
g. People of higher rank that can offer opportunities to the education scholar and promote them to others.
h. Working in blocks of time (typically 25 minutes) with breaks in between of varying lengths depending on the overall amount of time one has been working.
i. Working for either a specified amount of time (clock time) or until a task is finished (event time).

REFERENCES

1. Trede F, McEwen C. Scoping the deliberate professional. In: Trede F, McEwen C eds. *Educating the Deliberate Professional: Preparing for Future Practices.* Switzerland: Springer International Publishing; 2016:3-14.
2. Loehr A. How to live with purpose, identify your values, and improve your leadership. Huffington Post. 2014. Available at: https://www.huffpost.com/entry/how-to-live-with-purpose_b_5187572. Accessed August 7, 2019.
3. Verplanken B, Holland RW. Motivated decision-making: effects of activation and self-centrality of values on choices and behavior. *J Pers*

Soc Psychol. 2002;82(3):434-47.

4. Pololi LH, Kern DE, Carr P, et al. The culture of academic medicine: faculty perceptions of the lack of alignment between individual and institutional values. *J Gen Intern Med*. 2009;24(12):1289-95.

5. Sagiv L, Roccas S, Cieciuch J, et al. Personal values in human life. *Nat Hum Behav*. 2017;1:630-9.

6. Niemiec C, Ryan R, Deci E. The path taken: consequences of attaining intrinsic and extrinsic aspirations in post-college life. *J Res Pers*. 2009;73(3):291-306.

7. Darley JM, Batson CD. "From Jerusalem to Jericho": a study of situational and dispositional variables in helping behavior. *J Pers Soc Psychol*. 1973;27(1):100-8.

8. Redelmeier DA, Shafir E. Medical decision making in situations that offer multiple alternatives. *JAMA*. 1995;273:302-5.

9. Vohs KD, Baumeister RF, Schmeichel BJ, et al. Making choices impairs subsequent self-control: a limited-resource account of decision making, self-regulation, and active initiative. *J Pers Soc Psychol*. 2008;94(5):883-98.

10. Huber F, Kocher S, Vogel J, et al. Dazing diversity: investigating the determinants and consequences of decision paralysis. *Psychol Market*. 2012;29(6):467-78.

11. Carroll L. *Alice's Adventures in Wonderland*. Available at: https://www.cs.cmu.edu/~rgs/alice-VI.html Accessed August 7, 2019.

12. Locke EA, Shaw KN, Saari LM, et al. Goal setting and task performance: 1969-1980. *Psychol Bull*. 1981;90(1):125-52.

13. Schelling TC. *Micromotives and Macrobehavior*. New York, NY: WW Norton and Company; 2006.

14. Duckworth A. *Grit: The Power of Passion and Perseverance*. New York, NY: Scribner; 2016.

15. Locke EA, Latham GP. Building a practically useful theory of goal setting and task motivation: a 35-year odyssey. *Am Psychol*. 2002;57(9):705-17.

16. Kolb DA, Boyatzis RE. Goal-setting and self-directed behavior change. *Hum Relat*. 1970;23(5):439-57.

17. Boyatzis RE, Akrivou K. The ideal self as the driver of intentional change. *J Manage Dev*. 2006;25(7):624-42.

18. Barrera Jr M, Ainlay SL. The structure of social support: a conceptual and empirical analysis. *J Community Psychol*. 1983;11(2):133-43.

19. McKeown G. *Essentialism: The Disciplined Pursuit of Less*. New York, NY: Crown Business; 2014.

20. Drucker P. Managing knowledge means managing oneself. *Leader to Leader*. 2000;2000(16):8-10.

21. O'Donoghue T. Rabin, M. The economics of immediate gratification. *J Behav Decis Making*. 2000;13(2):233–50.

22. Giaimo-Ballard C, Hyatt L. Reflection-in-action teaching strategies used by faculty to enhance teaching and learning. *Networks*. 2012;14(2):1-11.

23. Ibarra H. Provisional selves: experimenting with image and identity in professional adaptation. *Admin Sci Quart*. 1999;44(4):764-91.

24. Byyny RL. Mentoring and coaching in medicine. *Pharos Alpha Omega Alpha Honor Med Soc*. 2012;75(1):1-3

25. Deiorio N, Carney PA, Kahl LE, et al. Coaching: a new model for

26. Mager-Lightfoot S. Coaching, mentoring and sponsorships: what does it all mean? Training industry. 2017. Available at: https://trainingindustry.com/articles/leadership/coaching-mentoring-and-sponsorships-what-does-it-all-mean/. Accessed August 7, 2019.

27. Kool W, McGuire JT, Rosen ZB, et al. Decision making and the avoidance of cognitive demand. *J Exp Psychol Gen*. 2010;139(4):665-82.

28. Cameron PA. Will subspecialization benefit the practice of Australasian emergency medicine? Yes. *Emerg Med Australas*. 2016;28(4):471-2.

29. Kane L. Medscape National Physician Burnout, Depression & Suicide Report 2019. 2019. Available at: https://www.medscape.com/slideshow/2019-lifestyle-burnout-depression-6011056.nAccessed August 7, 2019.

30. Clear J. *Atomic Habits: An Easy & Proven Way to Build Good Habits and Break Bad Ones*. New York, NY: Avery; 2018.

31. Marquadt M. *Leading with Questions: How Leaders Find the Right Solutions to Knowing What to Ask*. London, UK: Jossey-Bass; 2005.

32. Pang AS-K. *Rest: Why You Get More Done When You Work Less*. New York, NY: Basic Books; 2016.

33. Wieth MB, Zacks RT. Time of day effects on problem solving: when the non-optimal is optimal. *Think Reasoning*. 2011;17(4):387-401.

34. Aarts H, Dijksterhuis A. Habits as knowledge structures: automaticity in goal directed behavior. *J Pers Soc Psychol*. 2000;78(1):53-63.

35. Cirillo F. The Pomodoro technique. Available at: https://francescocirillo.com/pages/pomodoro-technique Accessed August 7, 2019.

36. Avnet T, Sellier A-L. Clock time vs. event time: temporal culture or self-regulation? *J Exp Soc Psychol*. 2011;47(3):665-7.

37. Ferrari JR. *Still Procrastinating? The No-Regrets Guide to Getting It Done*. Hoboken, NJ: Wiley; 2010.

38. Newby-Clark IR, Ross M, Buehler R, et al. People focus on optimistic scenarios and disregard pessimistic scenarios while predicting task completion times. *J Exp Psychol-Appl*. 2000; 6(3):171-82.

39. Ariely D, Wertenbroch K. Procrastination, deadlines and performance: self-control by precommitment. *Psychol Sci*. 2002;13(3):219-24.

40. Shanafelt TD, Oreskovich MR, Dyrbye LN, et al. Avoiding burnout: the personal health habits and wellness practices of US surgeons. *Ann Surg*. 2012;255(4):625-33.

41. Dweck CS. *Mindset: The New Psychology of Success*. New York, NY: Ballentine Books; 2016.

42. Lenz B. Failure is Essential to Learning. Edutopia. 2015. Available at: https://www.edutopia.org/blog/failure-essential-learning-bob-lenz. Accessed August 7, 2019.

43. Cohen M. Why education needs to understand that failure is a process not a destination. 2017. Available at: https://thetechrabbi.com/blog/2017/7/30/failure. Accessed August 7, 2019.

44. Leslie I. *Curious: The Desire to Know and Why Your Future Depends on It*. New York, NY: Basic Books; 2014.

45. Botelo EL, Powell KR, Wong N. The fastest path to the CEO job, according to a 10-Year Study. Harvard Business Review. 2018. Available at: https://hbr.org/2018/01/the-fastest-path-to-the-ceo-job-according-to-a-10-year-study. Accessed August 7, 2019.

46. Ericsson KA, Krampe RT, Tesch-Romer C. The role of deliberate practice in the acquisition of expert performance. *Psychol Rev.* 1993;100(3):363-406.

47. Brown S, Vaughan C. *Play: How it Shapes the Brain, Opens the Imagination and Invigorates the Soul*. New York, NY: Avery (the Penguin Group); 2009.

48. Sonnentag, S. Recovery, work engagement, and proactive behavior: A new look at the interface between nonwork and work. *J Appl Psychol.* 2003;88(3):518-28.

49. Sonnentag S, Zijlstra FRH. Job characteristics and off-job activities as predictors of need for recovery, well-being, and fatigue. *J Appl Psychol.* 2006;91(2): 330-50.

50. Aspinall P, Mavros P, Coyne R, et al. The urban brain: analysing outdoor physical activity with mobile EEG. *Brit J Sport Med.* 2015;49:272-6.

51. Ellwood S, Pallier G, Snyder A, et al. The incubation effect: hatching a solution? *Creativity Res J.* 2009;21(1):6-14

52. Gallate J, Wong C, Ellwood S, et al. Creative people use nonconscious processes to their advantage. *Creativity Res J.* 2012;24(2-3):146-51.

The Impact of Anonymity in Emergency Medicine Morbidity and Mortality Conferences: Findings from a National Survey of Resident Physicians

Emily L. Aaronson, MD, MPH*‡
Kathleen Wittels, MD†
Richard Dwyer, MD†
Eric Nadel MD*†
Fiona Gallahue, MD§
Olesya Baker, MA¶
Christopher Fee, MD||
Robert Tubbs MD#
Jeremiah Schuur, MD, MHS†

*Harvard Medical School, Massachusetts General Hospital, Department of Emergency Medicine, Boston, Massachusetts
†Harvard Medical School, Brigham and Women's Hospital, Department of Emergency Medicine, Boston, Massachusetts
‡Lawrence Center for Quality and Safety, Massachusetts General Hospital and Massachusetts General Physicians' Organization, Boston, Massachusetts
§University of Washington School of Medicine, Department of Emergency Medicine, Seattle, Washington
¶Center for Clinical Investigation, Brigham and Women's Hospital, Boston, Massachusetts
||University of California San Francisco School of Medicine, Department of Emergency Medicine, San Francisco, California
#Warren Alpert Medical School at Brown University, Department of Emergency Medicine, Providence, Rhode Island

Introduction: Although the Accreditation Council for Graduate Medical Education mandates structured case review and discussion as a part of residency training, there remains little guidance on how best to structure these conferences to cultivate a culture of safety, promote learning, and ensure that system-based improvements can be made. We hypothesized that anonymous case discussion was associated with a more effective, and less punitive, morbidity and mortality (M&M) conference. Secondarily, we were interested in determining whether this core structural element was correlated with the culture of safety at an institution.

Methods: We conducted a national survey at 33 emergency medicine residency programs evaluating residents' perceptions of M&M and the culture of safety at their institutions. Data was analyzed using descriptive statistics and bivariate analyses. We summarized Likert scores using mean and 95% confidence intervals. We also performed content analysis of the free-text comments and report on the themes identified.

Results: There were 1248 residents at the 33 programs surveyed. Of the 1002 who replied (80.3% response rate), 231 respondents reported anonymous case presentations and 744 reported non-anonymous case presentations. Residents at programs with anonymous case presentations were more likely to report that M&M was non-punitive. There were no other significant differences between anonymous and non-anonymous case presentations on any of the culture of safety domains measured. When these comments were systematically analyzed and coded, we found that the comments related to anonymity were both positive and negative. Among the themes identified were anonymity's impact on punitive response to error, the ability to learn from cases, and professional responsibility.

Conclusion: Anonymous M&Ms are associated with a perception of a less-punitive M&M and with better ratings in several conference-specific outcomes; however, there appears to be no association between the other Agency for Healthcare Research and Quality culture of safety scores and anonymity in M&M. [West J Emerg Med. 2020;21(1):127-133.]

INTRODUCTION

The value of systematic error analysis has long been recognized in healthcare. Pioneered by Earnest Codman at the turn of the 20th century,[1] and famously reinforced 100 years later in the Institute of Medicine's landmark *To Err is Human*,[2] the importance of routine case reporting and detailed case review is now widely accepted as foundational in the practice of medicine. Integral in training, the Accreditation Council for Graduate Medical Education now mandates structured case review and discussion, or morbidity and mortality (M&M) conferences, as a part of their system-based practice and practice-based learning and improvement domains.[3]

Despite the express interest in this activity supporting system-based practice, M&Ms have instead traditionally been focused on individual cognitive errors and have often further reinforced a "blame and shame" culture in medicine, undermining the effectiveness of these conferences.[4,5,6] For trainees in particular, it has been noted that the impact of M&M conferences that focus on individual cognitive errors is to increase fear of blame resulting in decreased participant engagement, lower likelihood of reporting safety events, and an overall decrease in the effectiveness of the conferences.[7] Despite this, there are no best practices to guide residency programs in the design of M&M conferences to mitigate the fear of blame, and to promote a non-punitive case discussion. To our knowledge, no work to date has looked to determine the association of different structural elements of M&M conferences and residents' perceptions of the conference and the overall impact on the culture of safety.

Recent papers have described the characteristics of emergency medicine (EM) M&Ms nationally, and found significant variation in core structural elements.[8,9,10] Given the fear of "blame and shame," we hypothesized that anonymous case discussion would cultivate a more effective, and less punitive, M&M conference. Secondarily, we were interested in determining whether this core structural element was associated with the overall culture of safety at an institution. We conducted a national survey, evaluating residents' perceptions of M&M and the culture of safety at their institutions.

METHODS

Study Setting and Measurement

Study setting and measurement is discussed in detail in a previous paper.[9] This is a convenience sample derived from all United States EM residency programs. We invited all programs to participate in a survey of all residents: 33 programs were both willing to participate and able to identify a local champion to serve as a co-investigator to help ensure a high response rate. The survey was conducted in May 2015, using a tool that was previously piloted with residency program directors (PD).[9] This included questions used in a previous survey of EM PDs[9] as well as questions from the validated Agency for Health Care Research and

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Population Health Research Capsule

What do we already know about this issue?
Structured case review is mandated by the Accreditation Council for Graduate Medical Education, but there are no best practices in the design of these conferences.

What was the research question?
Does anonymous case discussion cultivate a more effective, and less punitive, morbidity and mortality (M&M) conference?

What was the major finding of the study?
Anonymous M&Ms are associated with a perception of a less-punitive M&M and with better ratings in several conference-specific outcomes.

Quality (AHRQ) Safety Culture survey.[11] These questions are designed to assess aspects of a strong safety culture, including a non-punitive environment, comfort submitting and discussing errors, and an environment in which mistakes lead to positive change.

Analysis

We analyzed data using descriptive statistics and bivariate analyses. Likert scores were summarized using mean and 95% confidence intervals (CI). We calculated composite culture of safety scores by using the average of the four AHRQ safety domains surveyed. Anonymous and non-anonymous comparison was made using paired t-test. Data analysis was performed with STATA MP 13.1 (StataCorp, College Station, TX). We performed qualitative analysis of the free-text comments using conceptual content analysis.

To begin, a set of thematic codes was developed by three of the emergency physician investigators (ELA, JDS, KW) through an iterative reading of all reports. Subsequently, one author (ELA) used content-analysis techniques to code all transcripts in NVivo qualitative data analysis software version 10, 2014 (QSR International Pty Ltd. Doncaster, Australia). Multiple themes could be applied to a single response as appropriate. The final coded text and example quotations were reviewed with two other investigators (KW, JDS) iteratively until there was agreement on the coding structure. Descriptive statistics were generated to summarize the data and quantify the frequency of themes.

RESULTS

There were 1,248 residents at 33 programs surveyed during the study period. Of the 1002 who replied (80.3% response rate), 231 respondents reported anonymous case presentations, and 744 reported non-anonymous case presentations. There were no differences in the structural elements of the residency training programs between anonymous and non-anonymous respondents (Table 1).

When asked about features of M&M specifically, residents reporting anonymous case presentation reported that M&M was less punitive (Table 2; difference in percent agreeing = 8.21; 95% CI, 11.66-4.77; p<0.05). Regarding case submission, residents reporting anonymous case presentation trended toward being more comfortable submitting cases in which they were *not* involved as compared to residents reporting non-anonymous case presentations (difference in percent agreeing = 6.64; 95% CI, 7.24-14.01; p = 0.08). There was little difference between the groups in their degree of comfort when reporting cases they were involved in (difference in percent agreeing = 0.38; 95% CI, 6.44-7.21; p = 0.91).

Greater than 85% of all residents surveyed agreed that M&M was of value to their education, with no significant difference between the two groups (difference in percent agreeing =1.49; CI, 6.49-3.49; p = 0.55). Those reporting anonymous case presentation did report that case discussion was more focused on system errors (difference in percent agreeing = 6.73; CI, 0.85-12.62; p = 0.03); however, the two groups reported no significant difference in the perception that the discussions were more focused on cognitive errors (difference in percent agreeing = 0.004; CI, 7.22-7.31; p = 0.99]) The majority of residents surveyed agreed that mistakes led to positive change (65.9% of residents reporting anonymous case presentations; 68.6% of residents reporting non-anonymous case presentations).

Table 3 shows the positive composite score for the culture of safety survey stratified by the two different types of case presentation. There remained a significant difference between the two groups related to the perception of the punitive nature of the conference, with residents at programs with anonymous M&Ms significantly less likely to report that the M&M felt punitive.

When asked "Have you had a negative experience with having a case of yours discussed at M&M?," there was no statistical difference between respondents reporting an anonymous case presentation described negative experiences and respondents reporting non-anonymous case presentations described negative experiences (2.4% vs 0.8%; p = 0.188). Similarly, there was no statistically significant difference between positive experiences reported by respondents reporting anonymous case presentations and respondents reporting non-anonymous case presentations (6.9% vs 8.7%; p = 4.16).

Narrative Comments

When we systematically analyzed and coded these statements, we found that comments related specifically to anonymity were very common and both positive and negative. The majority of comments from anonymous programs were related to non-punitive responses to error, with residents noting that "*I feel bad about a decision that I made that I should have done differently; however, people are not punitive, they try to keep the discussion academic";* and "*the environment is generally very constructive and not punitive, which makes it much easier to accept criticisms of the care I provided.*" Another theme identified associated with anonymous case discussions was related to the impact of the providers not being present for the case discussion, noting that as a negative experience: the "*Attending who drove most of decision making of case was not present.*" While these two things, anonymity and the absence of the team involved, are not clearly related it does stand to reason that if the team will not be identified it becomes easier for them not to attend.

Additional themes identified were related to anonymity decreasing the punitive nature of these conferences and increasing the focus on systems and ability to learn from cases: "*M&M for us is completely anonymous and focused on systems errors and ways to avoid a similar error in the future. It does not feel punitive or finger-pointing. It was very interesting to hear the discussion of a case I was involved in, and allowed me to better process a poor patient outcome and give me ideas on how to prevent a similar error in the future.*" However, another resident noted that the same anonymous framework can lead to a loss of the context related to the original medical decision-making: "*I don't like that our institution does not allow the person involved in the case to OWN the case. Instead you listen to people talking about what they would have done etc. but the person involved in the case is not allowed to stand up and explain their motivations because it has to be anonymous.*"

Other residents provided examples of hybrid approaches to anonymity and described the ability of non-anonymous conferences to provide closure; however, "*at our institution the attendings and residents involved in the case are free to identify themselves and their experience but there is no pressure. When my case was presented, I thought it was helpful to discuss my experience, thought process during the case, and to ask if others in the room would have approached it differently. This gave me a sense of closure and afterwards I felt more resolution regarding the care of that patient.*" Another resident describing a hybrid conference noted the limitations of the non-anonymous structure, impeding honest discussion, perhaps related to self-censorship: "*at our institutions the presenter never identifies the resident or attending on the case but the resident and attending frequently self-identify and start discussing the case. That then makes it very difficult for others to comment honestly and*

Table 1. Demographics and structure of emergency medicine morbidity and mortality conferences.

	Residents reporting anonymous case presentations (%, N)	Residents reporting non-anonymous case presentations (%, N)	X^2
X^2			
Total respondents	23.69%, 231	76.31%, 744	
Postgraduate year			X^2=2.15 P = 0.54
PGY 1	23.13%, 71	76.87%, 236	
PGY 2	25.18%, 71	74.82%, 211	
PGY 3	25.00%, 65	75.00%, 195	
PGY 4	19.05%, 24	80.95%, 102	
Residency program structure			X^2=0.42 Pr = 0.52
PGY 1-3	24.55%, 123	75.45%, 378	
PGY 1-4	22.78%, 108	77.22%, 366	
Region			X^2=16.48 Pr = 0.001
Northeast	26.87%, 108	73.13%, 294	
Midwest	22.55%, 53	77.45%, 182	
South	28.57%, 50	71.43%, 125	
West	12.27%, 20	87.73%, 143	
(2) Number of your cases submitted to M&M in the past 12 months			X^2=2.02 Pr = 0.36
0	25.13%, 146	74.87%, 435	
1	22.77%, 46	77.23%, 156	
≥2	20.21%, 38	79.79%, 150	
(3) Number of your cases submitted to PSRS in the past 12 months			X^2=0.56 Pr = 0.75
0	24.07%, 181	75.93%, 571	
1	21.37%, 25	78.63%, 92	
≥2	25.51%, 25	74.49%, 73	
(4) Number of your cases presented at M&M during residency			X^2=2.01 Pr = 0.37
0	24.94%, 106	75.06%, 319	
1	24.72%, 67	75.28%, 204	
≥2	20.58%, 57	79.42%, 220	
(16) Most important objective of M&M			X^2=9.17 Pr = 0.10
Discuss adverse outcomes	41.04%, 87	34.06%, 233	
Identify systems errors	26.89%, 57	23.10%, 158	
Discuss interesting cases	10.38%, 22	11.26%, 77	
Identify cognitive errors	4.25%, 9	7.31%, 50	
Teach individual professional accountability	9.43%, 20	14.33%, 98	
Other	8.02%, 17	9.94%, 68	

X^2, chi-square test; _PGY_, postgraduate year; _Pr_, probability; _PSRS_, the Patient Safety Reporting System; _M&M_, morbidity and mortality.

Table 2. Anonymity and culture of safety domains.

Questions related to culture of safety	Residents reporting anonymous case presentations			Residents reporting non-anonymous case presentations			Difference in % agree [CI]	P-value
	Agree (Lik 4+5) % (n)	Neutral (Lik 3) % (n)	Disagree (Lik 1+2) % (n)	Agree (Lik 4+5) % (n)	Neutral (Lik 3) % (n)	Disagree (Lik 1+2) % (n)		
(7) M&M feels punitive (primary outcome)	3.93% (9)	11.79% (27)	84.28% (193)	12.15% (90)	18.76% (139)	69.10% (512)	-8.21% [-11.66; -4.77]	<0.05
(5) Comfort submitting cases I was not involved in	48.70% (112)	23.48% (54)	27.83% (64)	42.05% (312)	28.44% (211)	29.51% (219)	6.64% [-7.24; 14.01]	0.08
(6) Comfort submitting cases I was involved in	69.43% (159)	21.40% (49)	9.17% (21)	69.04% (513)	20.73% (154)	10.23% (76)	0.38% [-6.44; 7.21]	0.91
(8) Case discussion is focused on cognitive errors	59.13% (136)	29.57% (68)	11.30% (26)	59.08% (439)	26.24% (195)	14.67% (109)	0.04% [-7.22; 7.31]	0.99
(9) Case discussions are focused on systems errors	81.74% (188)	14.78% (34)	3.48% (8)	75.00% (558)	17.61% (131)	7.39% (55)	6.73% [0.85; 12.62]	0.03
(10) Mistakes have led to positive changes	65.94% (151)	29.26% (67)	4.80% (11)	68.64% (510)	26.51% (197)	4.85% (36)	-2.7% [-9.68; 4.28]	0.44
(12) M&M is a valuable educational didactic session	86.52% (199)	10.00% (23)	3.48% (8)	88.02% (654)	9.15% (68)	2.83% (21)	-1.49% [-6.49; 3.49]	0.55

Lik, Likert; *CI*, confidence interval; *M&M*, morbidity and mortality.

Table 3. Primary and secondary outcomes.

Questions related to Culture of Safety	Residents reporting anonymous case presentations	Residents reporting non-anonymous case presentations	Difference in % Agree [CI]	P value
	Average Likert score	Average Likert score		
(7) M&M feels punitive (primary outcome)	1.66	2.05	-0.39 [-0.55; -0.23]	<0.05
(5) Comfort submitting cases I was not involved in	3.39	3.25	0.15 [-0.04; 0.33]	0.12
(6) Comfort submitting cases I was involved in	3.92	3.88	0.04 [-0.11; 0.19]	0.61
(8) Case discussion is focused on cognitive errors	3.60	3.57	0.03 [-.10; 0.17]	0.63
(9) Case discussions are focused on systems errors	4.05	3.89	0.16 [0.03; 0.28]	0.01
(10) Mistakes have led to positive changes	3.82	3.84	-0.01 [-0.13; 0.11]	0.84
(12) M&M is a valuable educational didactic session	4.38	4.36	0.02 [-0.10; .14]	0.71

CI, confidence interval; *M&M*, morbidity and mortality.

changes the tone."

A common theme in the comments from non-anonymous programs was related to residents perceptions of punitive responses to error, such as "*I felt as though I was blamed by one of our senior attendings for this in front of the M&M attendees, even though I had ultimately no power in the decision made by the spine surgery team.*" Alternatively, another theme identified was related to the non-anonymous conference's ability to cultivate professionalism and accountability. One resident asserted that, "*it is helpful to watch more seasoned providers accept responsibility*"; and another resident noted, "*It teaches patient safety, personal accountability, and management of difficult cases.*"

Another theme that arose exclusively in the non-anonymous group was related to the absence of change resulting from case discussion. One resident noted that "*I have as of yet been informed of any system change to address the issue*" and noting concern that "w*hen a system process is changed as a result of questions and answers, it usually is not effectively communicated to the group (Attendings and Residents) and is often not widely adopted.*" Despite these concerns, residents reporting non-anonymous case presentations did point out the conferences' ability to provide emotional support to the clinicians involved in the cases discussed, commenting that " *This gave me a sense of closure and afterwards I felt more resolution regarding the care of that patient*" and "*allowed me to better process a poor patient outcome.*"

DISCUSSION

In this national survey of residents' perception of M&M conferences and their institutional cultures of safety, we found that residents reporting anonymous M&Ms were less likely to report that the M&M felt punitive and more likely to report that case discussions were focused on system issues. We found no other association between the AHRQ culture of safety scores and anonymity in M&M. As we think about the core elements of a strong safety culture that could be cultivated through M&M it becomes important that these conferences are designed to encourage robust case reporting, cultivate a nonpunitive environment for discussion, and provide clear follow-up for issues discussed.[12] Our study suggests that residents at institutions with anonymous M&Ms feel the case discussions are less punitive and that they focus more on systems errors.

In keeping with our hypothesis, we believe that this impact stems from a relationship between the fear of individual blame for case outcomes and being explicitly named in case discussion. It should be noted, however, that it was still a small minority of residents, from either conference structure, who felt these conferences are punitive. Instead, only 16% of residents at anonymous programs and 31% of residents at non-anonymous programs felt that these discussions were punitive. Although other indicators, such as

the educational value of the conference, showed no change between the two structures, these also had the clear majority of respondents from both programs (86% anonymous, 88% anonymous) agreeing that the conferences were of value.

Our study showed that, despite the impact of anonymous M&M on some indicators of safety culture, there was no impact on several others. This likely reflects the fact that M&M conferences are only one small determinant of an institution's culture of safety and this structure alone is not enough to modify the overall culture. This was reinforced by the qualitative analysis, which demonstrated that there were both residents who felt that anonymity cultivated a safety culture, and those who felt it hindered it. This further demonstrates the complexity of safety culture and reinforces that any single input, such as M&M conferences, is only one factor in determining the overall culture.

The analysis of free-text comments provided deeper insight into the nuances surrounding anonymous case presentations, painting pictures of both residents for whom anonymity provided a non-punitive environment that enabled the discussion of systems issues, as well as those for whom anonymity was frustrating and obstructed the ability of the providers to accurately relay the details of the case. The same was true for those reporting non-anonymous case discussions, with some residents recalling situations in which this structure led to them feeling personally attacked or abandoned; however, others described the important impact that this structure had on cultivating personal accountability and professionalism.

LIMITATIONS

There were several limitations to our study. As with all survey-based research, our study was prone to response bias. Although we had a robust response rate, with a >80% response rate across the study population and > 70% at each institution, only 33 programs out of the 151 programs in the country elected to participate. We suspect that those that did elect to participate were more likely to have stronger safety cultures and that, therefore, our results were biased toward a smaller effect size of anonymity. The survey questions themselves, although taken from a previously piloted survey for PDs and validated AHRQ questions, did not undergo formal psychometric testing as this set of questions. The qualitative analysis of the free-text comments has limitations typical for qualitative analysis, that our findings are hypothesis generating and not generalizable.

CONCLUSION

In this national survey of EM residents, we found that anonymous M&Ms are associated with a non-punitive perception of the conference. Future study should focus on the impact, within a single program, of anonymous case discussion, as well as other structural elements of M&M conference.

Address for Correspondence: Emily L. Aaronson, MD, MPH, Lawrence Center for Quality and Safety, Massachusetts General Hospital, Department of Emergency Medicine, 55 Fruit St., Bulfinch Building, Suite 280, Boston, MA 02115. Email: Emily.aaronson@ mgh.harvard.edu.

REFERENCES
1. Donabedian A. The end results of health care: Ernest Codman's contribution to quality assessment and beyond. *Milbank Q*. 1989;67(2):233-56.
2. Gruen R. (1999). *To Err Is Human*. (Kohn LT, Corrigan JM, Donaldson M., Eds). Cambridge, United Kingdom: Cambridge University Press.
3. Accreditation Council for Graduate Medical Education. ACGME Common Program Requirements.2002-2019. Available at: https:// www.acgme.org/What-We-Do/Accreditation/Common-Program-Requirements. Accessed May 10, 2019.
4. Harbison SP, Regehr G. Faculty and resident opinions regarding the role of morbidity and mortality conference. *Am J Surg*. 1999;177(2):136-9.
5. Orlander JD, Fincke BG. Morbidity and mortality conference: a survey of academic internal medicine departments. *J Gen Intern Med*. 2003;18(8):656-8.
6. Gordon L. Can Cedars-Sinai's "M+M Matrix" save surgical education? *Bull Am Coll Surg*. 2004;89(6):16-20.
7. Wu AW, Folkman S, McPhee SJ, et al. Do house officers learn from their mistakes? *Qual Saf Heal Care*. 2003;12(3):221-8.
8. Wittels K, Aaronson E, Dwyer R, et al. Emergency medicine morbidity and mortality conference and culture of safety: the resident perspective. *AEM E&T*. 2017;1(3):191-9.
9. Aaronson EL, Wittels KA, Nadel ES, et al. Morbidity and mortality conference in emergency medicine residencies and the culture of safety. *West J Emerg Med*. 2015;16(6):810-7.
10. Seigel TA, McGillicuddy DC, Barkin AZ, et al. Morbidity and mortality conference in emergency medicine. *J Emerg Med*. 2010;38(4):507-11.
11. Sorra J, Gray L, Streagle S, et al. AHRQ Hospital Survey on Patient Safety Culture: User's Guide. 2016. Available at: http://www.ahrq.gov/ professionals/quality-patientsafety/patientsafetyculture/hospital/index. html. Accessed January 3, 2019.
12. McVeigh TP, Waters PS, Murphy R, et al. Increasing reporting of adverse events to improve the educational value of the morbidity and mortality conference. *J Am Coll Surg*. 2013;216(1):50-6.

Effectiveness of a Pediatric Emergency Medicine Curriculum in a Public Tanzanian Referral Hospital

Carol C. Chen, MD, MPH*
Alexander L. Werne, MD†
Katharine A. Osborn, MD*‡
Holly Vo, MD, MPH, MSc†
Upendo George, MD§
Hendry Sawe, MD§
Newton Addo¶‖
Andrea T. Cruz, MD, MPH‖

*University of California, San Francisco, Section of Pediatric Emergency Medicine, Department of Emergency Medicine, San Francisco, California
†University of California, San Francisco, Department of Pediatrics, San Francisco, California
‡University of Utah, Division of Emergency Medicine, Department of Pediatrics, Salt Lake City, Utah
§Muhimbili National Hospital, Department of Emergency Medicine, Dar Es Salaam, Tanzania
¶University of California, San Francisco, Department of Medicine, Clinical Pharmacology Program, San Francisco, California
‖University of California, San Francisco, Department of Emergency Medicine, San Francisco, California

Introduction: The World Health Organization recently recognized the importance of emergency and trauma care in reducing morbidity and mortality. Training programs are essential to improving emergency care in low-resource settings; however, a paucity of comprehensive curricula focusing specifically on pediatric emergency medicine (PEM) currently exists. The African Federation for Emergency Medicine (AFEM) developed a PEM curriculum that was pilot-tested in a non-randomized, controlled study to evaluate its effectiveness in nurses working in a public Tanzanian referral hospital.

Methods: Fifteen nurses were recruited to participate in a two-and-a-half-day curriculum of lectures, skill sessions, and simulation scenarios covering nine topics; they were matched with controls. Both groups completed pre- and post-training assessments of their knowledge (multiple-choice test), self-efficacy (Likert surveys), and behavior. Changes in behavior were assessed using a binary checklist of critical actions during observations of live pediatric resuscitations.

Results: Participant-rated pre-training self-efficacy and knowledge test scores were similar in both control and intervention groups. However, post-training, self-efficacy ratings in the intervention group increased by a median of 11.5 points (interquartile range [IQR]: 6-16) while unchanged in the control group. Knowledge test scores also increased by a median of three points (IQR: 0-4) in the nurses who received the training while the control group's results did not differ in the two periods. A total of 1192 pediatric resuscitation cases were observed post-training, with the intervention group demonstrating higher rates of performance of three of 27 critical actions.

Conclusion: This pilot study of the AFEM PEM curriculum for nurses has shown it to be an effective tool in knowledge acquisition and improved self-efficacy of pediatric emergencies. Further evaluation will be needed to assess whether it is currently effective in changing nurse behavior and patient outcomes or whether curricular modifications are needed. [West J Emerg Med. 2020;21(1)134-140.]

INTRODUCTION

The lack of emergency care systems has been associated with lower survival rates in adults and children in low- and middle-income countries (LMICs).[1,2] At the 72nd World Health Assembly, delegates recognized the value of emergency and trauma care in reducing morbidity and mortality, and adopted a resolution that would support countries in the development of systems to deliver timely care to critically ill and injured people.[3] In addition to needs assessments and standards for equipment and processes to support the development of emergency care systems, training for all cadres of health workers was one of the identified interventions in the resolution.

Numerous studies surrounding emergency medicine (EM) curriculum implementation have demonstrated decreased mortality in adult populations[4-6] without a significant increase in the use of resources or economic burden.[5-7] While nearly 95% of the one million traumatic injuries occurring in children worldwide occur in LMICs,[8] to date, there remains a paucity of open access and comprehensive, pediatric-focused curricula for emergency and trauma care. Furthermore, of the pediatric curricula that have been implemented, most have only evaluated providers' self-efficacy and knowledge acquisition.[9-12] A rare few have attempted to show changes in provider behavior or patient outcomes.[13,14]

In response, the African Federation for Emergency Medicine (AFEM) assembled a working group with expertise in pediatric EM (PEM) from seven American and African academic institutions to develop a comprehensive PEM curriculum for three different tiers of healthcare professionals that would be made freely available. The curriculum development process was based upon a widely accepted model for medical education.[15] Curriculum topics were based upon a needs assessment conducted in Tanzania two years prior, and learning objectives were determined by expert consensus review using a modified Delphi process.[16,17] As part of the development process, the implementation and evaluation of the curriculum for the first tier of providers, nurses as described here, was conducted as a pilot study at Muhimbili National Hospital (MHN), the national referral hospital for Tanzania (see Figure 1). Specific efforts were made to broaden the curriculum's evaluation beyond self-efficacy and knowledge acquisition, to include changes in practice behavior.

METHODS

This study was a non-randomized, controlled pilot study to evaluate the effectiveness of a novel PEM curriculum in nurses (Tier 1 providers) by examining the association between participation in this curriculum and nurses' self-efficacy, knowledge, and changes in behavior.

Setting and Study Population

MHN is the national referral hospital for Tanzania and is located in the capital city, Dar es Salaam. It houses an emergency department (ED) that treats approximately 45-50 pediatric

Population Health Research Capsule

What do we already know about this issue?
Emergency care reduces morbidity and mortality, but countries in low-resource settings may lack dedicated training, especially in pediatric emergency medicine (PEM).

What was the research question?
Would Tanzanian nurses who participate in a novel PEM curriculum demonstrate improved self-efficacy, knowledge, and practice during pediatric emergencies?

What was the major finding of the study?
Trained nurses showed improved self-efficacy and knowledge, but failed to show increased performance of critical actions during live pediatric resuscitations.

How does this improve population health?
This PEM pilot has strengthened the curriculum and will be available to train nurses across Africa, to improve the care of critically ill and injured children.

patients (under 18 years old) per day.

Nurses were recruited by ED staff at MHN to participate in the training and were matched to control nurses who worked in the same setting based upon their level of experience. All ED Tier 1 nurses or prehospital providers for whom caring for pediatric patients on a daily basis was within their scope of practice were eligible to be enrolled. Any provider not proficient in the English language was excluded from the study. As a retention strategy, a certificate of completion was provided to all participants who attended at least 80% of the training sessions and completed all measurement tools.

The sample-size calculation was based off change in knowledge scores in previously published literature.[7,18] A minimum of 24 nurses (12 intervention and 12 control) was required to detect a 15% change in test scores.

Control Group

As mentioned, the control group of nurses was recruited from the same group of ED nurses as those in the intervention group, and were matched to participants in the intervention group based upon level of experience. The majority of the nurses in both groups (> 60%) hold a diploma in nursing (three-year program following secondary school or high school), while the remainder possess either a bachelor's degree or a

certificate in nursing. At baseline, all nurses in the ED receive annual training in pediatric emergencies via the American Heart Association's Pediatric Advanced Life Support course, and a five-day, multidisciplinary course focusing on pediatric resuscitation and trauma management that was developed by local physicians. In addition, they participate in a monthly course entitled "Basic Emergency Nursing Training," which includes some basic pediatric resuscitation training. Further exposure to pediatric-specific training for the nurses is more sporadic, with up to 25% of weekly continuing nursing education sessions being relevant to pediatrics.

Intervention
Training

Training sessions were conducted over two and a half days and included 30-minute lectures on nine topics, small-group skills stations and simulated scenarios, as well as scheduled intervals for pre-and post-training measurements and frequent breaks (see Appendix 1). The lectures were delivered by two instructors, one international instructor, and one local instructor, and the small-group sessions were facilitated by an additional three international instructors and two local instructors.

Outcomes/Measurements

The non-randomized, controlled study design was approved by institutional review boards at both the University of California San Francisco (UCSF) and MHN. Outcome measurements focused on three well-described dimensions to evaluate training programs.[19] Primary outcomes were 1) participant self-efficacy (as measured by a survey that used five-point Likert scales to rate participants' confidence with PEM concepts and skills); and 2) participant knowledge acquisition (as measured by written test scores on a 20-question multiple-choice test). Since no surveys for this target audience existed, items were adapted from previously published and validated surveys, with new content development informed by interviews conducted during a needs assessment and review by local experts (EM specialists in low-resource settings).[16,20-22] A similar process for developing questionnaires for educational research has been described.[23]

A secondary outcome was change in participant behavior (as measured with a binary checklist of critical actions for pediatric sepsis, respiratory distress, and trauma). Content validity for all tools was obtained through expert review; and a duplicate survey and written test were used for pre-training and post-training evaluations, demonstrating reliability (see Appendices 3 and 4).[24] Inter-observer reliability for the checklist was not assessed. Each group completed all measurements both pre- and post-training, except for the changes in participant behavior, which was only able to be measured post-training (see "Limitations" section). These data were collected for seven weeks post-training.

Statistical Analyses

We used paired *t* tests to compare means between normally distributed groups and Mann-Whitney *U* test to compare data that

were not normally distributed. Performance on the checklist of critical actions was compared using chi-squared or Fisher's exact tests as appropriate. For all comparisons, a two-tailed p-value less than 0.05 was considered statistically significant.

RESULTS

A total of 15 nurses participated in the training; however, only 11/15 completed all of the pre- and post-training measurements. Fourteen nurses were recruited as control participants; 11/14 completed all measurements. For the survey measurement of self-efficacy, median ratings were similar between the intervention and control groups; however, overall participant post-training ratings were significantly greater than pre-training ratings in the intervention group. Control participants showed no significant difference between their pre-training and post-training ratings (see Tables 1 and 3).

Similarly, for the test of knowledge acquisition, no pre-training difference existed between the intervention and control groups; however, a significant increase in median scores was seen within the intervention group across the two time points, as well as when comparing the intervention group to the control group post-training (see Tables 2 and 3).

A total of 402 live cases of pediatric respiratory distress (121 intervention; 281 control) were observed and measured using the critical actions checklist post-training (Table 4). Only one critical action was observed at a higher proportion in the intervention group (+8.6% (confidence interval [CI], -0.8 - 18.1%): "States that the child is in respiratory distress" (which was intended to serve as a proxy for recognition of an emergency condition – see Appendix 2 for the complete tool). For pediatric trauma, 394 live cases were observed (115 intervention; 279 control) with no statistically significant differences in performance of critical actions. For pediatric sepsis, 396 live cases were observed (117 intervention; 279 control). In two related critical behaviors – "States whether the child is or is not anemic" (eg indicating that the nurse checked for anemia) and "Attempts to place IV or IO (if available)" – the intervention group performed these actions at higher rates with estimated differences of + 6.3% (CI, -0.9 - 13.7%) and 12.6% (CI, 2.1 - 23.0%), respectively.

DISCUSSION

Emergency care has been proven to save lives, and educational curricula have been shown to be one way to effectively and feasibly support the development and expansion of emergency care services in LMICs.[4-7] Few comprehensive, open-access, pediatric-specific emergency curricula exist despite the high burden of critically ill and injured children in these settings. This study describes the pilot implementation of such a curriculum developed by AFEM to fill this gap, and demonstrates its effectiveness in improving both PEM self-efficacy and knowledge. Once finalized, this curriculum will be made freely available via the Internet to be modified and used to train nurses and prehospital providers across the African continent.

Combined pediatric emergency and critical care fellowships

Table 1. Overall median self-efficacy rating (scale 11-55), and within cohort p-value comparison of change in self-efficacy ratings pre- and post-training.

Cohort	Self-efficacy assessment	Median rating	Interquartile range	P-value
Control	Pre-	46	41 - 48	0.55
	Post-	45	43 - 49	
Intervention	Pre-	45	39 – 48	0.002
	Post-	54	54 - 55	

Table 2. Overall median knowledge score (scale 0-20), and within cohort p-value comparison of change in knowledge scores pre- and post-training.

Cohort	Self-efficacy assessment	Median rating	Interquartile range	P-value
Control	Pre-	14	14 – 17	0.54
	Post-	15	13 – 17	
Intervention	Pre-	16	14 – 17	0.016
	Post-	17	17 – 19	

are starting to be implemented on the continent.[25] At the same time that sub-specialty training for physicians in LMICs is being conducted at referral centers, it is important to recognize that many emergencies take place far from these large centers. To ensure that children receive the care they need, nurses and physicians at sites that are further afield also need training in the recognition and initial management of pediatric emergency conditions, but may not have the financial and logistical ability to commit to two or more years of full-time training.

Our curriculum addresses several of these issues. First, while this pilot training included all components and was held over two and a half days, it is designed in a modular fashion so that participants can view the lectures (available both in PowerPoint and PDF formats to accommodate local bandwidth restrictions) at their convenience. The hands-on, small-group skills sessions and simulated cases can be offered in a brief, one-day training with experienced facilitators. This multimodal format has been shown to be preferred by working emergency care nurses, interns, residents, and physicians in a similar setting.[16] Secondly, the final AFEM curriculum is designed to target multiple different cadres of healthcare workers through its tiered development. The Tier 1 curriculum piloted in this study is directed toward nurses and pre-hospital providers, recognizing that in most LMICs, the majority of the healthcare workforce is made up of professionals who are not physicians.

This study demonstrated a significant improvement in self-efficacy and knowledge scores of participating nurses. As mentioned, multiple studies of educational curricula have shown similar benefits; however, fewer have demonstrated actual changes in behavior. We attempted to show a change in nursing behaviors with this curriculum. However, an improvement in critical actions during specific pediatric emergencies (respiratory distress, trauma, sepsis), which was expected, was not seen for most actions (Table 4).

There are several potential reasons for this. First, critical actions included stating the existence of certain conditions, such as respiratory distress, as a proxy for recognition of the emergency condition. However, observations were being conducted during actual resuscitations and not in a traditional testing environment, so the fact that a nurse did not verbalize critical action statements may not be a true reflection of his or her recognition of these conditions, but rather a reflection of

Table 3. P-value comparisons at pre-training and post-training time points between cohorts (intervention vs control).

Time point	Self-Efficacy	Knowledge
Pre-training	p = 0.79	p = 0.53
Post-training	p < 0.001	p = 0.014

the lack of utility of such statements during live resuscitations. This hypothesis is supported by the observation that rates of performance of critical actions that required statements were relatively low in both groups, ranging from 6-36% (except for "States that the patient is in septic shock"). However, critical actions that followed recognition of these conditions were performed at relatively higher rates, suggesting that nurses may have been acting upon these emergent conditions, even if they were not stating their recognition of them.

Additionally, this pilot study was conducted at only one site (due to a limitation in funding), so there may have been information transfer among the ED nursing staff, which could have led to an improvement in performance of members of the control group, which makes the lack of significance in the rest of the critical actions difficult to interpret. Since pre-training data was not available to help triangulate the results, it is unclear whether participants were unable to transfer the knowledge acquired into action, or knowledge gained spilled over into the control group. The lack of pre-training data also prohibits us from assessing whether the intervention and control groups performed comparably at baseline. However, a significant difference in baseline is unlikely as there was no difference in their pre-training confidence or knowledge scores. The disproportionately higher number of post-training observations in the control group could be due to an unintentional counting of all nurses who did not undergo the training as controls; however, this could not be confirmed due to lack of identifying information.

Other groups have shown that practice change following educational interventions is often difficult to achieve, and our study supports this notion.[5] However, given the knowledge acquisition and improved confidence after the course, we believe that this does not suggest that such curricula are not effective, but, if the data are accurate, might not be sufficient, and that another component of training such as direct oversight

or on-site mentorship is needed. The value of such presence has been stressed by other researchers.[5] Future studies are needed to confirm or refute the lack of translation of knowledge into practice, and if confirmed to examine the effect of direct oversight on practice change.

LIMITATIONS

Our study has several important limitations, including small sample size, possible sample contamination, limited value of specific critical actions as described above, and a failure to confirm inter-observer reliability. In addition, the study design

Table 4. Post-training performance on each critical action (Yes/No) for both intervention and control groups, with associated p-values for comparison across groups.

Respiratory distress (N=402)	Intervention (N=121)			Control (N=281)			Intervention vs. control (%)	P-value
	N/A	No	Yes	N/A	No	Yes		
States: is in respiratory distress	1	90	30	0	235	46	(25.0 vs. 16.4)	0.04
Calls for more resources	27	22	72	111	30	140	(76.6 vs. 82.4)	0.26
Checks respiratory rate	1	109	11	0	264	17	(9.2 vs. 6.0)	0.26
Ensures proper airway alignment	1	103	17	0	246	35	(14.2 vs. 12.5)	0.64
Initiates oxygen therapy	88	8	25	228	8	45	(75.8 vs. 84.9)	0.29
States: whether due to an upper or lower airway condition	1	101	19	0	250	31	(15.8 vs. 11.0)	0.18
Chooses correct-sized mask	94	12	15	241	20	20	(55.6 vs. 50.0)	0.80
Ensures adequate mask-face seal	94	14	13	241	17	23	(48.1 vs. 57.5)	0.47
Assesses chest rise with ventilation	94	11	16	240	21	20	(59.3 vs. 48.8)	0.40
If no chest rise, repositions airway	95	12	14	241	21	19	(53.8 vs. 47.5)	0.62
Trauma (N=394)	Intervention (N=115)			Control (N=279)			Intervention vs. control (%)	P-value
	N/A	No	Yes	N/A	No	Yes		
States: is a trauma patient	1	79	35	0	176	103	(30.7 vs. 36.9)	0.29
Calls for more resources	21	18	76	105	35	139	(80.9 vs. 79.9)	0.85
States: assessment of airway	0	76	39	0	178	101	(33.9 vs. 36.2)	0.67
States: assessment of breathing	1	78	36	2	185	92	(31.6 vs. 33.2)	0.81
States: assessment of circulation	1	79	35	1	192	86	(30.7 vs. 30.9)	0.96
States: patient's GCS or AVPU	0	98	17	0	234	45	(14.8 vs. 16.1)	0.74
Exposes entire body with modesty	2	76	37	2	201	76	(32.7 vs. 27.4)	0.33
States: need for neck stabilization	0	110	5	0	262	17	(4.3 vs. 6.1)	0.49
Applies splint to extremity	105	1	9	217	8	54	(90 vs. 87.1)	0.80
Septic Shock (N=396)	Intervention (N=117)			Control (N=279)			Intervention vs. control (%)	P-value
	N/A	No	Yes	N/A	No	Yes		
States: child is in septic shock	0	56	61	0	142	137	(52.1 vs. 49.1)	0.66
Calls for more resources	22	20	75	105	33	141	(78.9 vs. 81.0)	0.68
States: if child is malnourished	0	90	27	0	233	46	(23.1 vs. 16.5)	0.12
States: if child is anemic	0	102	15	0	261	18	(12.8 vs. 6.5)	0.04
Attempts intravenous or intraosseous access	0	31	86	0	109	170	(73.5 vs. 60.9)	0.02
Gives correct fluid resuscitation for child without anemia/malnutrition	61	17	39	202	32	45	(69.6 vs. 58.4)	0.19
Gives correct fluid resuscitation for child with malnutrition	76	21	20	210	31	38	(48.8 vs. 55.1)	0.52
States: need blood transfusion for fluid resuscitation if severe anemia	95	17	5	265	12	2	(22.7 vs. 14.3)	0.68

Note: Phrasings in the table are abbreviations; refer to Appendix 2 for original checklist items.
N/A, not applicable.

was not randomized due to resource limitations and departmental staffing needs; we were provided with a convenience sample of participant nurses that was matched to a group of control nurses. Our pre-training data collection period for observation of critical actions was eliminated due to delays in obtaining IRB approval, making a comparison across the two time periods impossible. In addition, there was selection bias in recruitment, as many of the nurses in the intervention arm had expressed a particular interest in pediatrics and therefore likely had more experience and motivation. The same questions were used pre- and post-training to assess for knowledge acquisition, which could suggest a positive effect of exposure, however, this is likely limited as the control group did not show a significant increase in scores. Due to funding constraints, this pilot was conducted at only one site, which limits the overall generalizability of the findings.

FUTURE DIRECTIONS

The results of this pilot study have revealed several important areas needing further investigation. As mentioned above, future studies will focus on determining whether true practice change is occurring from this curriculum, as well as the most important factors contributing to behavior change in nurses and physicians in such settings. Interest in re-examining how this curriculum could alter provider behavior and pediatric mortality, especially with larger sample sizes, has already been expressed by institutions in other countries in Africa.

While this study demonstrated an improvement in confidence and knowledge from this curriculum, the ultimate goal is to develop a course that is effective in creating behavior change that leads to a reduction in pediatric mortality. Once we better understand the findings of this research and can make appropriate adjustments to the course, the goal is to make this course freely available to nurses and prehospital providers to download all of the material and adapt it to their needs and their setting. In addition, three local trainers were trained through this pilot study and the hope is that they will later be able to train future trainers to ensure the local sustainability of the course.

The curriculum for Tier 2 providers (eg, clinical officers, intern physicians) is currently being created and will be piloted at a large medical center in West Africa. The results of this study and subsequent planned studies will be used to modify this curriculum as well. Once these two tiers have been modified and piloted, the curriculum for Tier 3 providers (eg, specialist physicians) will be created and similarly evaluated.

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Address for Correspondence: Carol Chen, MD, Pediatric Emergency Medicine, UCSF PEM, Box 0632, 550 16th Street, Floor 5, San Francisco, CA 94143. Email: carol.chen@ucsf.edu.

REFERENCES

1. Hsiao M, Morris SK, |Malhotra A, et al. Time-critical mortality conditions in low-income and middle-income countries. *Lancet*. 2013;381(9871):993-4.

2. Reynolds TA, Sawe H, Rubiano AM, Shin SD, Wallis L, Mock CN. (2017). Chapter 13: Strengthening health systems to provide emergency care. In: Jamison DT, Gelband H, Horton S (Eds.), *Disease Control Priorities: Improving Health and Reducing Poverty* (247-266). 3rd edition. Washington, D.C.: The International Bank for Reconstruction and Development/The World Bank.

3. Director-General. Emergency care systems for universal health coverage: ensuring timely care for the acutely ill and injured. 2019. Available at: https://www.physiospot.com/2019/05/30/new-who-emergency-and-trauma-care-resolution/. Accessed October 31, 2019.

4. Wang P, Li NP, Gu YF, et al. Comparison of severe trauma care effect before and after advanced trauma life support training. *Chin J Traumatol*. 2010;13(6):341-4.

5. Petroze RT, Byiringiro JC, Ntakiyiruta G, et al. Can focused trauma education initiatives reduce mortality or improve resource utilization in a low-resource setting? *World J Surg*. 2015;39(4):926-33.

6. Arreola-Risa C, Mock C, Herrera-Escamilla AJ, et al. Cost-effectiveness and benefit of alternatives to improve training for prehospital trauma care in Mexico. *Prehosp Disaster Med*. 2004;19(4):318-25.

7. Crouse HL, Vaides H, Torres F, et al. Quality and effectiveness of a pediatric triage training program in a Guatemalan public hospital. *Pediatr Emerg Care*. 2016;32(8):525-8.

8. Mirkuzie AH, Sisay MM, Bedane MM. Standard basic emergency obstetric and neonatal care training in Addis Ababa; trainees reaction and knowledge acquisition. *BMC Med Educ*. 2014;14:201.

9. Kiragu AW, Dunlop SJ, Wachira BW, et al. Pediatric trauma care in low- and middle-income countries: a brief review of the current state and recommendations for management and a way forward. *J Pediatr*

Intensive Care. 2017;6(1):52-9.

10. Chang MP, Walters CB, Tsai C, et al. Sampson J. Evaluation of a neonatal resuscitation curriculum in Liberia. *Children (Basel)*. 2019;6(4):E56

11. Fant CD, Schwartz KR, Patel H, et al. Developing and implementing a pediatric emergency care curriculum for providers at district level hospitals in Sub-Saharan Africa: a case study in Kenya. *Front Public Health*. 2017;5:322.

12. Wesson HK, Plant V, Helou M, et al. Piloting a pediatric trauma course in western Jamaica: lessons learned and future directions. *J Pediatr Surg*. 2017;52(7):1173-6.

13. Chomba E, Carlo WA, Goudar SS, et al. Effects of essential newborn care training on fresh stillbirths and early neonatal deaths by maternal education. *Neonatology*. 2017;111(1):61-7.

14. Carlo WA, Goudar SS, Jehan I, et al. Newborn-care training and perinatal mortality in developing countries. *N Engl J Med*. 2010;362(7):614-23.

15. Thomas PA, Kern DE, Hughes MT. (2016). *Curriculum Development for Medical Education*. 3rd edition. Baltimore, Maryland: Johns Hopkins Univ. Press.

16. Vo H, George U, Straube S, Tenner A, Sawe H, Chen C. A needs assessment of pediatric emergency and critical care in Tanzanian providers: a model for curriculum development. *Pediatric Academic Society Global Pediatric Research*. 2018.

17. Carman A, Daftary R, George U, Sawe H, Chen C. Development of the objectives for a pediatric emergency medicine curriculum for the African Federation of Emergency Medicine. *Western Regional Society for Academic Emergency Medicine*. 2019.

18. Tchorz KM, Thomas N, Jesudassan S, et al. Teaching trauma care in India: an educational pilot study from Bangalore. *J Surg Res*. 2007;142(2):373-7.

19. Kirkpatrick DL, Kirkpatrick JD. (1998). *Evaluating Training Programs: The Four Levels.* 3rd edition. San Francisco, California: Berret-Koehler.

20. Spaite DW, Karriker KJ, Seng M, et al. Increasing paramedics' comfort and knowledge about children with special health care needs. *Am J Emerg Med*. 2000;18(7):747-52.

21. Dobson JV, Brancati DS, Nagel R. Pediatric resuscitation: evaluation of a clinical curriculum. *Med Educ Online*. 2003;8(1):4337.

22. Shilkofski N, Crichlow A, Rice J, et al. A standardized needs assessment tool to inform the curriculum development process for pediatric resuscitation simulation-based education in resource-limited settings. *Front Pediatr*. 2018;6:37.

23. Artino J, Anthony R, La Rochelle JS, et al. Developing questionnaires for educational research: AMEE guide no. 87. *Med Teach*. 2014;36(6):463-74.

24. Sullivan GM. A primer on the validity of assessment instruments. *J Grad Med Educ*. 2011;3(2):119-20.

25. Fellowship training program. PECC-Kenya pediatric emergency and critical care web site. Available at: http://www.pecc-kenya.org/. Accessed October 31, 2019.

When the Learner Is the Expert: A Simulation-Based Curriculum for Emergency Medicine Faculty

Emily S. Binstadt, MD, MPH*
Rachel A. Dahms, MD*
Amanda J. Carlson, MD†
Cullen B. Hegarty, MD*
Jessie G. Nelson, MD*

*University of Minnesota, Regions Hospital Emergency Department, St. Paul, Minnesota
†St. Mary's Medical Center Essentia Health, Department of Emergency Medicine, Duluth, Minnesota

Emergency physicians supervise residents performing rare clinical procedures, but they infrequently perform those procedures independently. Simulation offers a forum to practice procedural skills, but simulation labs often target resident learners, and barriers exist to faculty as learners in simulation-based training. Simulation-based curricula focused on improving emergency medicine (EM) faculty's rare procedure skills were not discovered on review of published literature. Our objective was to create a sustainable, simulation-based faculty education curriculum for rare procedural skills in EM. Between 2012 and 2019, most EM teaching faculty at a single, urban, Level 1 trauma center completed an annual two-hour simulation-based rare procedure lab with small-group learning and guided hands-on instruction, covering 30 different procedural education sessions for faculty learners. A questionnaire administered before and after each session assessed EM faculty physicians' self-perceived ability to perform these rare procedures. Participants' self-reported confidence in their performance improved for all procedures, regardless of prior procedural experience. Faculty participation was initially mandatory, but is now voluntary. Diverse strategies were used to address barriers in this learner group including eliciting learner feedback, offering continuing medical education credits, gradual roll-out of checklist assessments, and welcoming expertise of faculty leaders from EM and other specialties and professions. Participants perceived training to be most helpful for the most rarely-encountered clinical procedures. Similar curricula could be implemented with minimal risk at other institutions. [West J Emerg Med. 2020;21(1):141-144.]

BACKGROUND

Academic emergency physicians are expected to perform rarely-occurring emergency clinical procedures proficiently and to teach these procedures to residents. Faculty in emergency medicine (EM) training programs may perform procedures less frequently than other emergency physicians, as they prioritize learner hands-on procedural exposure over their own opportunity to practice. Infrequent and unpredictable procedures are difficult to study.

Simulation allows learners to train for high-risk, low-frequency clinical events on a predictable timetable.[1] Although many EM residency programs use simulation-based learning for procedural training,[2] simulation has been infrequently used for faculty learners. This may be due to lack of protected time in faculty schedules, a potentially judgmental environment surrounding procedural competence, lack of faculty comfort with simulation-based learning, and fear of exposing incompetence to peers.[3] Faculty often obtain continuing medical education (CME) training from passive learning or large-group settings, which changes performance less than hands-on learning.[4-6]

OBJECTIVES

This work describes the development of a novel curriculum for EM faculty in a small group, hands-on, non-threatening, simulation-based learning environment to improve self-rated confidence with rare EM procedures. This course was refined over eight years, such that a novel procedural curriculum for academic EM faculty has emerged.

CURRICULAR DESIGN
Probblem Identification and General Needs Assessment
Some EM procedures are time-dependent and potentially life-saving. Increased practice and improved confidence performing these procedures may increase the likelihood that faculty will attempt and perform these procedures well. Research using faculty physicians as the study subjects in any procedural skills labs is quite limited.[7-14] This curriculum is novel in that it focused on EM faculty as learners, and it focused on rare procedures.

Targeted Needs Assessment
Faculty discussions in staff meetings and multiple ad hoc discussions revealed a list of EM procedures faculty members would be interested in practicing. Initial procedures in 2012 were lateral canthotomy, ultrasound-guided, internal jugular central venous access, resuscitative thoracotomy, and rescue airway techniques.

Goals and Measureable Objectives
Recognizing the difficulty in assessing clinical outcomes for procedures performed infrequently, this project's main objective was to improve the self-rated confidence levels of EM faculty members for performing rare procedures.

Educational Strategies
Simulation centers are disproportionately used by trainees, likely due in part to challenges with faculty engagement, simulation center funding,[15] generational gap in comfort and experience with simulation technology, anxiety about performing procedures in front of colleagues, and reluctance to donate time to participate in additional training or assessment sessions.[16] This project circumvented some of these barriers by purposefully avoiding high-stakes assessment and focusing exclusively on a low-stakes, non-threatening, training environment. More objective assessments, such as checklists, were added after several years, once faculty buy-in and psychological safety regarding the activity had been established.

Implementation
The intervention was a two-hour, simulation-based training session, repeated two to three times per year to allow all faculty to attend one session. The department head initially mandated attendance but not survey data collection. Each session included four procedural stations through which groups of two to four learners rotated. Each station focused on a different procedure. Initial procedures were chosen by consensus among the authors and simulation staff, favoring high-yield procedures with availability of reasonable simulation models and instructors. Learners had no advance notice of the procedures to preclude preparation for a specific procedure. Learners obtained CME credit for participating. Instructors were faculty volunteers. Each session was heavily focused on hands-on practice for participants, with brief discussion of procedural steps,

Population Health Research Capsule

What do we already know about this issue?
Emergency medicine (EM) faculty may benefit from hands-on simulation-based procedural training, but lack regular opportunities to perform and practice EM procedures.

What was the research question?
Does small-group, hands-on, simulation-based training improve EM faculty participants' procedural performance confidence?

What was the major finding of the study?
Participants improved self-assessed confidence in performing 30 different emergency procedures over 8 years.

How does this improve population health?
This procedural curriculum for EM faculty appears sustainable and effective in promoting procedural practice with guided feedback, and is low-risk and accessible.

indications and contraindications, and common pitfalls. Formative feedback and peer discussion were encouraged.

IMPACT/EFFECTIVENESS
Evaluation and Feedback
Self-rated confidence in procedural skill for selected procedures was rated on a visual analog scale (VAS; 100 millimeters) pre- and post-session (Appendix A). Anonymous written survey responses about impressions after the session were nearly universally positive. Response rate for surveys was 95%. Faculty's self-reported confidence to perform each procedure improved for all 30 procedures (Appendix B). Faculty with higher pre-simulation experience with a procedure still demonstrated significant improvement in confidence scores.

At faculty and department head request, this training has been repeated annually for eight years, with evolution in the procedures taught. This curriculum has covered 30 different emergency procedures. Topics are chosen annually based on faculty requests, recent quality improvement initiatives, changing equipment and technology. This has proved to be a valuable venue for faculty education in general, with continued attendance even when no longer mandated and anticipated expansion to include more community-based faculty learners. Particularly time-critical procedures such as resuscitative thoracotomy, lateral canthotomy, and perimortem cesarean are repeated every few years. Summary data for these procedures is presented in Table 1. Additional recurrent themes in the

Table 1. Emergency faculty physicians' change in self-rated confidence in performance of three rarely-occurring procedures after procedural training.

Procedure	Average pre-training confidence	Average post-training confidence	Difference in confidence	Median # prior experiences	Range of # of prior experiences
Resuscitative thoracotomy 2012	44mm	66mm	22mm	3	0-190
Resuscitative thoracotomy 2015	61mm	80mm	19mm	4	0-20
Resuscitative thoracotomy 2019	67mm	84mm	17mm	6	3-102
Cricothyroidotomy	72mm	87mm	15mm	6	0-58
Lateral canthotomy 2012	30mm	66mm	36mm	0	0-5
Lateral canthotomy 2017	65mm	83mm	18mm	3	0-14
Peri-mortem cesarean section 2013	31mm	72mm	41mm	0	0-5
Peri-mortem cesearean section 2017	34mm	74mm	40mm	4	0-14

Physicians scored their confidence levels pre- and post-training on a 100mm visual analog scale. Three of the four procedures presented here were repeated in successive years, as labeled. The median number of physician-estimated personal prior experiences listed includes animal lab, cadaver lab, simulation lab, and clinical patient experiences. Despite prior simulation experience with the procedure, confidence continued to improve after successive training sessions. Lateral canthotomy confidence appeared more sustained than did confidence for peri-mortem cesarean section. Despite higher confidence scores pre-training for cricothyroidotomy, post-training scores still increased. *mm,* millimeter.

curriculum are procedures related to airway technology and equipment, and methods for various types of intravenous access. Appendix B lists the 30 prior procedure training modules used in the curriculum. This program can be replicated at other institutions with EM faculty and commonly available simulation technology.

LIMITATIONS

As with similar projects, there are limitations and lessons learned from this project. This effort's impact is limited based on performance in a single center, with limited numbers of participants. Prioritizing feasibility and faculty acceptance, knowledge changes, timing of retention in confidence gains, and impact on clinical care were not studied here.

CONCLUSION

These procedure labs will continue to be offered annually given positive faculty responses and continued interest. Anonymous satisfaction surveys for the curriculum demonstrate mainly "excellent" ratings of how it enhanced knowledge and ability to apply new strategies to clinical practice. Future studies are needed to determine whether participants with higher scores would actually perform better clinically, but exposing faculty to rare procedural practice in a standardized, non-threatening manner appears to be successful in increasing their perceptions of self-efficacy regarding their clinical competence. The resounding appreciation of this training among participants at all levels of previous procedural experience indicates that there

is a desire for hands-on training with rare procedures among practicing emergency physicians. The risks of implementing this type of curriculum are low, and it may be preferred over traditional lecture formats. This curriculum offers an opportunity for faculty to participate in high-yield, low-stakes, sustainable, simulation-based learning to help attain and maintain expertise with rare clinical procedures.

Address for Correspondence: Emily Binstadt MD, MPH, Regions Hospital Emergency Department, 640 Jackson Street, St. Paul, MN 55101. Email: Emily.S.Binstadt@healthpartners.com.

REFERENCES

1. Wang EE, Quinones J, Fitch MT, et al. Developing technical expertise in emergency medicine--the role of simulation in procedural skill acquisition. *Acad Emerg Med.* 2008;15(11):1046-57.

2. Chakravarthy B, Ter Haar E, Bhat SS et al. Simulation in medical school education: review for emergency medicine. *West J Emerg Med.* 2011;12(4):461-6.

3. Friedman SM, Sowerby RJ, Guo R, et al. Perceptions of emergency medicine residents and fellows regarding competence, adverse events and reporting to supervisors: a national survey. *CJEM.* 2010;12(6):491-9.

4. Davis DA, Rayburn WF, Smith GA. Continuing professional development for faculty: an elephant in the ouse of academic medicine or the key to future success? *Acad Med* 2017;92:1078-81.

5. Curry S. The adult learner. *Int Anesthesiol Clin* 2008;46(4):17-26.

6. Cervero RM and Gaines JK. The impact of CME on physician performance and patient health outcomes: an updated synthesis of systematic reviews. *J Contin Educ Health Prof.* 2015; 35(2)131-8.

7. Nestel D, Groom J, Eikeland-Husebo S, et al. Simulation for learning and teaching procedural skills: the state of the science. *Simul Healthc.* 2011;6 Suppl:S10-13.

8. Blum RH, Raemer DB, Carroll JS, et al. Crisis resource management training for an anaesthesia faculty: a new approach to continuing education. *Med Educ.* 2004;38(1):45-55.

9. Weitz G, Twesten C, Hoppmann J, et al. Differences between students and physicians in their entitlement towards procedural skills education--a needs assessment of skills training in internal medicine. *GMS J Med Educ.* 2012;29(1):Doc07.

10. Neary PC, Boyle E, Delaney CP, et al. Construct validation of a novel hybrid virtual-reality simulator for training and assessing laparoscopic colectomy; results from the first course for experienced senior laparoscopic surgeons. *Surg Endosc.* 2008;22(10):2301-9.

11. Murray DJ, Boulet JR, Avidan M, et al. Performance of residents and anesthesiologists in a simulation-based skill assessment. *Anesthesiology.* 2007;107(5):705-13.

12. Chapman DM, Rhee KJ, Marx JA, et al. Open thoracotomy procedural competency: validity study of teaching and assessment modalities. *Ann Emerg Med.* 1996;28(6):641-7.

13. Chapman DM, Marx JA, Honigman B, et al. Emergency thoracotomy: comparison of medical student, resident, and faculty performances on written, computer, and animal-model assessments. *Acad Emerg Med.* 1994;1(4):373-81.

14. Burden AR, Torjman MC, Dy GE, et al. Prevention of central venous catheter-related bloodstream infections: is it time to add simulation training to the prevention bundle? *J Clin Anesth.* 2012;24(7):555-60.

15. Okuda Y, Bryson EO, DeMaria S, Jr., et al. The utility of simulation in medical education: What is the evidence? *Mt Sinai J of Med* 2009;76:330-43.

16. Savoldelli GL, Naik VN, Hamstra SJ, Morgan PJ. Barriers to use of simulation-based education. *Can J Anesth* 2005;52:944-50.

Standardized Video Interview Scores Correlate Poorly with Faculty and Patient Ratings

Matthew M. Hall, MD°
Jason J. Lewis, MD°
Joshua W. Joseph, MD, MD, MBE
Andrew R. Ketterer, MD
Carlo L. Rosen, MD
Nicole M. Dubosh, MD

Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, Massachusetts
°Co-first authors

The Standardized Video Interview (SVI) was developed by the Association of American Medical Colleges to assess professionalism, communication, and interpersonal skills of residency applicants. How SVI scores compare with other measures of these competencies is unknown. The goal of this study was to determine whether there is a correlation between the SVI score and both faculty and patient ratings of these competencies in emergency medicine (EM) applicants. This was a retrospective analysis of a prospectively collected dataset of medical students. Students enrolled in the fourth-year EM clerkship at our institution and who applied to the EM residency Match were included. We collected faculty ratings of the students' professionalism and patient care/communication abilities as well as patient ratings using the Communication Assessment Tool (CAT) from the clerkship evaluation forms. Following completion of the clerkship, students applying to EM were asked to voluntarily provide their SVI score to the study authors for research purposes. We compared SVI scores with the students' faculty and patient scores using Spearman's rank correlation. Of the 43 students from the EM clerkship who applied in EM during the 2017-2018 and 2018-2019 application cycles, 36 provided their SVI scores. All 36 had faculty evaluations and 32 had CAT scores available. We found that SVI scores did not correlate with faculty ratings of professionalism (rho = 0.09, p = 0.13), faculty assessment of patient care/communication (rho = 0.12, p = 0.04), or CAT scores (rho = 0.11, p = 0.06). Further studies are needed to validate the SVI and determine whether it is indeed a predictor of these competencies in residency. [West J Emerg Med. 2020;21(1):145-148.]

BACKGROUND

In 2017, the Association of American Medical Colleges (AAMC) developed the Standardized Video Interview (SVI) score as an additional way to assess the professionalism, communication, and interpersonal skills of residency applicants.[1] The SVI is composed of six questions answered via a video-recorded, computerized interface and centered on two core competencies of the Accreditation Council for Graduate Medical Education (ACGME): knowledge of professional behavior and interpersonal and communication skills.[2] Responses are scored by third-party reviewers using a 1-5 point system with a composite score of 6-30 (Appendix A).[3] This score was provided in the 2017-2018 and 2018-2019

Electronic Residency Application Service (ERAS) application packets for emergency medicine (EM) residencies.

The AAMC and several leading EM organizations have sought to assess the validity the SVI. The AAMC found that SVI scores did not correlate with United States Medical Licensing Examination scores and speculated that they would add an additional element to the application.[4] The decision was made to proceed with a pilot administration during the 2017-2018 application period.[5] While the SVI may add additional information to the residency application, it is unclear how it correlates with other measures of professionalism and communication. Previous work has shown that the SVI does not correlate with faculty gestalt of

communication and professionalism.[6] We sought to investigate whether correlations exists between the SVI and two other measures of these competencies in EM applicants: faculty end-of-shift ratings of patient care/communication and professionalism, and patient ratings of communication skills.

OBJECTIVES

The goal of this study was to determine whether a correlation exists between the SVI and faculty and patient ratings of these competencies in EM applicants. This was a retrospective analysis of a prospectively collected dataset including fourth-year medical students who enrolled in the EM clerkship at our institution and applied to EM residencies in 2017-2018 and 2018-2019. We collected self-reported SVI scores, end-of-shift faculty evaluations on professionalism and patient care/communication, and scores on the Communication Assessment Tool (CAT), a questionnaire assessing communication skills from the patient perspective that has validity evidence.[7-9] We compared scores on all three tools using Spearman's rho. Statistical analyses were performed with Python 3.6 (Python Software Foundation, Fredericksburg, VA).[10-11] A p-value of <0.05 with a Bonferroni correction for multiple comparisons was considered statistically significant. This study was determined to be exempt by our institutional review board.

RESULTS

Forty-three students from our EM clerkship applied to EM during the study period. The response rate of SVI scores was 86.7% (36/43). Fifty-eight faculty members completed evaluations. Faculty ratings were available for 36 students, and CAT scores were available for 32 students. Median scores are shown in Table 1. None of the three tools had a normal distribution (p<0.01). SVI scores did not correlate with CAT scores (rho = 0.11, p = 0.06), nor with faculty evaluation

Population Health Research Capsule

What do we already know about this issue?
The SVI does not correlate with faculty gestalt of communication and professionalism.

What was the research question?
Is there a correlation between the SVI and faculty and patient ratings of professionalism and communication skills?

What was the major finding of the study?
We found no correlation between the SVI and ratings of professionalism and communication skills.

How does this improve population health?
This project suggests further research into the SVI is warranted before full implementation of this assessment tool.

of professionalism (rho = 0.09, p=0.13) or patient care/communication (rho = 0.12, p = 0.04). Faculty professionalism and patient care/communication scores were highly correlated (rho = 0.86, p<0.05).

IMPACT

We found no significant correlation between students' SVI scores and faculty ratings of professionalism and patient care/communication skills or CAT scores. To the best of our

Table 1. Demographic characteristics and evaluation scores of emergency medicine (EM)-bound medical students rotating in an EM clerkship. Medians presented with interquartile range and minimum; means with standard deviation. None of the three scoring methods (faculty evaluation, CAT score, SVI score) had normal distributions (all p values <0.01).

Characteristics of Medical Students (n = 36)	Number
Male	20
Female	16
Medical schools represented	28
Evaluation Scores of Medical Students	Median, IQR (min)
Median number of faculty evaluations per student	9, 8-10 (6)
Median number of evaluations completed per attending	5, 2-8 (1)
Median faculty rating: professionalism	4, 4-5 (2)
Median faculty rating: patient care/communication	4, 4-5 (2)
Median CAT score	69, 66-70 (44)
Median SVI score	20,18-24 (14)

IQR, interquartile range; *CAT*, Communication Assessment Tool; *SVI*, Standardized Video Interview.

knowledge, this is the first study comparing SVI scores with existing measures of communication and professionalism in the clinical setting.

Assessing communication and professionalism skills is essential in medical training, and the ACGME has identified both as core competencies.[12] A recent review demonstrates that EM program directors value strong interpersonal and humanistic qualities in applicants.[13] While it is important to understand applicants' professionalism and communication abilities, there is currently no "gold standard" assessment method. The ACGME suggests multi-source feedback and multiple evaluators for assessing trainees' competencies.[14] While validated tools are still needed, the use of multi-source assessment including patient feedback in the clinical setting has been shown to be successful.[15,16] The SVI scenarios are neither real-time clinical scenarios nor interactions with patients, and it is unclear whether an artificial testing environment is the ideal method of evaluating these competencies. The lack of correlation between the SVI and real-time evaluation of patient interactions raises questions about the SVI's validity. While the SVI is no longer being considered for use in EM, understanding the concerns surrounding its validity is essential if it is to be reconsidered in the future or used in other specialties.

LIMITATIONS

Our study has several limitations. The SVI scores are self-reported; thus, it is possible students did not provide the correct score. We used this methodology given proprietary restrictions regarding the use of ERAS data. Second, as a single-center study with a small sample size, generalizability is limited. Larger studies are needed to confirm these findings. While students worked 14 clinical shifts during their clerkship, the median number of faculty evaluations completed for each student was nine. This faculty response rate may have introduced bias to these scores. While faculty at our institution are offered individualized training by the clerkship directors on completing evaluations, it is possible that not all faculty participated in a training session and inter-rater reliability may be limited.

Additionally, the faculty evaluation tool groups patient care and communication together (Appendix B), and it is possible some faculty may have weighed this domain more heavily on the patient care aspect and not communication. Four of the students' CAT scores were lost and not included in the analysis; however, there were no demographic differences between these students and the analyzed population, and thus we do not expect this to have skewed the results. Neither the CAT nor our faculty evaluation system has been validated in terms of predicting success in residency; therefore. we cannot draw conclusions about the SVI's utility at assessing residency success based on our data. However, there is evidence evaluating the validity of similar tools based on direct observation in the clinical setting.[17] Finally, the three

scoring systems are all based on different scoring scales and comparison across scoring methods is limited.

CONCLUSION

While this was a small pilot study, we found no significant correlation between SVI scores and neither faculty nor patient ratings of communication competencies. This raises concern about the validity of the SVI. Further, larger scale studies are needed to determine the best methods for assessing trainees' communication skills and professionalism.

Address for Correspondence: Matthew M. Hall, MD, Beth Israel Deaconess Medical Center, Department of Emergency Medicine, One Deaconess Road, Rosenberg 2, Boston, MA 02189. Email: mmhall@bidmc.harvard.edu.

REFERENCES

1. Society for Academic Emergency Medicine. EMSVI announcement to the EM community. 2017. Available at: http://www.saem.org/home/misc/emergency-medicine-standardized-video-interview). Accessed January 5, 2018.
2. New England Journal of Medicine Knowledge+ Team. Exploring the ACGME core competencies. 2018. Available at: https://knowledgeplus.nejm.org/blog/exploring-acgme-core-competencies/). Accessed February 28, 2018.
3. Association of American Medical Colleges. How the SVI is scored. Available at: https://students-residents.aamc.org/applying-residency/article/how-svi-scored/). Accessed February 26, 2018.
4. Association of American Medical Colleges. AAMC standardized video interview update. 2017. Available at: aamc-orange.global.ssl.fastly.net/production/media/filer_public/63/7f/637f699e-dd03-4ac3-ae29-bff95f0a1bfe/svi-gsa-2017.pdf). Accessed January 5, 2018.
5. Bird S, Blomkalns A, Deiorio NM, et al. Stepping up to the plate: emergency medicine takes a swing at enhancing the residency selection process. *AEM Educ Train*. 2017;2(1):61-65.
6. Schnapp BH, Ritter D, Kraut AS, et al. Assessing residency applicants' communication and professionalism: standardized video

interview scores compared to faculty gestalt. *West J Emerg Med*. 2019;20(1):132-7.

7. Makoul G, Krupat E, Chang CH. Measuring patient views of physician communication skills: development and testing of the communication assessment tool. *Patient Educ Couns.* 2007;67(3):333-42.

8. Stausmire JM, Cashen CP, Myerholtz L, et al. Measuring general surgery residents' communication skills from the patient's perspective using the communication assessment tool (CAT). *J Surg Educ.* 2015;72(1):108-16.

9. Myerholtz L, Simons L, Felix S, et al. Using the communication assessment tool in family medicine residency programs. *Fam Med*. 2010;42(8):567-73.

10. Oliphant TE. Python for scientific computing. *Comput Sci Eng.* 2007;9(3):10-20.

11. McKinney W. Data structures for statistical computing in Python. In: Proceedings of the 9th Python in Science Conference. 2010;51-6.

12. Accreditation Council for Graduate Medical Education. ACGME program requirements for graduate medical education in Emergency Medicine. July 1, 2017. Available at: https://www.acgme.org/Portals/0/PFAssets/ProgramRequirements/110_emergency_medicine_2017-07-01.pdf. Accessed February 27, 2018.

13. Katzung KG, Ankel F, Clark M, et al. What do program directors look for in an applicant? *J Emerg Med.* 2019;56(5):e95-101.

14. Accreditation Council for Graduate Medical Education. Advancing educations in interpersonal and communication skills: and educational resource from the ACGME Outcome Project. Available at: http://www.acgme.org/outcome/assess/toolbox.asp. Accessed June 14, 2018.

15. Brinkman WB, Geraghty SR, Lanphear BP, et al. Effect of multi-source feedback on resident communication skills and professionalism: a randomized controlled trial. *Arch Pediatr Adolesc Med.* 2007;161(1):44-9.

16. Lockyer J, Vioato C, Fidler H. Likelihood of change: a study assessing surgeon use of multisource feedback data. *Teach Learn Med.* 2003;15(3):168-74.

17. Chan TM, Wallner C, Swoboda TK, et al. Assessing interpersonal and communication skills in emergency medicine. *Acad Emerg Med*. 2012;19(12):1390–402.

A Structured Curriculum for Interprofessional Training of Emergency Medicine Interns

Ashley C. Rider, MD*
Tiffany C. Anaebere, MD*†
Mariko Nomura, MD*
David Duong, MD, MS*
Charlotte P. Wills, MD*

*Highland Hospital, Alameda Health System, Department of Emergency Medicine, Oakland, California
†Dignity Health, St. Joseph's Medical Center, Department of Emergency Medicine, Stockton, California

Interprofessional education (IPE) has been shown to improve health outcomes and patient satisfaction. IPE is now represented in the Accreditation Council for Graduate Medical Education's emergency medicine (EM) milestones given the team-based nature of EM. The Highland Allied Health Rotation Program (H-AHRP) was developed by residents to enhance and standardize IPE for EM residents in a single hospital setting. H-AHRP was incorporated into the orientation month for interns starting in the summer of 2016. EM interns were paired with emergency department preceptors in registered nursing (RN), respiratory therapy (RT), pharmacy (PH), laboratory (LAB), and social work (SW) in either a four-hour shadowing experience (RN, RT, PH) or lecture-based overview (LAB, SW). We conducted a survey before and after the program. Overall, the EM interns reported an improved understanding of the scope of practice and day-to-day logistics after working with the preceptors. They found the program helpful to their future as physicians and would recommend it to other residencies. The H-AHRP program allows for the early incorporation of IPE into EM training, enhances interns' understanding of both the scope and logistics of their colleagues, and is a well-received effort at improving team-based care. [West J Emerg Med. 2020;21(2):149-151.]

BACKGROUND

Almost 20 years ago, the Institute of Medicine (now the National Academy of Medicine) issued a report drawing attention to the high rate of preventable healthcare errors, many of which may have been influenced by ineffective teamwork.[1] The increased awareness prompted numerous studies demonstrating how interprofessional teams can positively impact patient satisfaction, acceptance of care, and improve health outcomes.[2]

Interprofessional education (IPE) is now represented in the competencies for emergency medicine (EM) training.[3] The Accreditation Council for Graduate Medical Education and the American Board of Emergency Medicine developed the EM milestones, which include skills such as effective communication and teamwork, yet formal interprofessional education is often lacking. The Highland Allied Health Rotation Program (H-AHRP) was developed to provide deliberate exposure to the role of nursing, pharmacy, respiratory therapy, social work, and laboratory services during the first month of residency.

OBJECTIVES

The program's objectives for first-year residents were threefold: 1) better understand the roles of their fellow health professionals (scope); 2) learn to perform a number of procedures and actions common to these roles (logistics); and 3) develop skills of interprofessional communication and teamwork while getting to know these team members. The desired outcome was a resident physician who understands the contributions of other healthcare professionals, integrates skill sets effectively, and champions an interdisciplinary approach to patient care.

CURRICULAR DESIGN

At Highland Hospital the first month of intern year serves as an orientation to the emergency department (ED) during which interns participate in ED shifts, lectures, and workshops. The H-AHRP program was initially created in 2016 to purposefully introduce IPE into the curriculum. After

significant modifications and a pilot year, the program was studied in 2018.

At the beginning of orientation month, an introductory presentation and syllabus were provided to outline the expectations and objectives for the program. EM interns were assigned sessions with registered nursing (RN), respiratory therapy (RT), pharmacy (PH), laboratory (LAB), and social work (SW). The RN, RT, and PH shifts were one-on-one sessions lasting four hours, during which the intern participated in the activities of his or her preceptor with the guidance of syllabus objectives. These sessions allowed the interns to experience the real-time responsibilities of each allied health professional. In addition, SW and LAB learning objectives were introduced through a group-based tour and discussion, with the respective experts, the ED medical social worker and the director of the clinical laboratory, guiding the session.

To evaluate the interns' understanding, we administered pre- and post-program surveys using a five-point modified Likert scale with responses from -2 (strongly disagree) to +2 (strongly agree). The numerical responses were averaged for each question and these values were aggregated based on the professional it referenced and question type. The five sections that followed asked questions about the role of each professional represented in the program. We subdivided these questions into "scope"-type questions or "logistic"-type questions. "Scope" referred to questions related to the intern's

understanding of the general role or scope of practice of that profession, whereas "logistic" referred to specific procedures or actions of that profession. In the post-program survey, there were 10 additional questions aimed at collecting general program feedback and perceived utility of the session.

IMPACT/EFFECTIVENESS

H-AHRP was designed and implemented to fill a need for improved IPE early on in EM training. After participating in this program, interns showed an overall trend toward increased understanding of the scope of practice and logistics for each professional group. During the initial orientation lecture, all 12 interns (100%) completed the pre-program survey, and 11 of 12 (92%) completed the similar post-program survey at the end of the month. All responses to the seven general interprofessional questions demonstrated a better appreciation of IPE after the intervention, from agree (+1.0) to closer to strongly agree (+1.7).

Overall, interns reported an improved understanding of both scope and logistics of each profession after the program (Figure). For example, on the pre-program survey interns reported the least understanding of the scope of practice of respiratory therapists compared to other professions and largely disagreed with statements of understanding. After the session with the RTs, interns went from disagree (-0.6) to closer to strongly agree (+1.6) with statements of understanding of scope
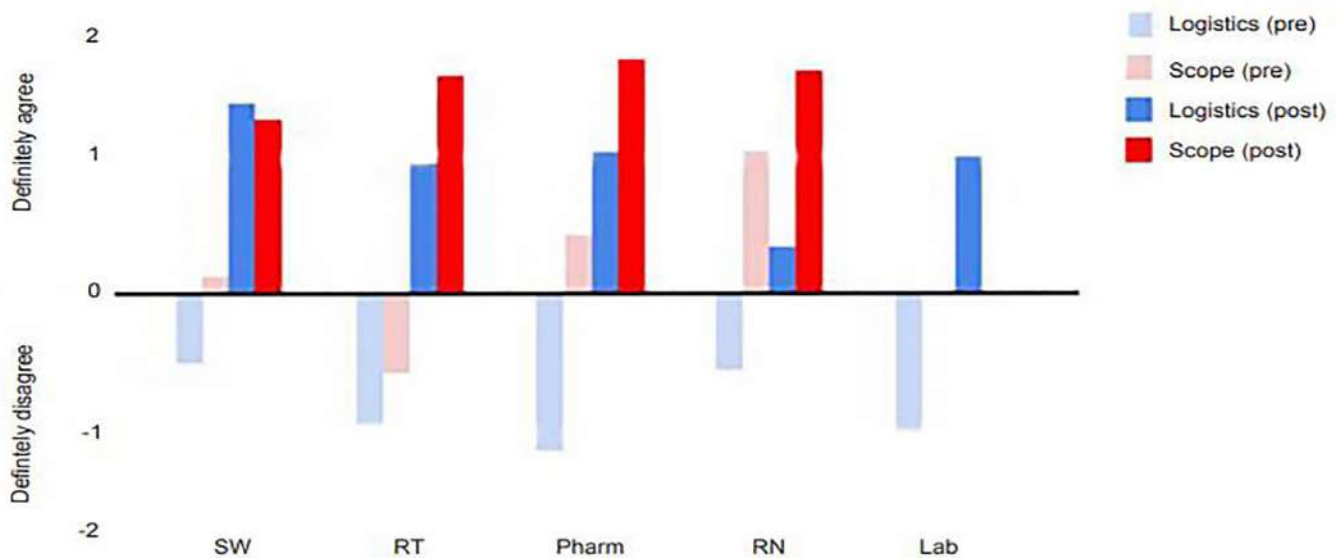
Figure. Survey results by specialty from the pre-and post-program survey taken by interns after they participated in an allied health professions program designed to enhance their understanding of the work done by non-physician team members in the emergency department.
SW, social work; *RT,* respiratory therapy; *Pharm,* pharmacy; *RN,* registered nursing; *Lab,* laboratory

and a similar two-point jump from disagree (-1.0) to agree (+1.0) for logistics of RTs. We saw positive trends across all specialties, particularly for questions related to logistics. In the post-program survey, a 10-question section was included for general feedback. Overall, participants agreed on the program's helpfulness to their future and would recommend a similar program to other EM residencies.

Although limited in time and scope, as well as by its small studied sample size, this IPE initiative serves as a framework for EM residencies to introduce the basic roles and skills of non-physician team members in the ED. We recognize the limitations of survey data and self-report; therefore, future studies should aim to objectively evaluate the impact of IPE on physician behavior and patient care over time.

Excellent teamwork is predicated on an understanding of the skills and knowledge of teammates. As Wilbur describes in a 2014 call to action, EM is the best-qualified specialty to lead an emphasis on IPE.[4] The H-AHRP is an example of a structured curriculum with clear objectives for EM interns to learn the basic scope and logistical roles of emergency nurses, respiratory therapists, pharmacists, laboratory scientists, and social workers to provide a foundation for IPE. By formally integrating H-AHRP into intern year, we hope to promote ED collaboration for effective, team-based patient care in residency and beyond.

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Address for Correspondence: Ashley C. Rider, MD, Highland Hospital, Department of Emergency Medicine, 1411 E. 31st Street, Oakland, CA 94602. Email: ashley.christine.rider@gmail.com.

REFERENCES
1. Kohn TL, Corrigan MJ, Donaldson SM. (2000). *To Err Is Human: Building a Safer Health System*. Institute of Medicine Reports. Washington, DC: National Academy Press.
2. Mickan SM. Evaluating the effectiveness of health care teams. *Aust Health Rev.* 2005;29(2):211-7.
3. Beeson MS, Carter WA, Christopher TA, et al. The development of the emergency medicine milestones. *Acad Emerg Med.* 2013;20(7):724-9.
4. Wilbur L. Interprofessional education and collaboration: a call to action for emergency medicine. *Acad Emerg Med.* 2014;21(7):833-4.

Professionalism Milestones Assessments Used by Emergency Medicine Residency Programs: A Cross-sectional Survey

Christine R. Stehman, MD*
Steven Hochman, MD†‡
Madonna Fernández-Frackelton, MD§
Emilio G. Volz, MD¶
Rui Domingues, MD‖
Jeffrey N. Love, MD, MHPE#
William Soares, MD, MS**

*Indiana University School of Medicine, Department of Emergency Medicine, Indianapolis, Indiana
†St. Joseph's University Medical Center, Department of Emergency Medicine, Paterson, New Jersey
‡New York Medical College, Department of Emergency Medicine, Valhalla, New York
§David Geffen School of Medicine at UCLA, Harbor-UCLA Medical Center, Department of Emergency Medicine, Los Angeles, California
¶Kendall Regional Medical Center, Department of Emergency Medicine, Broward County, Florida
‖Lincoln Medical and Mental Health Center, Department of Emergency Medicine, Bronx, New York
#George Washington University School of Medicine, Department of Emergency Medicine, Washington, District of Columbia
**University of Massachusetts Medical Center-Baystate Health, Springfield, Massachusetts

Introduction: Professionalism is a vital component of quality patient care. While competency in professionalism is Accreditation Council for Graduate Medical Education (ACGME)-mandated, the methods used to evaluate professionalism are not standardized, calling into question the validity of reported measurements. We aimed to determine the type and frequency of methods used by United States (US) -based emergency medicine (EM) residencies to assess accountability (Acc) and professional values (PV), as well as how often graduating residents achieve competency in these areas.

Methods: We created a cross-sectional survey exploring assessment and perceived competency in Acc and PV, and then modified the survey for content and clarity through feedback from emergency physicians not involved in the study. The final survey was sent to the clinical competency committee (CCC) chair or program director (PD) of the 185 US-based ACGME-accredited EM residencies. We summarized results using descriptive statistics and Fisher's exact testing.

Results: A total of 121 programs (65.4%) completed the survey. The most frequently used methods of assessment were faculty shift evaluation (89.7%), CCC opinion (86.8%), and faculty summative evaluation (76.4%). Overall, 37% and 42% of residency programs stated that nearly all (greater than 95%) of their graduating residents achieve mastery of Acc and PV non-technical skills, respectively. Only 11.2% of respondents felt their programs were very effective at determining mastery of non-technical skills.

Conclusion: EM residency programs relied heavily on faculty shift evaluations and summative opinions to determine resident competency in professionalism, with feedback from peers, administrators, and other staff less frequently incorporated. Few residency programs felt their current methods of evaluating professionalism were very effective. [West J Emerg Med. 2020;21(1):152-159.]

INTRODUCTION

Non-technical skills (NTS) such as communication, teamwork, leadership, and professionalism are vital to providing high-quality patient care.[1-2] NTS deficiencies have been associated with conflict, lawsuits, and loss of medical license, leading to a call for integration of formal NTS assessment into residency training.[3-5] In response, the Accreditation Council for Graduate Medical Education (ACGME) developed core competencies for residents to master during training, of which one-third are NTS including professionalism.[6] The ACGME further expanded the core competencies with the Next Accreditation System (NAS, or Milestone Project), in which each medical specialty created sub-competencies and milestones (levels within the sub-competencies that showed progressive skill development to guide assessment of trainees).[7-8] These NTS milestones were not meant to be assessment tools themselves; rather they were to "inform the use and development" of such tools.[7]

Of all the NTS competencies, professionalism might be both the most important as well as the most difficult to assess.[9-11] The Council of Emergency Medicine Residency Directors (CORD) found that "assessment and outcome measurement of professionalism are fraught with subjectivity and bias."[12] Finding standardized milestone-assessment tools that are emergency medicine (EM) specific and easy to use is difficult, causing residency programs to struggle to integrate competencies into their curricula.[7,13] Given this challenge, various CORD workgroups have proposed a number of ways that model behaviors of professionalism could be assessed, including incorporating non-EM tools; however, no standardized recommendation has been established.[12,14-15]

Given there are no standardized assessment recommendations evaluating professionalism in residency, we sought to determine the prevalence, variability, and self-perceived effectiveness of the methods that United States (US)-based, ACGME-accredited EM residencies currently use to assess the NTS competency of professionalism, divided in EM into the sub-competencies of accountability (Acc) and professional values (PV) (Supplement).[16]

METHODS

Design

This was a cross-sectional survey examining the prevalence of assessment methods used by US-based, ACGME-accredited EM residency programs when evaluating the NTS milestones for Acc and PV from July 31 – September 15, 2017.

Participants

All US-based EM residency programs that were ACGME-accredited and had graduated at least one residency class by July 1, 2017, were included in the study. We compiled the final participant list, which included 185 programs, by searching the American Medical Association FREIDA

Educational Research Capsule Summary

What do we already know about this issue?
There are no established recommended methods for assessing the difficult to define concept of Professionalism, despite its centrality to high quality medical care.

What was the research question?
What is the spectrum and self-perceived effectiveness of assessing Professionalism in emergency medicine (EM) residencies?

What was the major finding of the study?
EM residencies mainly rely on faculty opinion to assess professionalism. Few feel they are very effective in this assessment.

How does this improve population health?
Standardizing professionalism assessment methods may help decrease variability and perceived effectiveness of resident assessments allowing improved physician performance.

database; the residency databases of the American College of Emergency Physicians, the Society for Academic Emergency Medicine, and the American Osteopathic Association; and the websites of the individual residency programs.[17-20] Members of the research group used a combination of contact lists and resources to obtain contact information for each program's clinical competency committee (CCC) chair or program director (PD). While the goal was to directly send the survey to the CCC chair, in cases where we were unable to identify the CCC chair directly, we sent an email to the PD asking them to either forward the survey request to their CCC chair (preferable) or respond to the survey themselves. The CCC chair and PD were selected to participate in the survey as they are most likely to have comprehensive knowledge of their residencies' PV and Acc assessments, as well as a global view of performance and self-perceived effectiveness of their individual NTS measurements.

Survey Development and Administration

Drawing from previous work by Sullivan et al., and guided by existing core competency literature, the research group, comprised of six emergency physicians (EP) involved in resident education, used an iterative design and revision process over five working sessions to create a cross-sectional survey (Appendix).[9] This survey explored assessment practice and

resident competency in Acc and PV. The survey was piloted twice and modified for content and clarity based on feedback from approximately 15 EPs not involved in the study. The final survey included a combination of multiple-choice and free-text response questions as well as five demographics questions (Supplementary Material). The final survey was sent via email weblink (https://www.surveymonkey.com) to the CCC chair or PD of each program.[21] Up to two reminders to complete the survey were sent out at two-week intervals. The survey remained open for six weeks before it was closed for analysis.

Analysis

We summarized results using descriptive statistics. Methods of NTS resident evaluation were stratified by self-perceived effectiveness. Differences in methods by effectiveness were evaluated with Fisher's exact testing. We performed all statistical testing using R statistical software (The R Foundation, Vienna, Austria).[22] This study was approved by the institutional review boards of the research group members' home institutions.

RESULTS
Demographics

Of 185 EM residency programs meeting criteria, 121 (65.4%) completed the survey. Respondents included both three- and four-year programs. The table details the demographics of the respondents compared to the all- EM residency programs surveyed. Because of the anonymity of the survey, it is impossible to say which member of program leadership (CCC chair or PD) provided the responses.

Tools Used to AssessProfessional Value and Accountability

The top three assessment tools that respondents indicated are the most important in determining final NTS milestones assessments include CCC opinion (PV 75.2%; Acc 74.4%); faculty shift evaluations (PV 66.1%; Acc 60.3%); and faculty summative evaluations (PV 58.7%; Acc 54.5%). Residency programs used self-evaluations, lack of complaints, simulation, and OSCE less frequently as measurements that contribute to final milestone assessments (Figure 2).

Self-perceived Effectiveness of Assessments

With regard to self-perceived effectiveness of measurement of NTS milestones, only 11.2% of respondents felt their program was very effective at determining mastery of these sub-competencies, with 48% (54) considering their methods effective, and 40% (49) indicating their evaluation methods are only somewhat effective. For measurement of PV, self-perceived very effective programs more often used feedback from the program coordinator or office staff (85% vs 51%, p = 0.04) as well as non-physician feedback (100% vs 72%, p = 0.04). For measurement of Acc, self-perceived very effective programs also more often used feedback from the program coordinator or office staff (100% vs 62%, p<0.01)

as well as simulation (54% vs 24%, p = 0.04). No other significant differences emerged in methods used to assess professionalism in programs that perceived their assessment to be very effective compared to others.

DISCUSSION

Well-developed NTS, in particular professionalism, are essential to a physician's ability to deliver effective, compassionate patient care.[2] Thus, NTS comprise one-third of the ACGME competencies that residents must master in order to graduate. Based on ACGME guidance, each medical specialty divides the core competencies into their own sub-competencies and milestones. Like the creation of specialty-specific milestones, the ACGME offers only guidelines on skill assessment, leaving the methods and tools to the discretion of each residency program.[7]

This study represents the first attempt since the implementation of the core competencies and milestones to quantify the variability and breadth of methods and tools used by US-based EM residencies to evaluate professionalism.

While EM residencies overall appear to incorporate a variety of tools to assess residents in professionalism, faculty opinion, through both on-shift and summative evaluations, contributes most frequently to a resident's assessment and final milestone placement. These findings are in contrast to how EM PDs have previously assessed residents with potential professionalism issues, which has historically included both emergency department and off-service evaluations, advisor/residency leadership evaluations, and 360-degree evaluations.[9] Our finding that overall professionalism milestone assessments more frequently favor faculty opinion raises concerns. First, professionalism evaluation benefits from direct observation of behaviors, which faculty do less often as residents advance in training.[23] Second, non-physician staff and patients may observe different aspects of professionalism than faculty physicians.[24-25] For example, a resident may behave differently in the presence of a supervisor than with a colleague or a patient.[26]

Additionally, our study found that many respondents do not consider their residency programs very effective at assessing professionalism milestones. This finding echoes the results of the 2010 PD survey, which showed that 50.7% of PDs felt their current methods of assessment of professionalism were inadequate.[9] Although we cannot use perceived self-effectiveness as evidence of objective effectiveness of methods, it is concerning that the faculty charged with evaluating residents for readiness to progress to independent practice do not feel they have "very effective" methods of evaluating professionalism.

Unfortunately, the observed variability, the reliance on faculty opinions, and the limits in self-perceived effectiveness in assessing EM residents' professional values are likely related to the lack of standardized definitions and evidence-based

Table. Demographics of the respondents' residency programs.

	Respondents (#)	%	Invited (#)	%
Residency program				
3 year	80	66.1%	132	71.4%
4 year	32	26.4%	51	27.6%
Other	2	1.7%	2	1.1%
No answer	7	5.8%		
Residency program established				
Less than 5 years	19	15.7%		
5-15 years	23	19.0%		
More than 15 years	76	62.8%		
No answer	7	5.8%		
Number of residents per year				
Less than 8	18	14.9%	31	16.8%
8-15	79	65.3%	126	68.1%
Greater than 15	15	12.4%	28	15.1%
No answer	9	7.4%		
Type of hospital				
Community	34	28.1%		
University	62	51.2%		
County	9	7.4%		
Other	16	13.2%		
Geographic location				
Northeast (CT, MA, ME, NH, NY, RI, VT)	27	22.3%	35	18.9%
Central East (IN, KY, MI, OH, TN)	20	16.5%	34	18.4%
Mid-Atlantic (DC, DE, MD, NC, NJ, PA, VA, WV)	20	16.5%	40	21.6%
North Central (AR, IA, IL, KS, MN, MO, ND, NE, OK, SD, WI)	14	11.6%	24	13.0%
Southeast (Puerto Rico, AL, FL, GA, LA, MS, SC)	11	9.1%	17	9.2%
Southwest (AZ, CO, NM, NV, TX, UT)	13	10.7%	18	9.7%
West (CA, ID, MT, OR, WA, WY)	11	9.1%	18	9.7%
No answer	5	4.1%		
Percent of graduates achieving Accountability level 4 milestones				
Greater than 95%	44	36.4%		
75% - 95%	59	48.8%		
50% - 75%	8	6.6%		
Less than 50%	7	5.8%		
Percent of graduates to achieve Professional Values level 4 milestones				
Greater than 95%	49	40.5%		
75% - 95%	59	48.8%		
50% - 75%	6	5.0%		
Less than 50%	4	3.3%		

measurement tools. Adams et al. argued that EM in particular needs to demonstrate commitment to professionalism given the unusual vulnerability of the typical EM patient and the fact that the EP "performs an essential service in a unique social context, possesses specialized skill, and requires the confidence of patients."[27] Lack of professionalism in both medical school
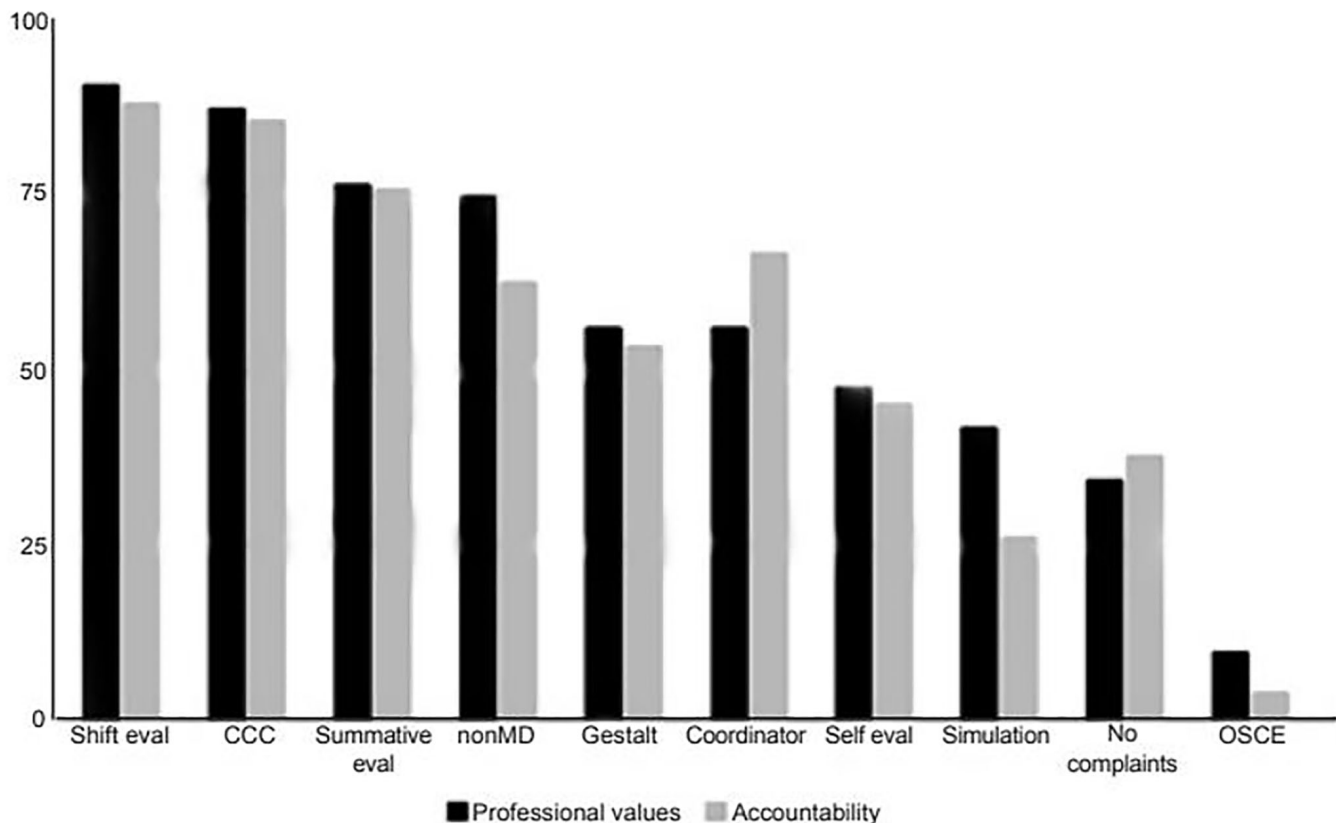
Figure 1. Methods used by residency programs to determine milestone assessment of professionalism sub-competencies, professional values and accountability.
eval, evaluation; *CCC,* clinical competency committee; *OSCE,* Objective Structured Clinical Examination.

and residency has been associated with professionalism issues later in a physician's career.[28-30] Unfortunately, definitions of professionalism vary.[31] Some state that it cannot be easily and clearly defined while others note that unprofessional behaviors are like the Supreme Court definition of obscene ("I know it when I see it").[32-33] In EM, Adams et al. does not define professionalism but rather identifies eight fundamental elements of it: (1) suspension of self-interest; (2) honesty; (3) technical competence; (4) authority and accountability; (5) communication; (6) justice; (7) humility; and (8) avoiding misuse of power.[27]

Few validated tools exist to guide assessment of these competencies, leading faculty to rely heavily on gestalt.[34] This is especially an issue with assessment of professionalism as the definition remains unclear, potentially making assessment a moving target based on which faculty member is evaluating the resident and in what circumstances.[15,35-36] CORD, like the ACGME, has suggested including multiple methods to measure professionalism such as using ethics knowledge and moral reasoning tests, multisource feedback (MSF; 360-degree evaluation), direct observation assessment tools, ratings- and survey-based assessment tools (including patient satisfaction surveys), portfolios and narratives, critical incident

reporting systems, and simulation.[12, 14-15] CORD has also suggested exploring the use of tools developed outside of EM for this purpose.[14] Despite these recommendations, a recent systematic review of such tools found that the one with the best psychometric properties has not yet been evaluated in either the US or in EM.[37] LaMantia et al. recently developed a MSF tool that seems to have excellent internal consistency; however, its implementation was quite challenging and time intensive.[38]

Given these limitations in the tools available, it is not surprising that this study demonstrates that some residencies simply provide faculty with the milestones and ask them to rate the residents. A quote from a respondent sums up the problem with this approach:

> *"The milestones are very broad and nonspecific in their descriptions. Most faculty have NO training in how to properly select a number for a milestone. There is tremendous variance between physicians who grade a single resident."*

This variance will likely exist no matter which tool a residency chooses, especially if there is limited faculty
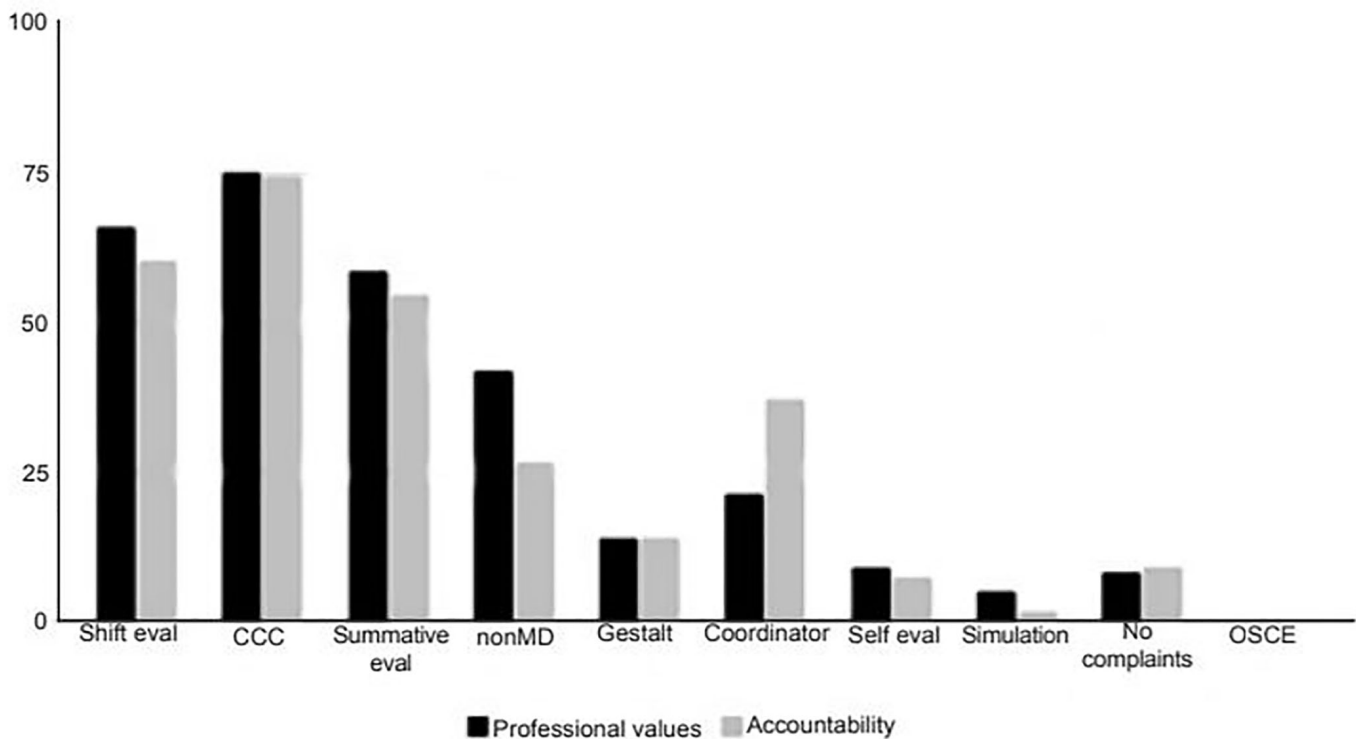
Figure 2. Residency programs' assessment tools that contribute most to determination of final milestone assessment of professional values and accountability sub-competencies.
eval, evaluation; *CCC,* clinical competency committee; *OSCE,* Objective Structured Clinical Examination.

development associated with implementation of the tool. These forms are completed by individuals who essentially become the assessment "tool," making faculty and staff development imperative to providing quality feedback to residents and residency programs alike.[7,39] Without training on easy to use, validated tools, assessment often goes back to what the assessor knows and does regularly.[34]

Future research should focus on the impact of different assessment tools on predicting future professional assessment. Further, residency programs may benefit from standardized, evidence-based recommendations on the factors that should be included when measuring professional values in resident physicians.

LIMITATIONS

This study potentially has several limitations. First, the study was not designed to determine the objective "best" or most-effective methods of assessing professionalism. As detailed above, issues with defining and measuring outcomes related to professionalism make objective, validated, specialty-specific assessments rare. That said, even with a lack of evidence-based methods, core faculty are still required to assess a resident's professionalism and in judging readiness for independent practice. Therefore, our study serves to determine

the current landscape and variability in assessment measures, as well as the perceived effectiveness of faculty who are required to use those measures.

Additionally, to avoid duplication only one person at each program was surveyed, and their view of the program may be different than others within their program. However, by choosing the CCC chair or PD, we attempted to select the respondent with the highest likelihood of having experience in ranking residents, up-to-date information on current practice in resident evaluation, and knowledge of current and recently graduated residents. Further, by keeping surveys anonymous, we attempted to promote honest program self-assessments. Second, based on the respondents' demographic, the respondents provided a diverse representative sample of all EM programs despite not having achieved a 100% response rate. Finally, this study only looked at EM residency assessment of NTS, so the results may not be fully applicable to other specialties. However, it is likely that the results highlight difficulties in assessing professionalism that are present in all medical specialties.

CONCLUSION

Although a variety of assessments are used overall by EM residencies to evaluate milestones for PV and Acc, the most frequently used measures rely on faculty shift evaluations and

summative opinions that, based on prior literature, may only provide a limited assessment of professionalism. Methods that incorporate non-faculty opinions, standardization through simulation or OSCE environments and self-reflection are used less frequently. Further, few residency programs felt their current methods of professional milestone assessment are very effective. Further research and guidelines that assist EM residency programs in standardizing assessments of professionalism incorporating the evidence-based literature that is available may help to decrease residency variability and increase perceived effectiveness.

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Address for Correspondence: Christine Stehman, MD, Indiana University School of Medicine, Department of Emergency Medicine, 720 Eskenazi Avenue, FOB 3rd Floor, Indianapolis, IN 46202. Email: cstehman@iu.edu.

REFERENCES

1. Flin R, O'Connor R, Crichton M. (2008). *Safety at the Sharp End: A Guide to Non-Technical Skills*. New York, NY: CRC Press.
2. Flowerdew L, Brown R, Vincent C, et al. Identifying nontechnical skills associated with safety in the emergency department: a scoping review of the literature. *Ann Emerg Med*. 2012;59(5):386-94.
3. Levinson W, Roter DL, Mullooly JP, et al. Physician-patient communication: the relationship with malpractice claims among primary care physicians and surgeons. *JAMA*. 1997;277(7):553-9.
4. Khaliq AA, Dimassi H, Huang CY, et al. Disciplinary action against physicians: who is likely to get disciplined? *Am J Med*. 2005;188(7):773-7.
5. Cruess SR, Cruess RL. Professionalism must be taught. *BMJ*. 1997;315(7123):1674-7.
6. Batalden P, Leach D, Swing S, et al. General competencies and accreditation in graduate medical education. *Health Aff (Millwood)*. 2002;21(5):103-11.
7. Holmboe ES, Edgar L, Hamstra S. *The Milestones Guidebook*. 2016. Available at: https://www.acgme.org/Portals/0/MilestonesGuidebook.pdf?ver=2016-05-31-113245-103. Accessed November 23, 2018.
8. Nasca TJ, Philibert I, Brigham T, et al. The next GME accreditation system - rationale and benefits. *N Engl J Med*. 2012;366(11):1051-6.
9. Sullivan C, Murano T, Comes J, et al. Emergency medicine directors' perceptions on professionalism: A Council of Emergency Medicine Residency Directors survey. *Acad Emerg Med*. 2011;18 Suppl 2:S97-103.
10. Schwartz AC, Kotwicki RJ, McDonald WM. Developing a modern standard to define and assess professionalism in trainees. *Acad Psychiatry*. 2009;33(6):442-50.
11. Arnold L. Responding to the professionalism of learners and faculty in orthopaedic surgery. *Clin Orthop Relat Res.* 2006;449:205-13.
12. Hobgood C, Promes S, Wang E, et al. Outcome assessment in emergency medicine - a beginning: results of the Council of Emergency Medicine Residency Directors (CORD) emergency medicine consensus workgroup on outcome assessment. *Acad Emerg Med.* 2008;15(3):267-77.
13. Swing SR, Clyman SG, Holmboe ES, et al. Advancing resident assessment in graduate medical education. *J Grad Med Educ*. 2009;1(2):278-86.
14. Kessler CS, Leone KA. The current state of core competency assessment in emergency medicine and a future research agenda: recommendations of the working group on assessment of observable learner performance. *Acad Emerg Med.* 2012;19(12):1354-9.
15. Rodriguez E, Siegelman J, Leone K, et al. Assessing professionalism: summary of the working group on assessment of observable learner performance. *Acad Emerg Med.* 2012;19(12):1372-8.
16. American Board of Emergency Medicine. 2012. The Emergency Medicine Milestone Project. Available at: https://www.abem.org/public/docs/default-source/default-document-library/em-milestones.pdf?sfvrsn=0. Accessed November 23, 2018.
17. American Medical Association. FREIDA database. Available at: https://freida.ama-assn.org/Freida/#/. Accessed July 1, 2017.
18. American College of Emergency Physicians. Find a residency. Available at: https://webapps.acep.org/utils/spa/Match#/search/map. Accessed July 1, 2017.
19. Society for Academic Emergency Medicine. Residency Directory. Available at: http://www.saem.org/resources/directories/residency-directory. Accessed July 1, 2017.
20. American Osteopathic Association. Opportunities – AOA-approved Post Doctoral Training. Available at: http://opportunities.osteopathic.org/search/search.cfm. Accessed July 1, 2017.
21. SurveyMonkey, Inc. Available at: https://www.surveymonkey.com.

22. R statistical software. 2014. R Foundation for Statistical Computing, Vienna, Austria.

23. Flowerdew L, Brown R, Vincent C, et al. Development and validation of a tool to assess emergency physicians' nontechnical skills. *Ann Emerg Med*. 2012;59(5):376-85.e4.

24. Tsyrulnik A, Whalen L, Goldflam K, et al. Comparison of faculty and nurse assessment of emergency medicine residents. *West J Emerg Med*. 2018;19(Suppl):S47-8.

25. Downing SM. Threats to the validity of locally developed multiple-choice tests in medical education: construct-irrelevant variance and construct underrepresentation. *Adv Health Sci Educ Theory Pract*. 2002;7(3):235-41.

26. McCarney R, Warner J, Iliffe S, et al. The Hawthorne effect: a randomised, controlled trial. *BMC Med Res Methodol*. 2007;7:30.

27. Adams J, Schmidt T, Sanders A, et al. Professionalism in emergency medicine. *Acad Emerg Med*. 1998;5(12):1193-9.

28. Teherani A, Hodgson CS, Banach M, et al. Domains of unprofessional behavior during medical school associated with future disciplinary action by a state medical board. *Acad Med*. 2005;80(10 suppl):S17-20.

29. Papadakis MA, Hodgson CS, Teherani A, et al. Unprofessional behavior in medical school is associated with subsequent disciplinary action by a state medical board. *Acad Med*. 2004;79(3):244-9.

30. Papadakis MA, Arnold GK, Blank LL, et al. Performance during internal medicine residency training and subsequent disciplinary action by state licensing boards. *Ann Intern Med*. 2008;148(11):869-76.

31. Shapiro J, Nixon LL, Wear SE, et al. Medical professionalism: what the study of literature can contribute to the conversation. *Philos Ethics Humanit Med*. 2015;10:10.

32. Nichols BG, Stadler ME, Poetker DM. Attitudes toward professionalism education in otolaryngology-head and neck Surgery residency programs. *Laryngoscope*. 2015;125(2):348-53.

33. Lee AG, Beaver HA, Boldt HC, et al. Teaching and assessing professionalism in ophthalmology residency training programs. *Surv Ophthalmol*. 2007;52(3):300-14.

34. Gingerich A, Regehr G, Eva KW. Rater-based assessments as social judgments: rethinking the etiology of rater errors. *Acad Med*. 2011;86(10 Suppl):S1-7.

35. Bryden P, Ginsberg S, Kurabi B, et al. Professing professionalism: are we our own worst enemy? Faculty members' experiences of teaching and evaluating professionalism in medical education at one school. *Acad Med*. 2010;85(6):1025-34.

36. Papadakis MA, Osborn EH, Cooke M, et al. A strategy for the detection and evaluation of unprofessional behavior in medical students. University of California, San Francisco School of Medicine Clinical Clerkships Operation Committee. *Acad Med*. 1999;74(9):980-90.

37. Kwan YH, Png K, Phang JK, et al. A systematic review of the quality and utility of observer-based instruments for assessing medical professionalism. *J Grad Med Educ*. 2018;10(6):629-38.

38. LaMantia J, Yarris LM, Sunga K, et al. Developing and Implementing a multisource feedback tool to assess competencies of emergency medicine residents in the United States. *AEM Educ Train*. 2017;1(3):243-9.

39. Nittur N, Kibble J. Current practices in assessing professionalism in United States and Canadian allopathic medical students and residents. *Cureus*. 2017;9(5):e1267.

How Well Do Core Faculty Understand The Emeregency Medicine Milestones?

Randy Sorge, MD*
Simiao Li-Sauerwine, MD, MS†
Jorge Fernandez, MD‡
Gene Hern, MD§

*Louisiana State University Health Sciences Center in New Orleans, Department of Emergency Medicine, New Orleans, Louisiana
†The Ohio State University, Department of Emergency Medicine, Columbus, Ohio
‡University of California San Diego School of Medicine, Department of Emergency Medicine, San Diego, California
§Highland Hospital – Alameda Health System, University of California San Francisco, Department of Emergency Medicine, San Francisco, California

Introduction: It is unclear how emergency medicine (EM) programs educate core faculty about the use of milestones in competency-based evaluations. We conducted a national survey to profile how programs educate core faculty regarding their use and to assess core faculty's understanding of the milestones.

Methods: Our survey tool was distributed over six months in 2017 via the Council of Emergency Medicine Residency Directors (CORD) listserv. Responses, which were de-identified, were solicited from program directors (PDs), assistant/associate program directors (APDs), and core faculty. A single response from a program was considered sufficient.

Results: Our survey had a 69.7% response rate (n=140/201). 62.9% of programs reported educating core faculty about the EM Milestones via the distribution of physical or electronic media. Although 82.6% of respondents indicated that it was important for core faculty to understand how the EM Milestones are used in competency-based evaluations, respondents estimated that 48.6% of core faculty possess "fair or poor" understanding of the milestones. Furthermore, only 50.7% of respondents felt that the EM Milestones were a valuable tool.

Conclusion: These data suggest there is sub-optimal understanding of the EM Milestones among core faculty and disagreement as to whether the milestones are a valuable tool. [West J Emerg Med. 2020;21(1):160-162.]

INTRODUCTION

The emergency medicine (EM) Milestone Project was created in 2012 by the Accreditation Council for Graduate Medical Education (ACGME) and the American Board of Emergency Medicine as a standardized framework for the assessment of EM residents.[1] The EM Milestones were developed through expert consensus and comprehensive literature review, as a result of the desire to move from a process-oriented to an outcomes-oriented focus, while retaining the six ACGME core competencies (patient care, medical knowledge, interpersonal communication, professionalism, practice-based learning and improvement, and systems-based practice).[2] Outcome measurements were assigned to each of these core competencies and were intended to serve as a framework for residency curricula and individual evaluation. ACGME Milestones allow programs to assess for gaps in curricula and to monitor resident progress, including the potential need for remediation.[3] Residency programs are required to evaluate their residents using milestones and to submit these assessments to the ACGME semi-annually.

It is unclear, however, how programs educate core faculty

about the EM Milestones Project and if core faculty possess adequate understanding of the milestones in order to make accurate assessments. Finally, it is unknown whether PDs and APDs, who implement milestones measurements based on ACGME requirements, feel that milestones are a valuable tool to assess resident learning.

METHODS

Our survey tool, which was designed as part of the Medical Education Research Certificate Program and deemed exempt by the Institutional Review Board at Alameda Health System (Highland Hospital), was comprised of 12 questions, 11 of which were multiple choice and one of which was free response (Appendix). To ensure face validity, the survey was piloted by six APDs at three authors' home institutions prior to distribution. Feedback from the pilot resulted in minor changes to improve clarity, which were incorporated into the final survey. The survey was then distributed over a six-month period from July 2017 to January 2018 via the Council of Emergency Medicine Residency Directors (CORD) listserv. Responses, which were de-identified with respect to program, were solicited from program directors (PD), assistant/associate program directors (APD), and core faculty. A single response from a program was considered sufficient. Duplicate responses were reconciled by computer algorithm, prioritizing the responses of PDs over APDs over core faculty.

Respondents were asked about how they educate core faculty about the EM Milestones and to estimate their perceived understanding of the milestones on a 5-point Likert-type scale, where 1 = "no understanding," 2 = "poor understanding," 3 = "fair understanding," 4 = "good understanding," and 5 = "very good understanding." Data were compiled and analyzed using Microsoft Excel.

RESULTS

Of the 201 EM programs contacted, 144 responses were received, representing 140 unique programs (response rate 69.7%). The four duplicate responses were reconciled by computer algorithm, prioritizing the response of PDs over APDs over core faculty. 70.7% of responses were from PDs, 26.4% were from APDs, and 2.9% were from core faculty. 62.9% of programs reported educating core faculty about the EM Milestones via the distribution of physical or electronic media. Although 82.6% of respondents indicated that it was important for core faculty to understand how the EM Milestones are used in competency-based evaluations, respondents estimated that 48.6% of core faculty possess "fair or poor" understanding of the milestones (Table 1). Furthermore only 50.7% of respondents felt that the EM Milestones were a valuable tool.

DISCUSSION

These data suggest that PDs and APDs perceive that there is suboptimal understanding of the EM Milestones amongst core faculty, which may stem from insufficient or inadequate faculty

Population Health Research Capsule

What do we already know about this issue?
Core faculty are responsible for evaluating residents semi-annually based on the ACGME milestones.

What was the research question?
How well do Core Faculty understand the milestones?

What was the major finding of the study?
Nearly half of core faculty are felt to have a "fair or poor" understanding of the milestones.

How does this improve population health?
These findings suggest that there is room for improvement in terms of core faculty development in regards to the milestones.

development in this area. If core faculty do in fact have a poor understanding of the milestones, it calls into question the validity of their evaluations. Further investigation may be warranted to determine the accuracy of these perceptions and to suggest recommendations to improve core faculty understanding.

There also appears to be disagreement about the importance and value of EM Milestones. General themes in free-text comments included the following: that the EM Milestones were good in theory yet administratively burdensome in practice, that they tend to be more useful with regard to the remediation of struggling residents but not as valuable in evaluating the majority of well-performing residents, and that they could be at times counterproductive due to variable faculty interpretation of each sub-competency and what actually constitutes meaningful achievement of proficiency within each sub-competency.

This study highlights that there is still significant room for improvement in terms of core faculty development regarding EM Milestones and their current role in competency-based assessment.

Table 1. Respondents' perceived understanding of the emergency medicine (EM) Milestone Project by core faculty.

	Core faculty
Very good understanding	10.7%
Good understanding	40.7%
Fair understanding	35%
Poor understanding	13.6%
No understanding	0%

LIMITATIONS

The main limitation of this study is that the survey tool is subject to recall, sample, and response bias.[4] Responders may be hesitant to answer truthfully to the questions out of fear of disparaging their own program. Another limitation is that responses were solicited from a representative sample of PDs, APDs and core faculty rather than directly from core faculty. A direct sampling was determined to be impractical due to the large number of responses required in order to draw meaningful conclusions. Therefore, the authors chose to solicit the perceptions of PDs and ADPs as a surrogate marker.

Efforts were made in this study's design to reduce potential bias, including the development of a high-quality, brief, questionnaire. Pilot testing of the survey tool occurred with APDs at each of the authors' programs in order to examine the quality and clarity of questions, ease of administration, potential for response fatigue, and to gather general feedback.

CONCLUSION

The results of this survey demonstrate that there is variability in how EM programs educate core faculty about the EM Milestones. Furthermore, nearly half of respondents believe core faculty possess a "fair to poor" understanding of the EM Milestones. These results demonstrate an opportunity to improve faculty development with respect to the utility of milestones in competency-based assessment. Ultimately, this study identifies areas of need with respect to better educating educators themselves of the criteria by which the acquisition of knowledge, skills, attitudes, and behaviors is assessed during residency.

Address for Correspondence: Randy Sorge, MD, Louisiana State University Health Sciences Center in New Orleans, Department of Emergency Medicine, 2000 Canal Street, Suite 2720, D&T Building, 2nd Floor, New Orleans, LA 70112. Email: rsorge@lsuhsc.edu.

REFERENCES

1. Beeson MS, Carter WA, Christopher TA, et al. The Development of the Emergency Medicine Milestones. *Acad Emerg Med*. 2013;20(7):724-9.

2. Swing SR. The ACGME outcome project: retrospective and prospective. *Med Teach*. 2007;29(7):648–54.

3. Nasca TJ, Philibert I, Brigham T, et al. The next GME accreditation system — rationale and benefits. *N Engl J Med*. 2012;366(11):1051-6.

4. Mello MJ, Merchant RC, Clark MA. Surveying Emergency Medicine. *Acad Emerg Med*. 2013. 20(4):409-12.

Increasing Education Research Productivity: A Network Analysis

William J. Peterson, MD*
Sally A. Santen, MD, PhD†
Joseph B. House, MD*
Laura R. Hopson, MD*
Meg Wolff, MD, MHPE‡
Michele Carney, MD‡
John W. Cyrus, MLIS§

*University of Michigan, Department of Emergency Medicine, Ann Arbor, Michigan
†Virginia Commonwealth University, Department of Emergency Medicine, Richmond, Virginia
‡University of Michigan, Department of Emergency Medicine and Pediatrics, Ann Arbor, Michigan
§Virginia Commonwealth University, Virginia Commonwealth University Libraries, Richmond, Virginia

Introduction: Forming effective networks is important for personal productivity and career development. Although critical for success, these networks are not well understood. The objective of this study was to usze a social network analysis tool to demonstrate the growth of institutional publication networks for education researchers and show how a single institution has expanded its publication network over time.

Methods: Publications from a single institution's medical education research group (MERG) were pulled since its inception in 2010 to 2019 using Web of Science to collect publication information. Using VOSViewer software, we formed and plotted a network sociogram comparing the first five years to the most recent 4.25 years to compare the institutions of authors from peer reviewed manuscripts published by this group.

Results: We found 104 peer-reviewed research articles, editorials, abstracts, and reviews for the MERG authors between 2010 and 2019 involving 134 unique institutions. During 2010-2014, there were 26 publications involving 56 institutions. From 2015- 2019, there were 78 publications involving 116 unique institutions.

Conclusion: This brief report correlates successful research productivity in medical education with the presence of increased inter-institutional collaborations as demonstrated by network sociograms. Programs to intentionally expand collaborative networks may prove to be an important element of facilitating successful careers in medical education scholarship. [West J Emerg Med. 2020;21(1):163–168.]

INTRODUCTION

Education research and scholarship are important for dissemination of new educational practices and faculty promotion. As academic faculty, emergency medicine (EM) attendings are often charged to engage in the tripartite mission of clinical practice, education and scholarship, yet scholarship in medical education can be challenging.[1,2] A better understanding of promotors of effective scholarly productivity will help the careers of EM academic faculty with a focus on medical education.

Research has elucidated several factors important for promoting scholarship including clear goal setting, a distinctive culture of research that emphasizes participation, frequent communication, accessible resources, and leadership with expertise and skill.[3,4] One important component is the creation of an environment that facilitates productivity.[3] Departmental educational research groups can facilitate and promote scholarship.[3] Forming effective networks is an important part of personal productivity and career development and has positive effects on productivity of all individuals in a group.[3,5]

A network often begins within a department and extends well beyond the department, potentially leading to scholarly productivity. Although apparently helpful for success, these networks are not well understood.

Originating in the field of sociology, social network analysis (SNA) is a tool for analyzing the structure of connections between individuals or groups.[6] SNA attempts to conceptualize a network using the ties (edges) that connect its members (nodes) and by focusing on attributes of the ties instead of the those of the members.[7] This tool captures quantitative aspects of the patterns of relationships, which allows for quantitative comparisons between different groups and network structures. The application of SNA to the health sciences has become increasingly common as it is a useful tool for understanding connections within systems ranging from communication patterns between physicians to team functioning and structure.[8-10] This has the advantage of showing connectedness that can reveal patterns. In addition, when compared over time, SNA can show growth of relationships between members of the network.

We hypothesize that social networks may contribute to successful education scholarship in EM. The objective of this study was to demonstrate the growth of institutional publication networks for education researchers in a medical education group, and use a network analysis tool to demonstrate this growth. We used a network analysis tool to show how a medical education research group (MERG) in a single institution expanded its publication network over time.

METHODS
Setting
The MERG was comprised of a group of faculty leaders from [blinded, single institution] emergency medicine (EM) residency, fellowship, and clerkship programs, as well as EM residents and fellows with a focus on education. The group intentionally formed as an innovative approach to promote educational work and turned usual educational work into scholarship by studying the impact of changes made to improve the programs. The scholarship was then presented at national meetings and often converted to a publication. The MERG team worked together, sharing projects that led to improved motivation, accountability, and work completion. The MERG had monthly meetings that served as brainstorming sessions for new projects, research skill building, and tracking work completion.[3] These techniques led to a strong local network. As members developed their own expertise, they reached outside of the institution's education group to national faculty to form broader networks for scholarship.

Data Collection
We pulled all publications from each author of the University of Michigan MERG group using Web of Science

(Clarivate Analytics, Philadelphia, PA, and London, GB). Web of Science is a subscription-based, inter-disciplinary database of scientific literature and conference abstracts that includes citations to the literature as well as information on how many times a specific item has been cited. The primary nine MERG faculty were used to generate the list of publications from the MERG group, and the author group was kept the same for the time period included in this analysis, 2010 to May 2019. Three authors were excluded as they were part of the initial MERG group but left education research shortly after MERG started to pursue other opportunities. Though the MERG group evolved to include other members during this time period, only the initial authors were included in this analysis to prevent the confounding of increased quantity of publications simply by expansion of members. Because we used publicly available data this study was considered to be not-human research.

Analysis
The publications as reported in Web of Science were recorded based on two time periods: the first five years 2010 to 2014, and the next 4.25 years from 2015 to 2019. This divide was chosen to compare two aggregates of time: the first five years, and the most recent five years. We recorded the number of publications, type of publications, and whether they extended beyond the local network. Using VOSviewer (www.vosviewer.com) we constructed a network sociogram based on the institutional affiliations of the author group involved in the publications from the first group, 2010-2014 (Figure 1), and compared it to the more recent group, 2015-2019 (Figure 2). Points in the figures represent individual institutions (nodes), and lines between points represent the connections between institutions.

The strength of connection, as seen in width of lines (edges) between nodes, was determined by analyzing co-authorship by organizations / institutions within the set of publications. In other words, the number of times two organizations were co-authors on a paper dictates the strength of connection. VOSviewer automatically calculates link strength based on co-authorship as part of the mapping process. The size of the node represents the overall number of times the institution was involved. The width of the connection line represents the number of overall connections between institutions. The color of the node represents clustering of nodes by the software to indicate institutions that are more closely related within the data set. In this case the clustering is indicative of the number of co-authorships with a range of years. Clusters are calculated by the VOSviewer software using an algorithm for mapping and clustering described more fully in Waltman, Van Eck, and Noyons.[11]

RESULTS
Using Web of Science, we found 104 peer-reviewed research articles, editorials, abstracts, and reviews for the
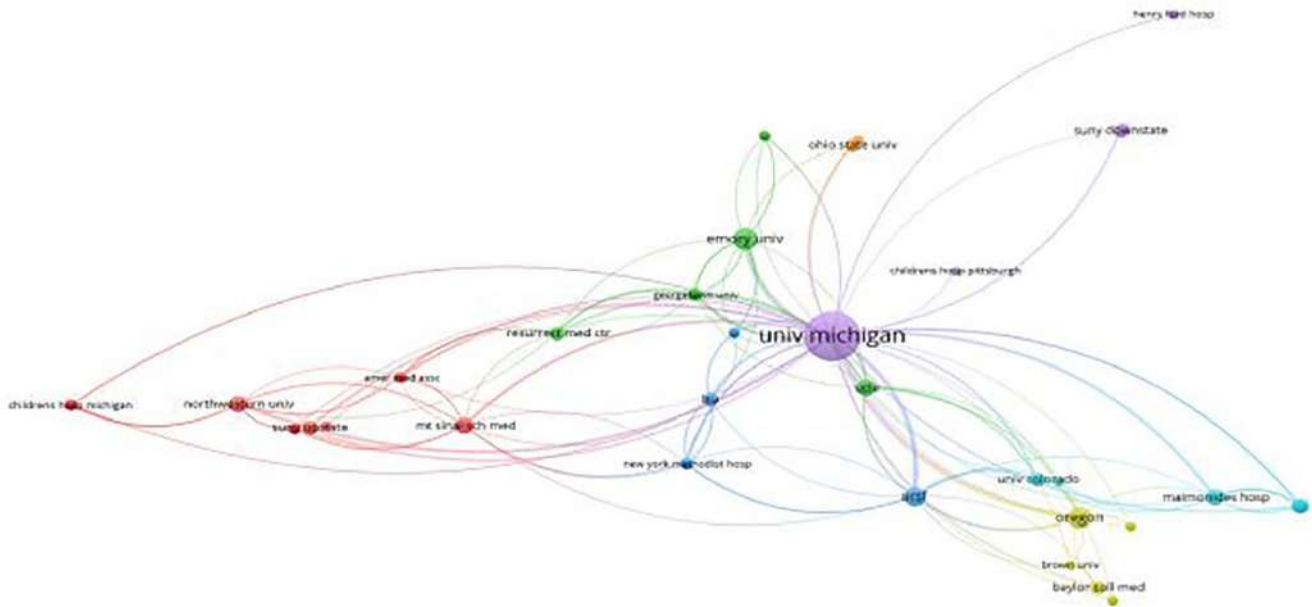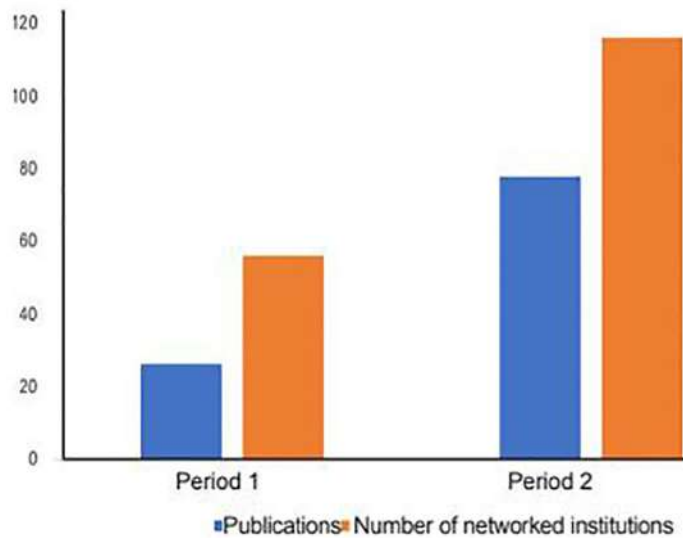
Figure 1. Institutions in 2010-2014.
Points in the figures represent individual institutions (nodes), and lines (edges) between points represent the connections between institutions.
Node size represents the overall number of times the institution was involved.
The width of the connecting line represents the number of overall connections between institutions.
The color represents clusters of closely related institutions measured by number of co-authorships within that range of years.
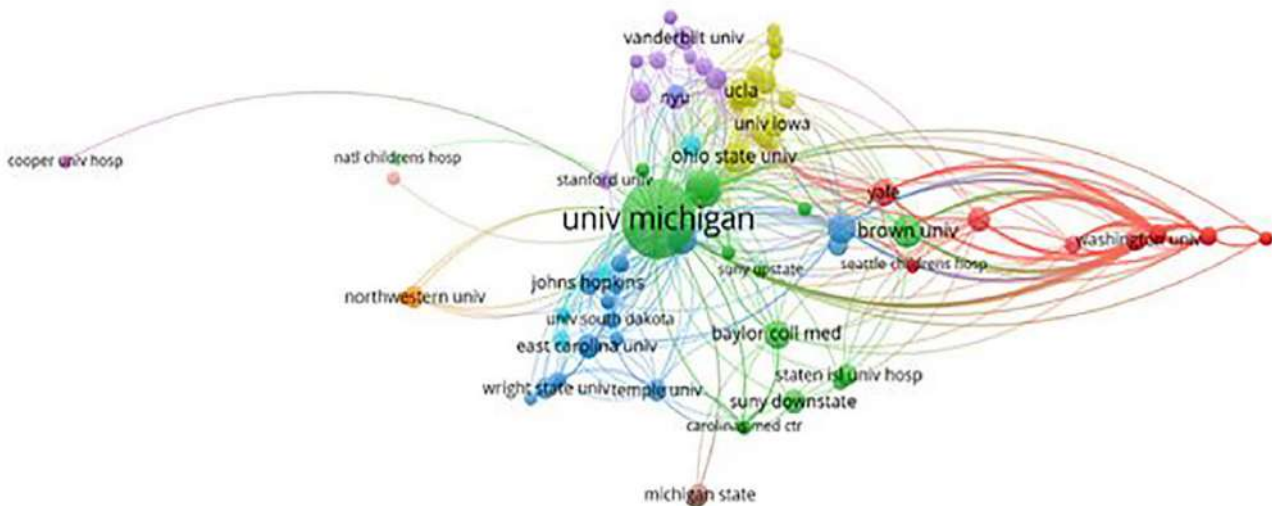
Figure 2. Institutions in 2015-2019.
Points in the figures represent individual institutions (nodes), and lines (edges) between points represent the connections between institutions.
Node size represents the overall number of times the institution was involved.
The width of the connecting line represents the number of overall connections between institutions.
The color represents clusters of closely related institutions measured by number of co-authorships within that range of years.

Figure 3. Publications for 2010-2014 (Period 1) and 2015-2019 (Period 2).

MERG authors between 2010-2019. During 2010-2014, there were 26 publications (19 research articles and seven abstracts). Of these, 23 included authors from multiple institutions that included 56 unique institutions and three were from a single institution. From 2015- 2019, there were 78 publications from the MERG author group (77 research articles and one abstract). Of these 58 included authors from other institutions and 20 were from a single institution. Over the time period 2010-2019, 134 unique institutions were involved in the co-authorship of publications from the MERG group. Fifty-six of these institutions were involved in publications over the 2010-2014 period, and 116 institutions were involved during the second period (Figure 3). The top 10 performing institutions

for each year range by total link strength and number of items included in the analysis are reflected in Table 1.

The network sociogram illustrates the institutions involved in publications from the first years, 2010-2014 (Figure 1), compared to the most recent years, 2015-2019 (Figure 2). Points in the figures represent individual institutions (nodes), and lines (edges) between points represent the connections between institutions. Node size represents the overall number of times the institution was involved. The width of the connecting line represents the number of overall connections between institutions. The color represents clusters of closely related institutions organizations. In this study, institutions with the same color are closely connected subgroups via co-authorship. For example, in the 2010-2014 network, LSU is clustered with Boston University, New York Methodist, and UCSF but not Mt. Sinai. In this case, Mt. Sinai had co-authorship with LSU, but had stronger connections, through a greater number of co-authorships, with institutions in the red cluster. In the years 2010-2014 there were seven clusters with mean of eight institutions per cluster with a range of 2-15 in each cluster. In the years 2015-2019 there were 11 clusters with mean of 10.5 institutions per cluster with a range of 1-26 in each cluster.

The distance between nodes also represents the strength of connection between the nodes, meaning that nodes depicted as being further apart have weaker connections than those that are closer together or overlapping as in Figure 2. The two figures graphically illustrate evolving institutional relationships on a temporal basis as well as their relative strengths.

DISCUSSION

The objective of this report was to demonstrate the evolution of the publication network for a research group at a single institution over time. The numbers of publications

Table 1. Top 10 performing institutions for each year range by total link strength and number of items included in analysis.

2010-2014	Total link strength	Number of items	2015-2019	Total link strength	Number of items
University of Michigan	81	26	University of Michigan	237	78
UCSF	21	4	Brown	56	8
Emory	20	5	Harvard	54	7
Mount Sinai	19	3	University of Washington	48	7
Northwestern	18	3	Yale	48	5
Oregon	18	5	UCLA	42	6
UCLA	18	3	Columbia	40	4
Maimonides	14	3	VCU	40	12
Resurrection	14	2	Ohio State	36	7
LSU	12	2	East Carolina	30	4

UCSF, University of California San Francisco; *UCLA,* University of California Los Angeles; *LSU,* Louisiana State University; *VCU,* Virginia Commonwealth University.

Table 2. Network facilitators.

CDEM- Clerkship Directors in Emergency Medicine

MERC (Medical Education Research Certificate) at CORD

CORD- Council of Emergency Medicine Residency Directors and associated committees, task forces, and communities of practice.

University of Michigan Master in Health Professions Education (several MERG members were either enrolled in the program or mentors, leading to publications across institutions)

Didactic presentations at national and international meetings (Society for Academic Emergency Medicine (SAEM), Association of American Medical Colleges, Accreditation Council for Graduate Medical Education (ACGME), Council of Residency Directors, Association of Medical Educators in Europe (AMEE), Pediatric Academic Societies (PAS), American Academy of Pediatrics (AAP), Directors of Clinical Skills Courses (DOCs))

Standardized Video Interview developed by AAMC

American Academy of Pediatrics Section of Emergency Medicine Fellowship Directors Committee

AAMC, Association of American Medical Colleges.

increased over time. In addition, as shown in the sociograms, the MERG network increased over time and evolved to include new institutions while prior relationships sometimes faded. While MERG has existed as a research group within one institution, the growth of the network over time has expanded to include co-authors from multiple institutions as demonstrated by comparison of Figure 1 to Figure 2.

These networks were facilitated by various learning networks such as service (committee work) and education involvement (didactics) seen in Table 2. Through a description of the different connection groups of the MERG network we hope to demonstrate how external networking can lead to increased scholarship. Some of the groups included clerkship directors academy (CDEM), residency education group (CORD), and pediatric EM fellowship program directors committee. Some faculty participated in MERC (Medical Education Research Certificate) at CORD; these connections resulted in multiple publications. In addition, some members expanded their work from exclusively EM-focused to general medical education with publications in high impact journals such as *Academic Medicine*. Some of the publications started as national meeting didactics and led to educational innovation reports, perspectives or educational monographs. Many of these groups continued to collaborate repeatedly for new scholarship.

LIMITATIONS

There are several limitations to the study. One confounder is that two of the members of the group left [blinded institution] to work at another institution during the timeframe, and this likely accounts for some of the variation and expansion of the network. In addition, trainees left the institution and may be represented by their new institutions or came to our institution. In these cases, a perceived connection between institutions might not be considered to represent a new

connection. However, the expansion of the research network extends beyond these known connections, and many of the new branches occur prior to those members moving to new institutions. An additional limitation is that some of the publication venues are not indexed in Web of Science, therefore some known publications are missing from this analysis.

CONCLUSION

This brief report found associations between an increase research productivity in medical education with the presence of inter-institutional collaborations as demonstrated by network sociograms. Programs to intentionally expand collaborative networks, may be to be an important element of facilitating successful careers in medical education scholarship. Further investigation about successful research networks is needed.

Address for Correspondence: William J. Peterson, Department of Emergency Medicine, University of Michigan Medical School, 1500 E Medical Center Dr., Emergency Medicine Dept B1 206, Ann Arbor, MI 48109. Email: wpet@med.umich.edu.

REFERENCES

1. Kessler C, Burton JH. Moving beyond confidence and competence: educational outcomes research in emergency medicine. *Acad Emerg Med.* 2011;18:S25-6.

2. Yarris LM, Deiorio NM. Education research: a Primer for educators in in emergency medicine. *Acad Emerg Med.* 2011;18:S27-S35.

3. Perry M, Hopson L, House JB, et al. Model for Developing Educational Research Productivity: The Medical Education Research Group. *West J Emerg Med.* 2015;16(6):947-51.

4. Bland CJ, Ruffin MT. Characteristics of a productive research environment: literature review. *Acad Med.* 1992;67(6):385-97.

5. Wolff HG, Moser K. Effects of networking on career success: a longitudinal study. *J Appl Psychol.* 2009;94(1):196-206.

6. Scott J. Social network analysis. *Sociology.* 1988 Feb;22(1):109-27.

7. Otte E, Rousseau R. Social network analysis: a powerful strategy, also for the information sciences. *J Inf Sci.* 2002;28(6):441-53.

8. Scott J, Tallia A, Crosson JC, et al. Social network analysis as an analytic tool for interaction patterns in primary care practices. *Ann Fam Med*. 2005;3(5):443-8.

9. Lurie SJ, Fogg TT, Dozier AM. Social network analysis as a method of assessing institutional culture: three case studies. *Acad Med.* 2009;84(8):1029-35.

10. Valente TW, Palinkas LA, Czaja S, et al. Social network analysis for program implementation. *PLoS One.* 2015;10(6):e0131712.

11. Waltman L, Van Eck NJ, Noyons EC. A unified approach to mapping and clustering of bibliometric networks. *JInformetr.* 2010;4(4):629-35.

Back in My Day: A Journal Club Using Landmark Articles for Emergency Medicine-Bound Medical Students

Christopher E. San Miguel, MD
Cynthia Leung, MD, PhD
Nicholas E. Kman, MD
Jason Bischof, MD

The Ohio State University Wexner Medical Center, Department of Emergency Medicine, Columbus, Ohio

This journal club style curriculum was developed to advance 4th year medical students in Emergency Medicine (EM) Milestone 19. The curriculum was introduced as part of a longitudinal boot camp course for EM- bound students. Students met monthly with faculty members to critically evaluate landmark articles within the field of EM. The curriculum culminated with student group presentations of two contemporary research articles with opposing conclusions. Discussed articles covered the following topics: stroke care, head trauma, cervical spine trauma, pulmonary embolism, cardiology treatments, syncope, post- cardiac arrest care, pediatrics, sepsis, and fluid resuscitation. The curriculum was evaluated using the institution's standard student educational session evaluation form. Students rated the quality of the sessions highly, and based on thematic review of comments, the journal club was a beneficial addition to the boot camp curriculum. [West J Emerg Med. 2020;21(1):169-172.]

BACKGROUND

The ability to critically appraise scholarly literature and apply results to patient care is a core component of medical practice as evidenced by its inclusion as a milestone for emergency medicine (EM) trainees by the Accreditation Council for Graduate Medical Education (ACGME).[1] Milestones are the knowledge, skills and attitudes required for successful practice within a given specialty, organized in a developmental framework from levels 1 through 5 to demonstrate advancing proficiency. Level 1 milestones are those skills expected on the first day of residency. The level 1 anchor for EM Milestone 19, "Practice-based Performance Improvement" requires that a learner "describes basic principles of evidence-based medicine," whereas one of the level 3 anchors of the same milestone requires that a learner "demonstrates the ability to critically appraise scientific literature and apply evidence-based medicine to improve one's individual performance."[2]

Traditionally, medical schools have focused their curricula on teaching principals of evidence-based medicine (EBM) during the first two years of medical school, and EM residency programs have focused on teaching clinical practice application

via journal clubs.[3,4] While medical schools report formal EBM activities occurring in the clinical environment during the third year of medical school, the most common environment for fourth- year EBM training was in fact "none."[3] Consequently, it is possible that new EM trainees could arrive at residency having not used or revisited EBM concepts at all over the final year of their medical school training and having never been exposed to EBM application within the field of EM.

Our institution has a longitudinal boot camp course for medical students pursuing an EM residency.[5] This boot camp experience was redesigned after the introduction of the ACGME Milestone Project in an effort to teach and assess EM-bound medical students on their progress toward and beyond level 1 proficiency.[6] In an effort to better teach and assess EM Milestone 19, a curriculum was designed to reinforce core concepts of EBM while exposing senior medical students to historical articles that had widespread practice-changing effects.

OBJECTIVES

The culminating objective of our curriculum was to enable students to analyze a recently published article and discuss its implications in clinical practice, thus ensuring

that each student at minimum had achieved level 1 in EM Milestone 19. To gain the skills necessary to complete this objective the students 1) analyzed landmark articles in EM to become familiar with common research methodologies, 2) studied the development process of clinical decision rules and the limitations of their application to clinical practice, and 3) discussed how research findings have historically influenced practice change within EM.

CURRICULAR DESIGN

This EBM curriculum was delivered in a traditional journal club format. Sessions were held monthly throughout the academic year and ran on average 90 minutes. Two faculty members, one fellowship-trained in education and the other fellowship-trained in research, co-facilitated all but two of the sessions. Both faculty members had experience facilitating small group discussions, but no further specific training was undertaken prior to the implementation of the curriculum. There were 10 total sessions, and to accommodate away rotations and interviews, students were required to attend a minimum of five sessions. Because of the relatively low rate of required attendance there was intentional redundancy within the curriculum in terms of the emphasized principles and learning points for each session. For instance, sessions on head trauma and cervical spine trauma were similar in that they both discussed the development and use of clinical decision tools.

During each of the first nine sessions, we reviewed two to three articles that were related by content. For example, the syncope session reviewed the original validation article of the San Francisco Syncope Rule and two subsequent external validation studies of the rule. Articles were chosen by the curriculum developers after review of the Academic Life in EM 2016 list of landmark articles.[7] Articles were chosen to ensure the curriculum covered different topics within EM, reviewed different core topics within EBM such as research methodologies, and included the study of articles with conflicting results. This curriculum was certainly not designed to be comprehensive in its breadth of clinical or EBM topics. See Table 1 for a complete list of articles included within the curriculum.

Articles were distributed to the students via the course's online learning platform, and they were expected to read the articles prior to each session. During the sessions, the articles were individually analyzed in a small- group discussion format, with one or two faculty members facilitating the discussion. Particular attention was paid to the clinical question, the research methodology, the results, the interpretation of the results, and the historical, clinical impact of the article, including its relation to other articles reviewed during that session.

The 10th session was slightly different in format. It was attended by all the students taking part in the course, and they were split into two groups. Each group presented a critical analysis of a contemporary article and commented on whether and how it should change clinical practice. Although there was no formal evaluation of this presentation, it did allow students to independently apply the skills they had developed throughout the curriculum.

IMPACT

Institutionally designed and mandated surveys assessing the quality of the sessions on a five-point Likert scale were distributed to the participating students after each session. A total of 15 students were enrolled in the curriculum and generated a total of 83 surveys. The overall rating of the sessions was positive with 79 (95.2%) scoring either a 4 or 5 on the Likert scale. Each survey contained two open-ended items: one asking for positive feedback, and the other asking for constructive feedback. Two authors conducted reflexive thematic review of these comments, which revealed three main themes: 1) students are supportive of the journal club model of teaching EBM; 2) students value discussion of study design and statistics; and 3) sessions should target key clinical topics.

The curriculum's impact is limited both by our outcome measures and our cohort size. Although we can only present satisfaction data, the fact that this curriculum was the only formal EBM received by our students in the fourth year of medical school leads us to believe that its implementation was worthwhile. Our cohort size was limited by the number of students who are EM bound each year, but our cohort reflects the experience of students interested in EM at a large medical school; thus, our findings are likely applicable to institutions nationwide.

The implementation of this journal club-style curriculum designed to advance fourth-year medical students' proficiency in EM Milestone 19 was positively reviewed by the target audience.

Address for Correspondence: Christopher E. San Miguel, MD, The Ohio State University, Department of Emergency Medicine, 779 Prior Hall, 376 W 10th Avenue, Columbus, OH 43210. Email: Christopher.SanMiguel@osumc.edu.

Table 1. Journal club sessions and articles.

Session topic	Article citation
Stroke care	Brott T, Broderick, R, Kothari R, et al. Tissue Plasminogen Activator for Acute Ischemic Stroke. N Engl J Med. 1995;333(24):1581-8.
	Berkhemer OA, Fransen PS, Beumer D, et al. A Randomized Trial of Intraarterial Treatment for Acute Ischemic Stroke. N Engl J Med. 2015;372:11-20.
Head trauma	Kuppermann N, Holmes JF, Dayan PS, et al. Identification of children at very low risk of clinically-important brain injuries after head trauma: A prospective cohort study. Lancet Lond Engl. 2009;374(9696):1160-70.
	Stiell IG, Wells GA, Vandemheen K, et al. The Canadian CT Head Rule for patients with minor head injury. Lancet Lond Engl. 2001;357(9266):1391-6.
	Haydel MJ, Preston CA, Mills TJ, et al. Indications for computed tomography in patients with minor head injury. N Engl J Med. 2000;343(2):100-5.
Cervical spine trauma	Hoffman JR, Wolfson AB, Todd K, et al. Selective Cervical Spine Radiography in Blunt Trauma: Methodology of the National Emergency X-Radiography Utilization Study (NEXUS). Ann Emerg Med. 1998;32(4):461-9.
	Stiell IG, Wells GA, Vandemheen KL, et al. The Canadian C-Spine Rule for Radiography in Alert and Stable Trauma Patients. JAMA. 2001;286(15):1841-8.
Pulmonary embolism	Wells PS, Anderson DR, Rodger M, et al. Excluding pulmonary embolism at the bedside without diagnostic imaging: Management of patients with suspected pulmonary embolism presenting to the emergency department by using a simple clinical model and d-dimer. Ann Intern Med. 2001;135(2):98-107.
	Kline JA, Courtney DM, Kabrhel C, et al. Prospective multicenter evaluation of the pulmonary embolism rule-out criteria. J Thromb Haemost. 2008;6(5):772-80.
Cardiology treatments	Andersen HR, Nielsen TT, Rasmussen K, et al. A Comparison of Coronary Angioplasty with Fibrinolytic Therapy in Acute Myocardial Infarction. N Engl J Med. 2003;349(8):733-42.
	Wyse DG, Waldo AL, DiMarco JP, et al. A Comparison of Rate Control and Rhythm Control in Patients with Atrial Fibrillation. N Engl J Med. 2002;347(23):1825-33.
Syncope	Quinn J, McDermott D, Stiell I, et al. Prospective validation of the San Francisco Syncope Rule to predict patients with serious outcomes. Ann Emerg Med. 2006;47(5):448-54.
	Sun BC, Mangione CM, Merchant G, et al. External validation of the San Francisco Syncope Rule. Ann Emerg Med. 2007;49(4):420-427, 427.e1-4.
	Birnbaum A, Esses D, Bijur P, et al. Failure to validate the San Francisco Syncope Rule in an independent emergency department population. Ann Emerg Med. 2008;52(2):151-9.
Post cardiac arrest care	Holzer M, Cerchiari E, Martens P, et al. Mild Therapeutic Hypothermia to Improve the Neurologic Outcome after Cardiac Arrest. N Engl J Med. 2002;346(8):549-56.
	Nielsen N, Wetterslev J, Cronberg T, et al. Targeted Temperature Management at 33°C versus 36°C after Cardiac Arrest. N Engl J Med. 2013;369(23):2197-206.
Pediatrics	Bjornson CL, Klassen TP, Williamson J, et al. A Randomized Trial of a Single Dose of Oral Dexamethasone for Mild Croup. N Engl J Med. 2004;351(13):1306-13
	Spiro DM, Tay K-Y, Arnold DH, et al. Wait-and-see prescription for the treatment of acute otitis media: A randomized controlled trial. JAMA. 2006;296(10):1235-41.
Sepsis	Rivers E, Nguyen B, Havstad S, et al. Early Goal-Directed Therapy in the Treatment of Severe Sepsis and Septic Shock. N Engl J Med. 2001;345(19):1368-77.
	Yealy MD, Kellum JA, Huang DT, et al. A Randomized Trial of Protocol-Based Care for Early Septic Shock. N Engl J Med. 2014; 370:1683-93.
Fluid resuscitation	Young P, Bailey M, Beasley R, et al. Effect of a Buffered Crystalloid Solution vs Saline on Acute Kidney Injury Among Patients in the Intensive Care Unit: The SPLIT Randomized Clinical Trial. JAMA. 2015;314(16):1701-10.
	Semler MW, Self WH, Wanderer JP, et al. Balanced Crystalloids versus Saline in Critically Ill Adults. N Engl J Med. 2018;378(9):829-39.

REFERENCES

1. Beeson M, Christopher T, Heidt J, et al. The emergency medicine milestone project. Accreditation Council for Graduate Medical Education. Available at: https://www.acgme.org/Portals/0/PDFs/Milestones/EmergencyMedicineMilestones.pdf?ver=2015-11-06-120531-877. Accessed July 2019.

2. Lamba S, Wilson B, Natal B, et al. A suggested emergency medicine boot camp curriculum for medical students based on the mapping of Core Entrustable Professional Activities to Emergency Medicine Level 1 milestones. *Adv Med Educ Pract*. 2016;7:115-24.

3. Blanco MA, Capello CF, Dorsch JL, et al. A survey study of evidence-based medicine training in US and Canadian medical schools. *J Med Libr Assoc*. 2014;102(3):160-8.

4. Gottlieb M, King A, Byyny R, et al. Journal Club in Residency Education: An Evidence-based Guide to Best Practices from the Council of Emergency Medicine Residency Directors. *West J Emerg Med*. 2018;19(4):746-55.

5. Kman NE, Bernard AW, Martin DR, et al. Advanced topics in emergency medicine: curriculum development and initial evaluation. *West J Emerg Med*. 2011;12(4):543-50.

6. Leung CG, Thompson L, McCallister JW, et al. Promoting achievement of Level 1 milestones for medical students going into emergency medicine. *West J Emerg Med*. 2017;18(1):20-5.

7. *52 Articles in 52 Weeks* (2nd ed). 2016. Available at: https://www.aliem.com/2016/10/52-articles-in-52-weeks-2nd-edition-2016/. Accessed July 15, 2019.

Which Emergency Medicine Milestone Sub-competencies are Identified Through Narrative Assessments?

David Diller, MD*
Shannon Cooper, MD†
Aarti Jain, MD*
Chun Nok Lam, MPH*
Jeff Riddell, MD*

*LAC+USC Medical Center, Keck School of Medicine of the University of Southern California, Department of Emergency Medicine, Los Angeles, California
†Henry Ford Allegiance Health, Department of Emergency Medicine, Jackson, Michigan

Introduction: Evaluators use assessment data to make judgments on resident performance within the Accreditation Council for Graduate Medical Education (ACGME) milestones framework. While workplace-based narrative assessments (WBNA) offer advantages to rating scales, validity evidence for their use in assessing the milestone sub-competencies is lacking. This study aimed to determine the frequency of sub-competencies assessed through WBNAs in an emergency medicine (EM) residency program.

Methods: We performed a retrospective analysis of WBNAs of postgraduate year (PGY) 2-4 residents. A shared mental model was established by reading and discussing the milestones framework, and we created a guide for coding WBNAs to the milestone sub-competencies in an iterative process. Once inter-rater reliability was satisfactory, raters coded each WBNA to the 23 EM milestone sub-competencies.

Results: We analyzed 2517 WBNAs. An average of 2.04 sub-competencies were assessed per WBNA. The sub-competencies most frequently identified were multitasking, medical knowledge, practice-based performance improvement, patient-centered communication, and team management. The sub-competencies least frequently identified were pharmacotherapy, airway management, anesthesia and acute pain management, goal-directed focused ultrasound, wound management, and vascular access. Overall, the frequency with which WBNAs assessed individual sub-competencies was low, with 14 of the 23 sub-competencies being assessed in less than 5% of WBNAs.

Conclusion: WBNAs identify few milestone sub-competencies. Faculty assessed similar sub-competencies related to interpersonal and communication skills, practice-based learning and improvement, and medical knowledge, while neglecting sub-competencies related to patient care and procedural skills. These findings can help shape faculty development programs designed to improve assessments of specific workplace behaviors and provide more robust data for the summative assessment of residents. [West J Emerg Med. 2020;21(1):173-179.]

INTRODUCTION

In 2012, the Accreditation Council for Graduate Medical Education (ACGME) developed educational milestones to serve as the primary framework for competency-based assessment in graduate medical education.[1] These educational milestones were framed within specialty-specific sub-competencies, with each sub-competency belonging to one of six previously established ACGME core competencies.[2] A central tenet to the milestones framework is the emphasis on resident trainee assessment based on observable performance and behaviors.[3] While many workplace-based assessment strategies have been piloted, a comprehensive validated

approach to resident assessment within the milestones framework has yet to be developed.[4-6]

Workplace-based narrative assessment (WBNA), also known as the in-training evaluation report (ITER),[7] uses descriptive commentary for performance assessment and has been proposed as an alternative method to checklists and rating scales.[7-9] Through descriptive commentary, WBNA provides assessors with a version of assessment without the constraints of pre-selected ratings or options, theoretically allowing for a more robust analysis. WBNA can exist independently as an evaluation form, or in combination with checklists or rating scales as a hybrid evaluation model.

The benefits of WBNAs in medical education are well documented. WBNAs have been shown to be useful in ranking trainees,[10] detecting learners who are experiencing difficulty,[11] identifying milestone sub-competencies that are more difficult to assess,[10-12] and predicting the need for resident remediation.[13] In addition to providing a richer data source, narrative assessments are also appreciated by learners.[14,15] Whether used in addition to anchor-based rating tools[16] or as an independent assessment method, descriptive commentary can be a reliable method of assessment that influences faculty judgment on global resident performance.[7]

Despite these benefits, validity evidence for using WBNAs as a method for assessing milestone sub-competencies in graduate medical education is lacking. The prevalence of vague comments, such as "hard worker" and "pleasant to work with," are well-documented,[17-21] and it is unclear how beneficial these comments are in assessing learners within the milestones framework. Furthermore, while contextual framing and faculty development can provide more robust narrative assessments in terms of both quantity and quality of comments,[9] the frequency with which WBNAs comment on specific milestone sub-competencies remains unknown. Without knowing which milestone sub-competencies are being assessed, program directors and clinical competency committees (CCC) may be left to assume competence in a broad range of skills, despite a lack of explicit evidence to support those conclusions.[8]

This study aims to determine the frequency of milestone sub-competencies assessed through semi-annual WBNAs in an emergency medicine (EM) residency program.

METHODS
Settings and Participants
Faculty at the LAC+USC EM residency program complete semi-annual WBNAs on residents with whom they have worked over the prior six-month period. An internally created online form through the education management platform MyEvaluations allows faculty to provide descriptive responses to two prompts: "Please describe at least one area of strength for this resident" and "Please describe at least one area for potential improvement for this resident." Faculty WBNAs are encouraged but not mandatory, and not all faculty complete

Educational Research Capsule Summary

What do we already know about this issue?
Narrative assessments are a commonly used evaluation tool for making judgments on resident clinical performance.

What was the research question?
What milestone sub-competencies are assessed through narrative assessments in an EM residency program?

What was the major finding of the study?
Unstructured narrative assessments identified relatively few milestone sub-competencies.

How does this improve population health?
These results can improve evaluation tool design and faculty development to improve the validity for narrative assessments within the Milestones framework.

WBNAs on all residents. No formal training exists for faculty regarding milestone sub-competencies or workplace-based assessment strategies.

Study Design
We performed a retrospective analysis of the WBNAs of postgraduate year (PGY) 2-4 residents completed between the second semester of 2016 and the first semester of 2017. WBNAs of PGY-1 residents and second semester PGY-4 residents were excluded due to limited faculty contact with PGY-1 residents and a hypothesized concern from the study authors regarding a lack of critical assessment of PGY-4 residents during their final semester of training. The local institutional review board determined the study was exempt.

Protocol
Author DD collated, de-identified, and randomized the selected WBNAs. Three authors (SC, AJ, JR), blinded to both the identity of the faculty assessor and resident being assessed, reviewed the WBNAs to determine whether the comments assessed any of the 23 EM-specific milestone sub-competencies.[22] Prior to reviewing narrative assessments, the study authors SC, AJ, and JR met to establish a shared mental model by reading and discussing the ACGME milestones framework. We reviewed the first 50 WBNAs, resolved discrepancies as a group, and developed a guide detailing our interpretations of the milestones (Appendix A). We reviewed subsequent blocks of 50 WBNAs, discussed discrepancies, and updated our guide in an iterative manner. This process

continued until the inter-rater reliability between the three reviewers was good (k > 0.8). We then independently reviewed the remaining WBNAs and recorded the sub-competencies that each WBNA assessed in spreadsheets that included all 23 EM-specific milestone sub-competencies. For any given WBNA, there was no limit to the number of sub-competencies that could be assessed (Table 1).

Analysis

We performed descriptive statistics and conducted chi-square and analysis of variance tests for comparison on milestone proportions and means across three faculty levels to determine whether milestone sub-competencies were reported more frequently by specific faculty cohorts based on years of experience. All two-tailed significance tests were computed in Stata 13 with a set to 0.05 (StataCorp. 2013. Stata Statistical Software: Release 13. College Station, TX: StataCorp LP).

RESULTS

During the 2016-2017 study period, we analyzed 2517 WBNAs. WBNAs were completed for 51 PGY 2-4 residents by 61 faculty members. Each resident received an average of 49 WBNAs (range: 37 to 71), and each faculty member completed an average of 41 WBNAs (range: 1 to 102). From the 2517 WBNAs, we identified a total of 5130 milestone sub-competencies, with an average of 2.04 milestone sub-competencies assessed per WBNA. Of the 23 EM milestone sub-competencies, those most frequently identified through WBNAs were multitasking, medical knowledge, practice-based performance improvement, patient-centered communication, and team management. The sub-competencies least frequently identified through WBNAs were pharmacotherapy, airway management, anesthesia and acute pain management, goal-directed focused ultrasound, wound management, and vascular access. Overall, the frequency with which WBNAs assessed individual sub-competencies was low, with 14 of the 23 sub-competencies being assessed in less than 5% of WBNAs (Range: 0-33.3%) (Figure).

Junior faculty, defined as attending physicians in practice for less than five years, represented only 16% of the faculty, but completed 24% of the WBNAs. Conversely, senior faculty,

defined as attending physicians in practice for greater than 15 years, represented 26% of the faculty, but completed only 17% of the WBNAs. Mid-career faculty, defined as attending physicians in practice between 5-15 years, accounted for the 57% of the faculty and 58% of the WBNAs. On average, junior faculty members identified 2.30 milestone sub-competencies per WBNA, compared to 2.03 milestone sub-competencies per WBNA for mid-career faculty, and 1.88 milestone sub-competencies per WBNA for senior faculty.

There was a statistically significant difference in milestone sub-competencies identified by faculty cohorts based on years of experience (ie, junior, mid-career, senior) in 14 of the 23 EM milestone sub-competencies (Table 2). On average, senior faculty tended to identify fewer individual milestone sub-competencies on WBNAs when compared to their junior or mid-career faculty colleagues.

DISCUSSION

In this evaluation of 2517 WBNAs at a single residency program, we found that each WBNA on average identified two milestone sub-competencies, with WBNAs clustering around five specific sub-competencies and largely ignoring 60% of the sub-competencies. All sub-competencies are directly observable in the clinical environment,[22] and while certain sub-competencies such as medical knowledge can be observed elsewhere (eg, in-service examination, mock oral boards), those related to patient care and procedural skills that are best observed in the clinical environment were notably absent from the WBNAs. While junior faculty narratives assessed slightly more sub-competencies than mid-career or senior faculty narratives, the overall frequency of addressing milestone sub-competencies through WBNAs was low.

These findings are concerning because when WBNAs fail to comment on the majority of milestone sub-competencies, program directors and CCCs are left to make judgments regarding resident performance on a wide range of unassessed skills.[8] This is detrimental to resident education, as the assumption of competence limits future targeted observations and interventions by faculty members, and it may either suppress a resident's desire to self-report areas of weakness or it may promote a sense of inappropriate overconfidence when true performance lags behind resident self-assessment.

Despite the value of WBNAs as an assessment tool,[7-9] we hypothesize a lack of consistent faculty development as one reason for faculty's poor performance in identifying numerous milestone sub-competencies. According to van der Vleuten et al.,[23] as an instrument seeks to assess higher levels on Miller's pyramid,[24] the validity is more dependent on the assessors and the quality of the implementation as opposed to the instrument itself. Workplace-based observation and assessment of resident performance, and the subsequent narrative documentation of these observations and interpretations, is a skill that requires both training and practice. Too often, assessors receive little to no training in the practice of delivering WBNAs,[6] even though

Table 1. Example of a workplace-based narrative assessment identifying emergency medicine milestone sub-competencies.

Workplace-Based Narrative Assessment	Milestone(s) Assessed
"She has a great fund of knowledge, advocates for her patients, and does a great job managing the critically ill."	Medical Knowledge Patient Centered Communication Emergency Stabilization
I love working with him. He's very friendly, humble, hard-working, and enjoys learning."	None applicable
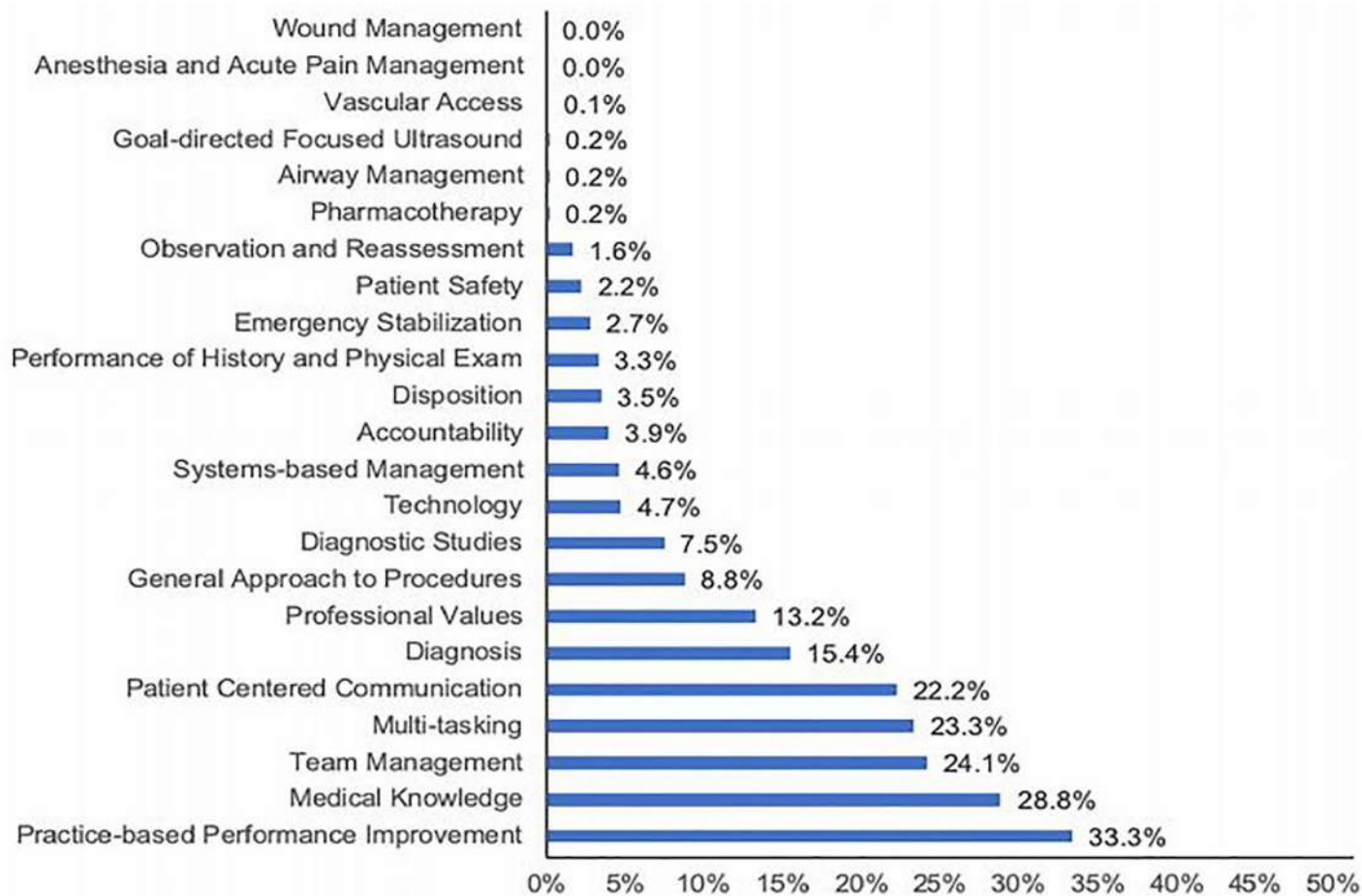
Figure. Frequency of emergency medicine milestone sub-competencies identified per workplace-based narrative assessment.

studies suggest that faculty development can improve the number and quality of narrative comments.[9] While no recurrent faculty training program exists within our department, we do not know whether prior faculty development initiatives had been implemented in past years. Regardless, the fact that junior faculty narratives assessed slightly more sub-competencies than mid-career or senior faculty narratives suggests that if there were prior faculty development initiatives, they did not have a lasting effect.

Faculty were more likely to comment on sub-competencies relating to the ACGME core competencies of interpersonal and communication skills, practice-based learning and improvement, and medical knowledge, than on sub-competencies relating to patient care and procedural skills. This differs from prior studies conducted in general surgery and internal medicine training programs, which demonstrated a higher frequency of faculty comments regarding patient care and greater variability in comments regarding interpersonal communication skills.[25,26] The difference in ACGME core competencies identified through WBNAs between our study and prior studies may be due to differing specialty-specific, faculty-resident dynamics,

varying prompts and constructs of the WBNAs used, faculty training in workplace-based assessment, or cultures inherent to respective specialties or institutions.

We found that junior faculty completed WBNAs more frequently than senior faculty and their WBNAs identified milestone sub-competencies more frequently. It is unclear why this may be; however, one explanation may be that junior faculty members are more familiar with the milestones framework than senior faculty. Additionally, junior faculty generally work more shifts than senior faculty, and thus may be more likely to observe and comment on observed behaviors.

LIMITATIONS

Our study had several notable limitations. It is a single-center, specialty-specific study, which limits its generalizability. The fact that we did not account for the number of shifts worked per faculty member limited our ability to assess for whether shift count influenced the differences among faculty cohorts. We did not account for faculty members who provided the same verbatim written commentary for each WBNA, regardless of resident

Table 2. Frequency of emergency medicine (EM) milestone sub-competencies identified by respective faculty assessor cohorts.

Emergency Medicine Milestone Sub-Competencies	Junior (<5 years)	Mid-Career (5-15 years)	Senior (>15 years)	p-value
Observation and reassessment	0.91%	2.54%	0.00%	<0.001
Disposition	2.28%	5.30%	0.16%	<0.001
Patient safety	4.33%	2.27%	0.64%	<0.001
Systems-based management	8.88%	4.81%	0.96%	<0.001
Diagnostic studies	12.07%	8.73%	1.44%	<0.001
Diagnosis	17.08%	17.47%	9.29%	<0.001
General approach to procedures	2.73%	5.23%	21.31%	<0.001
Patient-centered communication	14.12%	24.35%	23.08%	<0.001
Practice-based performance improvement	46.01%	27.03%	38.78%	<0.001
Multitasking	20.05%	25.86%	19.71%	0.002
Team management	30.07%	23.66%	20.99%	0.002
Medical knowledge	35.76%	27.10%	27.72%	0.002
Professional values	18.22%	12.24%	12.02%	0.003
Accountability	5.92%	3.78%	2.72%	0.028
Performance of history and physical exam	2.05%	4.06%	2.56%	0.056
Vascular access	2.00%	1.00%	0.00%	0.073
Airway management	0.68%	0.14%	0.16%	0.109
Emergency stabilization	3.87%	2.68%	1.92%	0.155
Goal-directed focused ultrasound	0.46%	0.14%	0.00%	0.176
Pharmacotherapy	0.00%	0.28%	0.00%	0.231
Technology	3.87%	5.23%	4.01%	0.325
Anesthesia and acute pain management	0.00%	0.00%	0.00%	-
Wound management	0.00%	0.00%	0.00%	-

performance, which was an observed practice. While this type of behavior may alter the overall frequencies of milestone sub-competencies our study identified, as well as the quality of the assessment provided, we chose to include their data because both residents and the CCC receive their comments on an individual level.

The WBNAs used at our institution did not include any prompting for faculty to comment on specific milestone sub-competencies, which may have resulted in lower frequencies of milestone sub-competencies identified. As a result, these findings may not be generalizable to institutions that use evaluation structures with specific milestone prompts. In addition, the lack of an annual formalized faculty training raises the question as to whether consistent faculty development would improve the frequency of milestone sub-competencies identified.

Finally, while we interpreted the WBNAs based on definitions and consensus, evaluators often "read between the lines" of narratives when providing summative assessments on residents.[8,27] Therefore, identifying the frequency of milestone sub-competencies may undervalue the role of WBNAs in providing information for summative assessments.

However, we would contend that a more analytical process than evaluator gestalt is necessary for improved reliability and validity in providing competency judgments on trainees.

We recognize that identifying milestone sub-competencies is not the only measure in determining the quality of an assessment. Similar to prior research,[26] many WBNAs commented on non-ACGME themes. While this study was not designed to evaluate these comments, prior research has demonstrated their value to both faculty[27] and residents.[7] However, if assessment of individual sub-competencies is desirable,[8,28] targeted faculty development activities can be implemented to enhance sub-competency identification. With improved assessments that target previously unaddressed milestone sub-competencies, CCCs and program directors will have better guidance towards providing summative assessments regarding resident performance.[8]

Future research should examine the effectiveness of these faculty development programs in improving the frequency of milestone sub-competencies identified, as well as evaluating for satisfaction of both residents and faculty members post-intervention. In addition, given the disparities in assessments of male and female residents,[29] it is important to examine the

role that gender (of both the assessor and trainee) plays in identifying which sub-competencies are identified through WBNAs. Finally, while we believe our coding guide is generalizable to other EM programs interested in mapping WBNAs to the milestones, it is possible that natural language processing, which aims to program machines to interpret human language,[30] could replace the need for manual assessment of WBNAs. Future research could look at the feasibility of natural language processing in the evaluation of WBNAs.

CONCLUSION

Our study demonstrates that unstructured WBNAs identify relatively few milestone sub-competencies. Faculty tend to assess similar sub-competencies related to interpersonal and communication skills, practice-based learning and improvement, and medical knowledge, while neglecting sub-competencies related to patient care and procedural skills. These findings can help shape faculty development programs designed to improve assessments of specific workplace behaviors and provide more robust data in the summative assessment of residents.

Address for Correspondence: David Diller, MD, LAC+USC Medical Center, Keck School of Medicine of University of Southern California, Department of Emergency Medicine, 1200 North State St, Room 1060, Los Angeles, CA 90033. Email: diller@usc.edu.

REFERENCES

1. Nasca TJ, Philibert I, Brigham T, et al. The next GME accreditation system--rationale and benefits. *N Engl J Med.* 2012;366(11):1051-6.
2. Team NK. Exploring the ACGME core competencies. Available at: https://knowledgeplus.nejm.org/blog/exploring-acgme-core-competencies/. Accessed 1/25/2019.
3. Carter WA. Milestone myths and misperceptions. *J Grad Med Educ.* 2014;6(1):18-20.
4. Dehon E, Jones J, Puskarich M, et al. Use of emergency medicine milestones as items on end-of-shift evaluations results in overestimates of residents' proficiency level. *J Grad Med Educ.* 2015;7(2):192-6.
5. Schott M, Kedia R, Promes SB, et al. Direct observation assessment of milestones: problems with reliability. *West J Emerg Med.* 2015;16(6):871-6.
6. Kogan JR, Holmboe ES, Hauer KE. Tools for direct observation and assessment of clinical skills of medical trainees: a systematic review. *JAMA.* 2009;302(12):1316-26.
7. Ginsburg S, van der Vleuten CPM, Eva KW. The hidden value of narrative comments for assessment: a quantitative reliability analysis of qualitative data. *Acad Med.* 2017;92(11):1617-21.
8. Hanson JL, Rosenberg AA, Lane JL. Narrative descriptions should replace grades and numerical ratings for clinical performance in medical education in the United States. *Front Psychol.* 2013;4:668.
9. Hatala R, Sawatsky AP, Dudek N, et al. Using in-training evaluation report (ITER) Qualitative comments to assess medical students and residents: a systematic review. *Acad Med.* 2017;92(6):868-79.
10. Ginsburg S, Eva K, Regehr G. Do in-training evaluation reports deserve their bad reputations? A study of the reliability and predictive ability of ITER scores and narrative comments. *Acad Med.* 2013;88(10):1539-44.
11. Cohen G, Blumberg P, Ryan N, P. S. Do final grades reflect written qualitative evaluations of student performance? *Teaching and Learning in Medicine.* 1993;5(1):10-15.
12. Frohna A, Stern D. The nature of qualitative comments in evaluating professionalism. *Med Educ.* 2005;39(8):763-8.
13. Guerrasio J, Cumbler E, Trosterman A, et al. Determining need for remediation through postrotation evaluations. *J Grad Med Educ.* 2012;4(1):47-51.
14. Sargeant J, Armson H, Chesluk B, et al. The processes and dimensions of informed self-assessment: a conceptual model. *Acad Med.* 2010;85(7):1212-20.
15. Govaerts MJ, van der Vleuten CP, Schuwirth LW, et al. The use of observational diaries in in-training evaluation: student perceptions. *Adv Health Sci Educ Theory Pract.* 2005;10(3):171-88.
16. Lefebvre C, Hiestand B, Glass C, et al. Examining the effects of narrative commentary on evaluators' summative assessments of resident performance. *Eval Health Prof.* 2018:163278718820415.
17. Ginsburg S, van der Vleuten C, Eva KW, et al. Hedging to save face: a linguistic analysis of written comments on in-training evaluation reports. *Adv Health Sci Educ Theory Pract.* 2016;21(1):175-88.
18. Ginsburg S, Gold W, Cavalcanti RB, et al. Competencies "plus": the nature of written comments on internal medicine residents' evaluation forms. *Acad Med.* 2011;86(10 Suppl):S30-34.
19. Lye PS, Biernat KA, Bragg DS, et al. A pleasure to work with--an analysis of written comments on student evaluations. *Ambul Pediatr.* 2001;1(3):128-31.
20. Kiefer CS, Colletti JE, Bellolio MF, et al. The "good" dean's letter. *Acad Med.* 2010;85(11):1705-8.

21. Canavan C, Holtman MC, Richmond M, et al. The quality of written comments on professional behaviors in a developmental multisource feedback program. *Acad Med.* 2010;85(10 Suppl):S106-9.

22. Beeson M, Christopher T, Heidt J, et al. The Emergency Medicine Milestone Project: A Joint Initiative of the Accreditation Council for Graduate Medical Education and the American Board of Emergency Medicine. Available at: https://www.acgme.org/Portals/0/PDFs/Milestones/EmergencyMedicineMilestones.pdf. Accessed January 25, 2019.

23. van der Vleuten CP, Schuwirth LW, Scheele F, et al. The assessment of professional competence: building blocks for theory development. *Best Pract Res Clin Obstet Gynaecol.* 2010;24(6):703-19.

24. Miller GE. The assessment of clinical skills/competence/performance. *Acad Med.* 1990;65(9 Suppl):S63-7.

25. Park YS, Zar FA, Norcini JJ, et al. Competency evaluations in the Next Accreditation System: contributing to guidelines and implications. *Teach Learn Med.* 2016;28(2):135-45.

26. Tekian A, Borhani M, Tilton S, et al. What do quantitative ratings and qualitative comments tell us about general surgery residents' progress toward independent practice? Evidence from a 5-year longitudinal cohort. *Am J Surg.* 2019;217(2):288-95.

27. Ginsburg S, Regehr G, Lingard L, et al. Reading between the lines: faculty interpretations of narrative evaluation comments. *Med Educ.* 2015;49(3):296-306.

28. Ekpenyong A, Baker E, Harris I, et al. How do clinical competency committees use different sources of data to assess residents' performance on the internal medicine milestones? A mixed methods pilot study. *Med Teach.* 2017;39(10):1074-83.

29. Dayal A, O'Connor DM, Qadri U, et al. Comparison of male vs female resident milestone evaluations by faculty during emergency medicine residency training. *JAMA Intern Med.* 2017;177(5):651-7.

30. Chary M, Parikh S, Manini A, et al. A review of natural language processing in medical education. *West J Emerg Med*. 2019;20(1):78-86.

An Inexpensive Conceptual Training Model for Transvenous Pacemaker Placement

Timothy P. Young, MD
Jennifer M. Tango, MD
Cory J. Toomasian, MD
Kayla J. Kendric, MD
Deena I. Bengiamin, MD

Loma Linda University School of Medicine, Medical Simulation Center, Loma Linda, California
Loma Linda University Medical Center and Children's Hospital, Department of Emergency Medicine, Loma Linda, California

Introduction: Emergent transvenous (TV) pacemaker placement can be life-saving, but it has associated complications. Emergency medicine (EM) educators must be able to teach this infrequent procedure to trainees.

Methods: We constructed a conceptually-focused, inexpensive training model made from polyvinyl chloride pipes and connectors, vinyl tubing, and a submersible pump. Cost of the model was $51. We tested the model with a group of 15 EM residents. We then asked participants to complete a survey reporting confidence with the procedure before and after the session. Confidence was compared using a Wilcoxon matched-pairs test.

Results: Confidence improved after the session, with a median confidence before the session of 2 (minimally confident; interquartile range [IQR] 1-3) and a median confidence after the session of 4 (very confident; IQR 3-4, p=0.001). All residents agreed that the model helped them to understand the process of placing a TV pacemaker.

Conclusion: Our TV pacemaker placement model was inexpensive and allowed for practice of a complex emergency procedure with direct visualization. It improved trainee confidence. [West J Emerg Med. 2020;21(1):180–183.]

BACKGROUND

Emergent transvenous (TV) pacemaker placement is a core emergency medicine (EM) skill.[1,2] While relatively rare, it is potentially life-saving in amenable unstable bradycardia.[3] However, positioning a temporary TV pacing wire to obtain electrical and mechanical capture is a multi-step, complex task. Complications, including arterial puncture, pneumothorax, myocardial perforation, wound infection, venous thrombosis, line sepsis, diaphragmatic pacing, and pacemaker dislodgement, occurred in 23% of cases where a pacemaker was placed by an EM attending.[4]

EM educators must be able to teach this procedure to trainees. In our training program at a tertiary-care, Level 1 trauma center, residents sometimes do not have the opportunity to perform this procedure on a live patient during their training. We use simulation to address this issue, but have encountered difficulty in demonstrating and practicing the process of TV pacing using standard central line models. In our well-stocked simulation center, we have access to multiple models that allow for placement of blind and ultrasound-guided central lines. However, these models do not simulate the right ventricle or accommodate the length of a TV pacing wire.

Anecdotally, our trainees have commented that the most intimidating factors in TV pacemaker placement are understanding the equipment and remembering the sequence of steps. TV pacemaker placement involves first placing an introducer sheath, which our residents generally have ample

opportunities to perform. However, the introducer sheath is generally smaller (6 French) than the more familiar, trauma-sized sheath (8.5 French), and a contamination shield must be correctly loaded onto the wire prior to placement. The process of "floating" the pacemaker using the wire balloon is difficult to conceptualize.

High fidelity has not been shown to have an advantage over low fidelity in simulation.[5] Simulation models with functional fidelity that lack physical fidelity have shown learning outcomes that are similar to models with both.[6] We find physical fidelity to be less important in teaching and learning TV pacemaker placement than the ability to demonstrate, practice, and visualize the complete procedure.

OBJECTIVES

We aimed to build a conceptually-focused model that would allow us to demonstrate emergent TV pacemaker placement inclusive of wire positioning in the right ventricle. We planned to determine the cost of the model and its impact on EM residents' confidence with the procedure.

CURRICULAR DESIGN
Model construction

We chose to create a functional TV pacemaker placement model instead of a realistic one, using ½-inch opaque polyvinyl chloride (PVC) pipe, clear pipe, vinyl tubing and water. We bought the pipe and tubing locally from a national-chain home improvement store and bought other components online. We used a PVC cutter to cut the pipe to appropriate sizes. We assembled the model to mimic anatomic blood flow, splitting the outflow from the pump to provide directional flow down the superior vena cava (SVC) and up the inferior vena cava (IVC) (Figure 1).
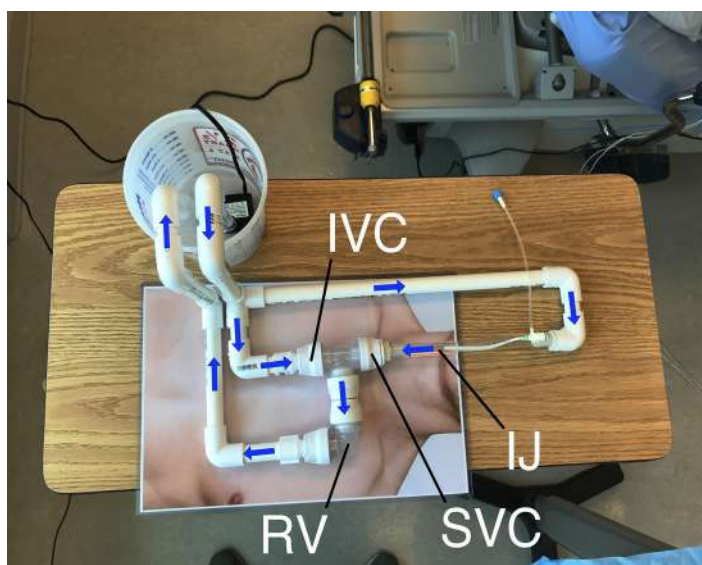
Figure 1. The transvenous pacemaker placement trainer. Arrows denote direction of water flow.
IJ, internal jugular; *IVC*, inferior vena cava; *RV*, right ventricle; *SVC*, superior vena cava.

This allowed the pacemaker balloon to "float" into the simulated right ventricle in the same manner as it would in a live patient. We drilled a hole in the vinyl tubing and placed a 6 French introducer sheath from our educational equipment supply. To allow air in the system to be expelled, we placed the pump in a 2 ½ quart bucket that acted as a reservoir. Lastly, we printed a photo of a human torso at roughly life-size and placed the model on the photo to allow for learner orientation. Total cost of the model was $51 (Table). It required approximately 2 hours to build.

Table. Transvenous pacemaker placement model materials.

| Material	Anatomy/function	Price
½ inch PVC pipe and connectors	Vessels	$20
Clear PVC pipe	SVC/IVC/RV	$10
Vinyl tubing	Internal jugular vein	$5
Submersible pump (tinyurl.com/y42u2mn6)	Heart	$10
2 ½ quart plastic bucket (tinyurl.com/yyy3aqqm)	Reservoir	$6
	Total	$51

PVC, polyvinylchloride; *SVC*, superior vena cava; *IVC*, inferior vena cava; *RV*, right ventricle.

We created a YouTube video to demonstrate the trainer in use (https://youtu.be/Y1JnOuqtjlg).

We tested the trainer with a group of postgraduate year (PGY)-2 and PGY-3 EM residents (Figure 2). Each resident used the trainer in an individual 30-minute session. At the end of each session, the resident was given a link to a survey and asked to complete it. The survey first asked whether the resident had placed a TV pacemaker in a live patient. The survey then asked the resident to rate confidence in the procedure prior to and after the session on a five-point Likert scale (1=unconfident, 2=minimally confident, 3=confident, 4=very confident, 5=extremely confident). Finally, the resident was asked whether the model helped him or her to understand the process of placing a TV pacemaker.

Lessons Learned

We found that the model offered several advantages over an opaque model. Two residents inflated the pacing balloon but did not turn the stopcock to trap the air in the balloon. When they removed the syringe, the balloon deflated. The visibility of the model gave them visual feedback and allowed them to correct this mistake and understand why it occurred. This would not have been possible with an opaque trainer or a live patient. The presence of a path to the right ventricle, with the junction between the clear PVC pipes being treated as the tricuspid
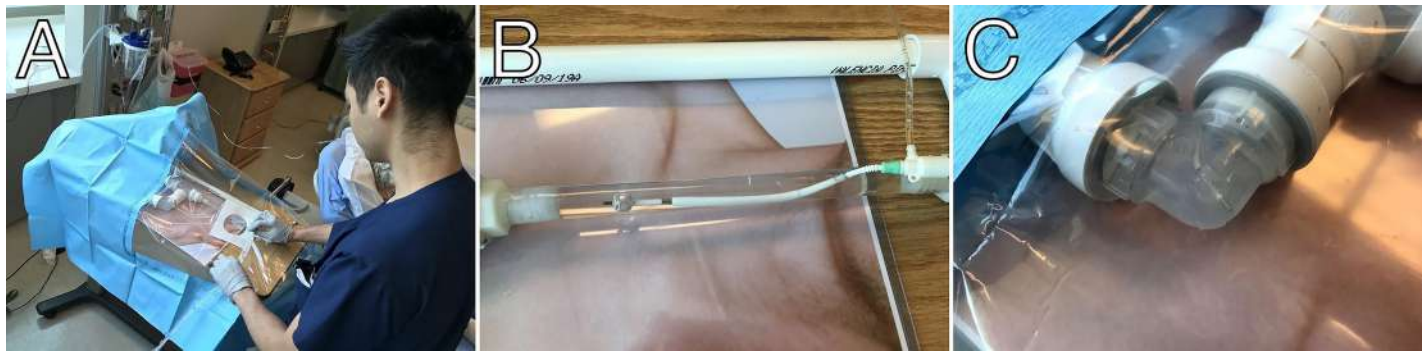
Figure 2. The transvenous pacer trainer in use (A). Inflation of the ballon (B). Wire placed in the right ventricle (C).

valve, allowed us to better demonstrate the potential valvular damage that could be done by withdrawing the wire with the balloon inflated. We were able to directly demonstrate why the wire needs to be passed to a minimum distance (such as 20 centimeters [cm]) before inflating the balloon, as residents were able to see the wire exit the sheath at about 13 cm. Preference for the right internal jugular as a site for the introducer sheath was easier to demonstrate with visible vessels. The anatomic, directional flow of water in the SVC and IVC allowed us to explain the function of the balloon.

Initially, the model leaked slowly. This occurred because we tried to connect PVC pieces by friction only. Standard PVC pipe glue at each slip joint resolved this problem. The pacemaker wire sometimes became caught on the lip of the connector, and we needed to redirect it manually by pushing on the outside of the tubing. We found this did not detract from conceptual learning.

IMPACT/EFFECTIVENESS

Of 15 participants, 13 completed an evaluation (87%). Five residents had placed a TV pacemaker in a live patient. All 13 reported an increase in confidence after the session. We compared confidence levels before and after using a Wilcoxon matched-pairs test. Confidence improved after the session, with a median confidence level before the session of 2 (minimally confident; interquartile range [IQR] 1-3) and a median confidence level after the session of 4 (very confident; IQR 3-4, p=0.001). All residents agreed that the model helped them to understand the process of placing a TV pacemaker.

Our study has limitations. Trainee confidence is considered to be a lower level of training evaluation, and does not guarantee improved behavior or better patient outcomes.[7] The procedure was placed in isolation, and the relaxed environment may have inflated self-reported confidence. Electrical and mechanical capture are not simulated by our model.

We successfully used the model for one subsequent training session. Maintenance consisted of draining and storing the model between sessions. We plan to implement this model into our regular procedural skills curriculum moving forward. Because of the low cost, we will be able to make the model

available for residents longitudinally for just-in-time teaching.

Our TV pacemaker placement model was inexpensive and allowed for demonstration and practice of a complex emergency procedure. It improved trainee confidence in our small sample. Other training programs may find it a good option to teach an important yet difficult-to-simulate procedure.

REFERENCES

1. Accreditation Council for Graduate Medical Education (ACGME) Review Committee for Emergency Medicine. Emergency Medicine Defined Key Index Procedure Minimums. Available at: https://www.acgme.org/Portals/0/PFAssets/ProgramResources/EM_Key_Index_Procedure_Minimums_103117.pdf?ver=2017-11-10-130003-693. Accessed December 9, 2019.

2. Harrigan RA, Chan TC, Moonblatt S, et al. Temporary transvenous pacemaker placement in the Emergency Department. *J Emerg Med.* 2007;32(1):105-11.

3. Piela N, Kornweiss S, Sacchetti A, et al. Outcomes of emergency department placement of transvenous pacemakers. *Am J Emerg Med.* 2016;34(8):1411-14.

4.   Birkhahn RH, Gaeta TJ, Tloczkowski J, et al. Emergency medicine-trained physicians are proficient in the insertion of transvenous pacemakers. *Ann Emerg Med.* 2004;43(4):469-74.

5.   Norman G, Dore K, Grierson L. The minimal relationship between simulation fidelity and transfer of learning. *Med Educ.* 2012;46(7):636-47.

6.   Schoenherr JR, Hamstra SJ. Beyond fidelity: deconstructing the seductive simplicity of fidelity in simulator-based education in the health care professions. *Simul Healthc.* 2017;12(2):117-23.

7.   Kirkpatrick JD, Kirkpatrick WK. Kirkpatrick's Four Levels of Training Evaluation. Association for Talent Development; 2016.

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