

# Fostering Students' Personal and Professional Growth: Responding to Error During the Internal Medicine Clerkship

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## ABSTRACT

**OBJECTIVES:** Developing professionalism is critical to medical education; accordingly, professionalism curricula may be implemented longitudinally throughout undergraduate medical education. Here we share our experiences addressing student response to medical error as a component of professionalism education during the core clerkship year.

**METHODS:** This pretest–posttest study reports medical students' knowledge regarding learning and growing in response to medical error. Students complete an online module, *Beyond Recovery: Learning and Growing in the Wake of an Error*, during the Internal Medicine Clerkship. We analyzed matched pre- and posttest responses using the Wilcoxon signed-rank test.

**RESULTS:** Pre- and posttest queries addressed 5 key elements during clinician assessment of medical error: self-expectations of perfection, long-term guilt following an error, likelihood of leaving the medical profession following an error, ability to address error with patients and families, and ability to grow in response to medical error. Results indicate students felt significantly more comfortable after completing the module in key components of managing emotions and responses in the wake of an error.

**CONCLUSION:** Benefits observed in medical students' perspectives include improved ability to move forward following medical error, ability to engage with affected patients and families, and capacity to learn from mistakes. Despite these positives, students' high self-expectations of perfectionism were unchanged.

**KEYWORDS:** Professionalism, medical error, undergraduate medical education

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## Introduction

Professionalism is foundational to the physician's commitment to patients, their loved ones, colleagues and healthcare teams, and society. Therefore, professionalism is an essential component of medical education, along with preclinical and clinical training. Exposing learners to the tenets of professionalism with assessment limited to knowledge only has become the usual way to demonstrate competency. Developing professionalism competency requires foundational knowledge followed by experience, feedback, and reflection; demonstrating competency requires validated assessment of observable behaviors.

Professionalism is a component of competency-based health professions education.<sup>1,2</sup> Medical educators have struggled with defining a professionalism curriculum and related assessment challenges following the general adoption of this competency.<sup>2</sup> At Geisinger Commonwealth School of Medicine (GCSOM), the Doctor of Medicine (MD) program includes a longitudinal personal and professional development (PPD) curriculum that is integrated throughout students' undergraduate medical education. This PPD curriculum has been implemented to address the institutional and educational program objectives to ensure

our graduates' competency to meet professionalism expectations of medical doctors.

A component of the PPD curriculum was deployed using *Growing and Learning in the Wake of an Error*, an interactive module from the Center for Professionalism and Communication in Health Care, originally ProfessionalFormation.org (PFO), which was developed through a collaborative process of experts in professionalism education and case-based, team learning with an active learning session.<sup>3,4</sup> The aim of this study is to assess the change in third-year medical students' knowledge about learning and growing in response to medical error through PFO engagement during the Internal Medicine (IM) clerkship.

## Methods

### *Study design, participants, and target audience*

This is a pretest–posttest educational research study. Convenience sampling was used to identify participants. Data from students who completed the IM clerkship at GCSOM during the 2020–2022 academic years were eligible for inclusion. Data from students who did not follow assignment instructions were excluded. Student responses with a duplicate numeric score of



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50 for each of the 5 pre- and posttest questions were excluded as nonresponses. The primary audience for this study is faculty who design, implement, and evaluate educational content regarding response to medical error for students. The target audience for the curricular intervention reported here is medical students in the IM clerkship. We did not seek written informed consent from students whose data were included from this curriculum assignment, as all data are reported in aggregate, and individual identifiers are not included. This study met criteria for exemption by the Geisinger Institutional Review Board (#2019-0293) and falls under the exemption category under 45 CFR 46.104 category 1 and informed consent is waived.

### *Pre- and posttests and statistical analysis*

Pre- and posttests from the PFO module were used to assess changes in students' knowledge and attitudes. Module authors, subject matter experts (SMEs), developed the pre- and posttest questions. Questions underwent content and face validity testing by module editors, also SMEs. The module was reviewed by SMEs from the 13 medical schools who developed and deployed ProfessionalFormation.org.<sup>5</sup> Those schools piloted the module in their curricula and provided feedback to module editors.<sup>5</sup> The pre- and posttest assessments are identical and are presented with a numeric slider rating scale, with a range (anchor) of 0 (not at all) to 100 (completely) and a default value of 50.<sup>4</sup> We did not alter the questions for use in this study. Matched pair responses from students who completed both the pre- and posttest were included in the final analysis. Results of the Shapiro–Wilk test of normality demonstrated that responses to most measures were not normally distributed. Therefore, the Wilcoxon signed rank test was used to compare the matched pre- and posttest data and measure the difference in knowledge regarding learning and growing in response to medical error.<sup>6,7</sup> The significance level was set at .05. Statistical analysis was completed using SPSS (SPSS Statistics).

### *Educational setting and intervention*

GCSOM students complete preclinical education in Scranton, Pennsylvania, and transition to 1 of 5 regional campuses located in Pennsylvania and New Jersey to engage in core clinical clerkships. The core clerkship year includes a transition to clerkship course, followed by clerkships in Family Medicine, IM, Pediatrics, Obstetrics and Gynecology, Surgery, and Neuroscience, which includes Psychiatry. One week between clerkships, termed a bridge week, includes administration of National Board of Medical Examiners subject exams, content review for the preceding clerkship, and orientation to the upcoming clerkship.

PPD faculty provide curriculum coordinators with information to create the PFO assignment and post announcements to the Canvas learning management system (instructure.com). Coordinators assign the module to students who will be completing the IM clerkship on the Friday preceding the clerkship

start date. Students are assigned the pretest, exercises 1, 3, and 5, and the posttest. Students complete the pretest prior to beginning the module. Module exercises include a prompt followed by a comment box into which students enter free-text responses. Peer responses are not visible until the student has submitted their contributions. Students complete assignments independently and asynchronously. Exercises 1 and 3 must be completed by mid-clerkship. The posttest is completed after the module and all exercises are completed, prior to the facilitated discussion. Staggering due dates ensures that students participate in the module while they are completing the clerkship. The PPD director verifies completion of assignments. Students attend a synchronous facilitated discussion during the last week of the IM clerkship or the following bridge week. Students with an excused absence on the date of the facilitated discussion may be excused from synchronous participation and provided with an alternative assignment. The facilitated discussion, led by the PPD Director, occurs virtually using the Zoom platform because students are dispersed across regional campuses. Faculty facilitators include the PPD Director, Assistant Chair of IM, IM Clerkship Director for a regional campus, and PPD faculty. All faculty facilitators receive access to PFO, a facilitator's guide developed specifically for the virtual synchronous discussion, and virtual training provided by the PPD Director.

A PowerPoint presentation supports the facilitated discussion, which begins with a 3 min introduction that outlines the session format and guidelines. Participants review learning objectives from the PFO module in parallel with learning objectives for the facilitated discussion, followed by a 12 minute presentation of the concepts introduced in the module. The presentation includes a clinical scenario presented to the student group. Students and facilitators then are placed into 1 of 3 breakout rooms with approximately 8 students in each for a 40 min discussion. Participants in each breakout room answer a set of questions based on the clinical scenario and representing the perspectives of a medical student, resident, and colleague. Faculty facilitators identify student volunteers to report a small-group summary during the large-group debriefing. The PPD Director concludes the facilitated discussion with closing remarks (5 min) based on student group contributions. Qualitative feedback was obtained through the facilitated discussion and was used by faculty for continuous quality improvement. This process is repeated for each cohort of students who complete the IM clerkship.

## **Results**

A total of 214 students completed the IM clerkship during the study period. We excluded pretest responses from 82 students and posttest responses from 121 students with scores of 50 for all questions. Of the remaining 132 students who followed assignment instructions, 86 had matched-pair responses for both pre- and posttest results.

Pre- and posttest results for question 1 were similar, with no significant difference ( $n = 86$ ,  $z = -0.63$ ,  $P = .53$ ); see Table 1. Statistically significant differences in the answers to pre- and posttest questions 2-5 were observed. For question 2, pretest scores were significantly higher than posttest scores ( $n = 86$ ,  $z = -5.46$ ,  $P < .001$ ). Posttest scores were significantly higher than pretest scores for question 3 ( $n = 86$ ,  $z = -3.00$ ,  $P = .003$ ). Posttest scores were also significantly higher than pretest scores for question 4 ( $n = 86$ ,  $z = -6.72$ ,  $P < .001$ ) and question 5 ( $n = 86$ ,  $z = -6.68$ ,  $P < .001$ ).

## Discussion

Our aim was to assess learning related to response to medical error for students during the IM clerkship. Students' responses to question 1, "Though I know that to err is human, I strive for perfection" demonstrate extensive identification with perfectionism among respondents both prior to and after completing the module ( $P = .53$ ). Analysis of the change in responses to question 2, "feeling guilty forever following a medical error" ( $P < .001$ ), and 3 "thoughts of quitting the profession following a medical error" ( $P = .003$ ) indicates acquisition of knowledge and points to development of self-awareness and self-compassion. Based on the significant changes in responses to questions 4 ( $P < .001$ ) and 5 ( $P < .001$ ) it appears that students felt more comfortable about key components of managing emotions and responses related to medical error after completing the assignment.

The clerkship year is a useful time to introduce students to the application of the tenets of professionalism as students are witnessing the positive and negative influences of the hidden curriculum in the clinical learning environment.<sup>8</sup> Providing an opportunity for students to reflect on witnessed experiences of

medical error while they incorporate evidence-based content provides a unique educational experience for student development in several competencies, including patient care, communication, and professionalism. By engaging in this educational opportunity, students demonstrated increased comfort with challenging concepts such as how they would communicate with patients and families after an error and how they would respond to a medical error in a way that led to professional growth.

Although student perceptions of their knowledge, skills, and attitudes related to responding to a medical error increased, students' self-perception of perfectionism was unchanged following completion of the module. Considering the pervasiveness of perfectionism among medical students and, indeed, physicians, the responses are unsurprising. Perfectionism is a common trait among health professionals, including medical students, and has been related to burnout and distress.<sup>9</sup> Our data confirm the prevalence of perfectionistic tendencies in this population and indicate an area for future curricular and well-being interventions.

After completing the module, learners' feelings of guilt and thoughts of leaving the profession following a medical error changed for the better, which is important to consider in the context of medical student and physician well-being, resilience, and burnout.<sup>10</sup> In addition, their increased ability to engage patients and families following a medical error helps medical students and physicians step forward toward transparency and disclosure of error critical to patient safety. When physicians improve and grow in wake of an error, they are participating in the lifelong professional development of the physician.<sup>11,12</sup>

Recognizing professionalism learning goals related to response to medical error places our study results within the

**Table 1.** Wilcoxon signed rank test comparison of paired pre-post responses.

QUESTION	TEST	MEAN n = 86	SD	PERCENTILE			POST- PRE Z*	Asympt. Sig (2-tailed)
				25TH	50TH (MEDIAN)	75TH		
1. Though I know that to err is human, I strive for perfection	Pre	76.45	19.00	68.75	79.50	90.00	0.63 <sup>a</sup>	.53
	Post	75.09	22.62	60.75	84.00	91.25		
2. If I made an error that caused serious harm to a patient, I would feel guilty forever about it	Pre	77.44	20.08	66.00	82.50	95.00	5.46 <sup>a</sup>	<.001
	Post	64.49	24.47	53.00	67.00	85.00		
3. If I made an error that caused serious harm to a patient, I would seriously consider quitting my profession	Pre	43.43	23.39	28.50	39.50	60.00	3.00 <sup>a</sup>	.003
	Post	37.93	25.85	18.00	34.00	54.00		
4. I know how I would respond to an error in communicating to my patients and their families	Pre	55.30	20.97	39.75	59.00	75.00	6.72 <sup>b</sup>	<.001
	Post	72.00	19.04	59.75	73.50	85.00		
5. I know how I would respond to an error in a way that would lead me to grow personally	Pre	60.36	20.61	48.00	60.50	74.25	6.68 <sup>b</sup>	<.001
	Post	77.01	16.94	65.00	78.50	91.00		

<sup>a</sup>Based on positive ranks.

<sup>b</sup>Based on negative ranks.

broader literature of this field. While professionalism education for health professionals through interactive online modules is not unique,<sup>13</sup> specific data regarding education about response to error integrated within the IM clerkship are lacking. Data about medical students and medical error are often presented in the context of patient safety.<sup>13–19</sup> A recent study of medical students in Taiwan explored factors that limited students from speaking up about medical error but did not address education about response to error or the potential professional impact on students.<sup>18</sup> Studies focused on medical error specifically during the IM clerkship in the United States also emphasize education about error identification and reporting.<sup>17,19,20</sup> While education and understanding about students' roles in error prevention, occurrence and reporting are critical, we think it is equally critical to explore educational interventions that support learning about effective response to medical error. Such interventions may help students learn how to respond effectively, cope with professional challenges in a constructive way, and prevent or mitigate the negative consequences of perfectionism.

Unlike existing data, the focus and unique aspect of our study is assessing outcomes of education about effective response to error. GCSOM students' engagement with PFO content during the IM clerkship resulted in significant differences in self-perceptions of their ability to respond with a growth mindset to the experience of medical errors in their clinical training. These findings have practical implications for educators, specifically for curriculum development and implementation. Our results support efforts to refine when concepts related to professionalism and medical error such as just culture and the second victim phenomenon are introduced and how they are taught during undergraduate medical education. We did not assess long-term outcomes of response to error following the IM clerkship. Ensuring that knowledge obtained through this PFO module, or professionalism curricula integrated in clerkships, is associated with improved outcomes in graduate medical training and practice should be considered for future studies.

Limitations of this study include convenience sampling, lack of a power analysis and pilot testing of specific questions. Another limitation is the self-reporting of increase in knowledge, skills, and attitude in response to medical error. Our sample is limited to students from one US-based medical school, and results may not be reflective of other populations who engage with PFO.

## Conclusion

Professionalism education addressing response to medical error was effectively delivered utilizing an interactive module during the IM clerkship. Positive changes in the professional values and behaviors of addressing guilt, resilience, engagement with patients and families, and an improved ability to grow in the aftermath of medical error were demonstrated. Despite these positive changes, high self-expectations of perfectionism were unchanged.

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## Author Contributions

Study conception and design: M. Schmude and T. Adonizio; data collection: M. Schmude and T. Adonizio; analysis and interpretation of results: H. Ellison; manuscript preparation: M. Schmude, T. Adonizio, H. Ellison., M. Shoemaker. All authors reviewed and approved the final manuscript.

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