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Primer in Patient Safety Concepts: Simulation Case-Based Training for Pediatric Residents and Fellows

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Abstract

Introduction: Health care quality and patient safety remain one of the core areas of focus for the Accreditation Council for Graduate Medical Education. In addition to using the traditional approach to teaching patient safety, disclosure of a safety event and introduction to the concepts of just culture and safely doing less add a unique perspective to our module. **Methods:** This 4-hour learning activity was conducted using a formal PowerPoint presentation, simulation, and interactive discussion/debriefing. The presentation reviewed safety concepts and introduced learners to the concepts of just culture and safely doing less. The first case was a standard scenario in which participants assessed a sick but stable child and evaluated the use of premature closure bias that might preclude them from making the correct diagnosis. The second case represented disclosure of a medical error. Participants were evaluated on their communication/professionalism skills and challenged to discover overuse as one of the root causes of medication error. Pre- and posttest surveys were used for learner evaluation. **Results:** Participants showed significant improvement on content-based questions, increasing from 51.7% to 69.3% correct ($p < .001$). After Bonferroni correction, only the question on overdiagnosis showed significant improvement ($p < .001$). Participants reported significantly increased confidence in all areas evaluated ($p < .001$). **Discussion:** Participants placed high value on the workshop. The question on overdiagnosis showed significant improvement on the posttest. The concepts of patient safety, just culture, and safely doing less can be introduced to learners at a formative stage in their career through simulation.

Keywords

Simulation, Patient Safety, Just Culture, Safely Doing Less

Appendices

- A. Case 1.docx
- B. Case 2.docx
- C. Introduction-Agenda.docx
- D. Pre- and Posttest.docx
- E. Didactic Presentation.pptx
- F. Presentation Talking Points.docx
- G. Debriefing Summary.docx

All appendices are peer reviewed as integral parts of the Original Publication.

Educational Objectives

By the end of this activity, learners will be able to:

1. Explain why patient safety is focused on in graduate medical education.
2. Define the different terminologies used, such as medical error, near miss, and sentinel event.
3. Describe and explain the just culture approach to patient safety.
4. Apply the concept of safely doing less during root cause analysis.
5. Identify the institutional and program approach to teaching patient safety and error reporting.

Introduction

Health care quality and patient safety remain one of the core areas of focus for the Accreditation Council for Graduate Medical Education (ACGME) and the Clinical Learning Environment Review program.¹ The 2017 updated common program requirements stipulate that both faculty and graduate medical education (GME) trainees (residents and fellows) must actively participate in patient safety systems and contribute to a culture of safety in their work environment.^{2,3} Training programs are tasked with several targets in this regard: (1) They must promote safe interprofessional team-based care and educate trainees on patient safety activities, as well as promote awareness of the patient safety systems in place in the institutions in which they work. (2) Trainees must participate in activities designed to promote patient safety, including root cause analysis of safety events; must do so without fear of retribution; and moreover must have

access to subsequent reports. (3) Finally, trainees must be taught how to disclose patient safety events to families and patients in a manner using good judgement.

Our institution requires mandatory patient safety training for all residents at least twice during their 3 years of training (once for fellows). In previous years, our residents participated in the institutional training; however, this was not specific to pediatrics. We felt that using a simulation-based training module, geared towards our GME trainees, would be of greater benefit. This was partly based on feedback from our residents, most of whom had requested more opportunities for active learning modalities rather than traditional lecture-based classroom learning. This is similar to trends that have been observed in other institutions.⁴ We also wanted to incorporate disclosure of patient safety events and introduce our trainees to the concepts of just culture and safely doing less, thus giving them a more comprehensive overview of the approach to patient safety.

We chose to use a low-tech simulation learning modality rather than a problem-based learning discussion (PBLD) because we felt the learners would be more engaged with this modality. While only a few learners participated in the role-play, the entire group took part in the debriefing and other aspects of the workshop. The low-tech nature of our simulation allows easy replication at other sites. This educational module does lend itself to a PBLD format, and others may choose to make such an adaptation.

The concept of safely doing less was introduced by Schroeder, Harris, and Newman in 2011.⁵ They proposed that harm from overuse was a missing component of the safety dialogue and that the root cause analysis of harm from a medical intervention should include information on the indication for the intervention. Zapata, Lai, and Moriates more recently called out excessive resource utilization itself as a possible adverse event.⁶ Although discussion of overuse as a significant contributor to escalating health care costs is becoming more frequent, active dialogue on the harms of overuse is still lacking, particularly in training programs where young physicians first begin to learn the independent practice of medicine. While GME training programs are beginning to emphasize cost-conscious care,⁷⁻¹⁰ the patient safety aspects of overuse may be ignored. Although most programs do an excellent job of teaching trainees how to work through differential diagnosis, order laboratory tests, and diagnose and treat patients, they must also teach their trainees the possible harms of excessive testing, overdiagnosis, and overtreatment. This should be viewed as an integral component of the environment of inquiry that shows up as a regular question on ACGME program and resident surveys.

In addition, our parent institution focuses on a just culture approach to patient safety. The just culture approach emphasizes that medical errors are seldom the result of an individual's actions; rather, the fault often lies in the system. This is crucial to ensuring that people feel they work in a blame-free, open, fair, and just culture where there is a systemic approach to problems, with an emphasis on designing safe work systems. Creating a fair and just culture has been shown to improve patient safety, with enhanced employee engagement and participation leading to a safer work environment.¹¹ We explained this concept in detail to our trainees during the PowerPoint presentation. Our institutional leaders have been trained in just culture, and our faculty felt that residents, an integral component of the medical team, should understand these concepts.

There are several patient safety educational publications in MedEdPORTAL. Gill, Cowart, Hatfield, et al. developed an interprofessional training module addressing the core competencies of communication and teamwork in the context of patient safety.¹² Similarly, Stewart, Lye, Lopez, Mothner, Camp, and Vachani developed modules on quality improvement (QI), patient safety, and evidence-based practice.¹³ However, neither of these addressed the concepts of safely doing less and just culture. Keefer, Orringer, Vredevelde, Warrior, and Burrows described a formal longitudinal curriculum incorporating QI and patient safety in GME training,¹⁴ while Allen-Dicker, Markoff, Nguyen, Radbill, and Shah emphasized the importance of integrating residents into ongoing departmental patient safety efforts, focusing on upper-level residents.¹⁵

Our resource is unique in several ways. The training module was specifically developed for our pediatric GME trainees, with a focus on interns. The cases involved pediatric scenarios with limited clinical complexity in order to emphasize the patient safety and value-based care aspects. The purpose was to make certain that our trainees were aware of the importance and relevance of including steps to ensure patient safety in their daily practice while making every effort to incorporate concepts like safely doing less. The importance of value-based care is being recognized as an important component of GME training. Wiest, Farnan, Byrne, et al. used simulation training to reveal lack of awareness of low-value care, particularly among interns.¹⁶ Furthermore, we also introduced our trainees to the concept of just culture. Use of simulated patients as part of both scenarios, as well as didactic instruction and interactive discussion/debriefing, helped to ensure that our trainees stayed engaged and involved. Disclosure of a safety event and introduction of the concepts of just culture and safely doing less as part of the discussion on patient safety are unique features of this module as compared to any other patient safety–related educational program in *MedEdPORTAL*.

Other learners participating in this training included upper-level pediatric GME trainees. While these learners were expected to be more familiar with patient safety concepts, our institution requires that advanced learners repeat patient safety training at least once during their training period. These concepts need ongoing reinforcement, and as noted earlier, experiential learning appears to be an effective and often underutilized tool in GME.⁴ In addition, concepts such as safely doing less and just culture had not previously been incorporated in earlier patient safety modules for these trainees.

Methods

This training was designed to replace the institutional safety training required for all learners at our institution. Besides traditional patient safety teaching, we introduced the concepts of safely doing less and just culture, as described in detail in the previous section.

The total duration of this simulation training (Appendices A & B) was 4 hours and is outlined in the introduction and agenda document (Appendix C). The training itself consisted of an introduction to the module and a pretest (Appendix D), followed by a formal PowerPoint presentation (Appendix E; talking points, Appendix F). Next came the two patient simulation cases. Both cases were followed by debriefing sessions. The training concluded with a posttest (Appendix D) followed by a final group debriefing (Appendix G). Time was also allocated for learner report-out. The posttest was the same as the pretest, with the addition of a session evaluation on the last page. The target audience for this training was pediatric GME trainees, with a focus on interns. No prerequisite knowledge was required from the learners.

To evaluate this training activity, a pre- and posttraining survey was designed and refined by the facilitators to address the participants' learning. The survey consisted of nine content-based questions, in addition to reporting of the participants' confidence with various aspects of patient safety and their evaluation of the workshop's components. Pre- and posttraining surveys were matched using a unique, anonymous identifier. Results were summarized by percentage correct and average Likert-scale score. Hypothesis testing was performed using the sign test. In cases of multiple testing, Bonferroni correction was utilized to minimize type I errors.

Equipment/Environment

This training activity was carried out in our simulation center, although parts can be done even when no such center is available. A classroom setting can be used, but learners should be seated in such a way that interactive discussion is feasible. For the simulation sessions, the same room may be used to set up the equipment and position the actors and training mannequins; however, the room should be large enough to accommodate all the learners. This may only be feasible in the case of a small group of learners (four to six), where two participate in the actual simulation and the remainder observe at the other end of the room. In our case, because the group was large and we had available space in our dedicated

simulation center, the cases were set up in separate rooms and video-conferenced to an adjacent classroom where all learners not serving as actors were observing the simulation cases. Two residents (one intern and one senior) participated in each simulation case while the rest of the learners observed on television monitors in real time from the adjacent classroom.

We did not use standardized patients for our scenarios because none were available at our institution. Instead, we used simulated patients as family members. Simulated patients differ from standardized patients in that the former do not have formal training in acting or communication. Simulated patients are useful in cases where medical errors are being disclosed, such as in the second case; in cases where end-of-life care discussions are being held; or with hybrid cases using high-fidelity mannequins. Residents can also be involved in the simulation, playing the roles of the parent actors, which can enhance trainee engagement.

Supplies for Case 1 included a fully equipped code cart, patient monitors, personal protective equipment (gowns, gloves, mask), a lumbar puncture tray, intravenous line placement equipment, and an intravenous fluid bag (normal saline as well as D5 half normal saline). No specific supplies were needed for Case 2, although a mannequin could be used in order to make the environment more realistic if needed. In our instance, we did use a mannequin with attached monitors. Additional material needed included copies of the facilitator's guide, the PowerPoint presentation and a projector, evaluation forms, attendance sheets, and audiovisual equipment.

Personnel

Case 1:

- Family member (one): We had a single simulated family member for this case.
- Patient can be a mannequin, as in our case, or can be a simulated patient, if one can be arranged for.
- Resident volunteers (one to two): an intern and a senior who presented the case vignette and then were told to go into the room where the patient, nurse, and parent were present.
- Nurse(s) (one to two).

Case 2:

- Parent (one to two): In this case, if two actors are available, then two parents can be present.
- Residents (two): an intern as well as a senior resident.
- Nurse (one).
- Baby mannequin: optional.

Implementation

Our simulation center had set up a separate classroom where we gave the introduction as well as the PowerPoint presentation. The trainees were ushered into the room at the beginning of the session. This was where the pre-/posttests and debriefing sessions took place. This was also where the trainees observed the simulations in real time. The classroom was equipped with computers as well as a smart board and connected to other rooms in the center via audiovisual equipment. Simulation cases were set up in two separate rooms with audiovisual capability.

The session started with an introduction delivered by the first author describing how the 4-hour session would run (Appendix C). Next, the trainees were administered the pretest (Appendix D). This took about 15 minutes.

After the pretest came the PowerPoint presentation (Appendix E). The presentation provided an overview of the basic concepts of patient safety and other learning objectives as described in detail in the introduction. Specific talking points for individual slides (Appendix F) are included for instructors. The PowerPoint was presented to the learners by the faculty responsible for putting it together. This

presentation can be done by one or more instructors at other institutions as needed by others implementing this module.

After the presentation was over, faculty instructors asked for volunteers among the trainees to participate in the simulation cases (two trainees for each case). The instructors presented the trainees with the individual case scenarios, as detailed in the separate case templates.

For Case 1, the room had been set up with an infant mannequin. Cardiorespiratory monitors had already been attached to the mannequin, and vital signs were displaying on the monitors. Triage vital signs had been recorded by the nurse. The family member (simulated patient/actor) was seated at the bedside. The room was equipped with a code cart, lumbar puncture tray, and all the supplies listed above.

The trainees were allowed about 15 minutes to talk with the parent as well as proceed with case evaluation and management. Two faculty members were present in the room to observe and redirect the conversation if needed, while the other faculty instructors and trainees observed from the classroom.

After the allocated time was over, the trainees returned to the classroom, where the faculty proceeded with the debriefing. This started with asking the trainees who had performed the simulation what their thought processes had been and why they had proceeded as they did.

The discussion was then opened to all the trainees, and input was obtained as to what had been done right, what had been missed, and what else could have been done. All faculty instructors were present for the debriefing. At the end of the session, faculty wrapped up by revisiting the salient features of the case and important lessons learned. The debriefing sessions were led by two faculty members, with all other faculty participating in the discussion.

A 10-minute break was then taken while the faculty briefed the actor parent for the second case and provided background information. For Case 2, only the mother was seated in the room, with two other chairs for the trainees. The simulation center had a baby mannequin lying in the infant crib; the baby was attached to monitors but not to any intravenous fluids.

The two trainees who had volunteered were given a brief history of the case. They proceeded to enter the room to talk with the mother. A process similar to the first case was followed for this one, with time allocated for discussion with the mother, followed by a return to the main classroom for the debriefing and wrap-up by the faculty. At the end of the debriefing for the second case, learners were given the opportunity to report out and share take-home learning points. The posttest was then administered to all trainees. Wrap-up of the session followed, with final debriefing and reflections by faculty and trainees regarding the training.

Assessment

Pre- and posttests were used to assess learner knowledge and understanding of the concepts reviewed.

Debriefing

The debriefing summary (Appendix G) contains a written description of the clinical discussion points that relate to the simulated cases. It is designed to be read both by the instructor, prior to each case, in order to refresh critical concepts, and by the learner, after the case, to solidify learning points discovered during the simulation.

Following the completion of the case simulation, it is recommended that the learner first be given the opportunity for self-reflection using open-ended questions such as the following:

- Overall, how did you think the case went?
- What do you think you did well?

- What do you think is an area where you could improve?
- What was your thought process when you did this . . . ?
- Why did you proceed that way?
- What could you have done differently and why?
- What were the salient features of the case?
- What are the lessons learned?

The debriefing summary can be given to the trainees as a handout following the simulation. For our training, senior residents led the discussion, facilitated by faculty instructors. Our faculty instructors were all seasoned, as described in the Faculty Characteristics section below, and had previous experience with running simulation sessions. In addition, all of them regularly participated in faculty development addressing different aspects of this training, such as communication and professionalism.

Results

Participants showed significant improvement on content-based questions, going from 51.7% correct on the pretest to 69.3% correct on the posttest ($p < .001$; Table 1). After Bonferroni correction, only the question on overdiagnosis showed significant improvement ($p = .001$). A question regarding cognitive bias had worse results after the workshop (pretest 79.3% vs. posttest 58.6%), although the difference was not statistically significant after Bonferroni correction ($p = .984$). Participants reported significantly increased confidence in all five of the areas evaluated ($p < .001$; Table 2). Overall, participants evaluated the session highly, averaging between 3.89 and 4.07 for all sections of the workshop on a 5-point Likert-type scale (1 = Poor, 2 = Good, 3 = Very good, 4 = Excellent, 5 = Spectacular).

Table 1. Pre- and Postsession Content-Based Question Results ($N = 29$)

Question	% Correct		<i>p</i>
	Pretest	Posttest	
1. Sentinel events	34.5	55.2	.984
2. Patient safety framework	82.8	82.8	1.000
3. Medical errors	24.1	58.6	.057
4. Cognitive bias	79.3	58.6	.984
5. Just culture	48.3	62.1	1.000
6. Three behaviors	69.0	93.1	.589
7. Error reporting	86.2	89.7	1.000
8. Response to lapse	10.3	34.5	.141
9. Overdiagnosis	31.0	86.2	.001
Total	51.7	69.3	<.001

Table 2. Pre- and Postsession Participant Self-Reported Confidence ($N = 29$)

Domain	Average Confidence ^a		<i>p</i>
	Pretest	Posttest	
Communicating patient safety issue with families	2.54	3.31	<.001
Identifying medical overuse/overdiagnosis	2.43	3.24	.002
Reporting medical errors appropriately	2.25	3.38	<.001
Identifying interventions to prevent medical errors	2.14	3.28	<.001
Defining culture of safety	2.25	3.45	<.001
Total	2.32	3.94	<.001

^aRated on a 5-point scale (1 = not at all confident, 2 = somewhat confident, 3 = confident, 4 = very confident, 5 = completely confident).

Faculty Characteristics

The facilitators for this session are all faculty members at the University of Florida, Jacksonville. They are actively involved with undergraduate and postgraduate medical education. Drs. Mirza and Maraqa are program directors and have previously participated in and served as faculty for university-wide patient safety simulation sessions. All faculty members also serve as mentors for residents and fellows for their QI and patient safety projects, many of which have been presented at national and international meetings. Hence, they are all well versed in QI and patient safety methodology. In addition, Dr. Winer has had specific training in QI and biostatistics. Dr. Garber is the director of the Value in Inpatient Pediatrics Network of the American Academy of Pediatrics. He recently received an award from the American Board

of Pediatrics for his work on improving the quality of health care for children. Under his guidance, discussions on safely doing less and value-based care have become a regular part of our conversation with residents during morning report as well as on daily rounds. Dr. Makker is currently participating in formal QI training through Johns Hopkins University. Dr. Alissa is one of our core QI and patient safety faculty champions and mentors multiple residents in these efforts.

Trainee Characteristics

This training was imparted to 31 pediatric trainees: 12 pediatric interns, 13 upper-level residents (PGY-2 and PGY-3), and six fellows. The interns had no previous patient safety training; however, the upper-level residents had attended the university-based safety training as interns. This previous training was not specific to pediatrics, nor did it incorporate any of the new concepts discussed in the previous sections. The fellows all came from different training backgrounds and had variable experiences with patient safety training.

We have used this module only once thus far but intend to use it for ongoing training on an annual basis at the very least. The formal, as well as verbal, feedback we received on this module was overwhelmingly positive. Trainees would like to undergo this type of training more often.

Discussion

Our results showed that overall, participants placed high value on the workshop. In particular, the question on overdiagnosis showed significant improvement on the posttest. Since the majority of our participants were interns, this may have contributed to some bias in our results; however, all learners reported increased confidence in all domains tested. Although we conducted this training at the beginning of a new academic year, patient safety education should be longitudinal rather than an annual event. Such training can also occur during dedicated times such as morbidity/mortality and QI conferences.

Trainees need ongoing exposure to patient safety concepts, in particular recognition and appropriate response to different types of medical errors. Our trainees had only a 24.1% accurate response rate to the question on medical errors (Table 1). While there was an increase of 34.5% on the posttest, the posttest correct response rate of 58.6% is still suboptimal. The concept of just culture was also an area new to many of our trainees. Only 48.3% of our trainees had a correct response on the pretest, while 62.1% had a correct response on the posttest. It is apparent that we need to offer more education in this area as well in order to increase the confidence of our trainees in their work environment and let them know that their workplace does not penalize individuals when they make mistakes but rather seeks to determine the root cause of errors that result as a consequence of human behavior. The just culture approach has been shown to improve the patient safety environment as well as allowing institutions to better respond to external auditors such as the Joint Commission by developing improved communication and focusing on systems design.¹¹

Introducing trainees to the concept of safely doing less was also well received by our learners, as evidenced by pre-/posttest correct responses improving from 31.0% to 86.2%. As discussed in the Introduction, too often this aspect of patient safety is overlooked in training and needs to be emphasized more. Results from ACGME and other surveys in our program show that trainees want to be challenged and seek to learn under conditions where faculty create an environment of inquiry.

One of the limitations to this type of training is the lack of dedicated time that most clinical faculty have to devote to educational activities. Another limitation of our module is that the evaluation tool used does not assess behavior change or clinical metrics.

Our plan is to continue this training on an annual basis at the very least. We also envision incorporating discussions on appropriate health care utilization, in addition to ensuring a safety culture that promotes teamwork and communication, as well as encouraging trainees to feel comfortable reporting errors

without any fear of retribution, through ongoing education, dialogue, and discussion. Involvement of other members of the health care team such as nursing staff in these efforts would be another aspect that would help promote cooperation and goodwill as well as foster teamwork within training programs.

Finally, although this training resource was conducted specifically with pediatric trainees, it is generalizable to other undergraduate and postgraduate medical trainees and can be utilized when teaching students as well as professionals, including faculty, nurses, and mid-level providers. The different concepts discussed in this training are applicable to all health care providers and allied health professionals at different levels of training.

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Prior Presentations

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Ethical Approval

Reported as not applicable.

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