"Good Catch, Kiddo"—Enhancing Patient Safety in the Pediatric Emergency Department Through Simulation

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Objectives: Adverse events that affect patient safety are a significant concern in pediatrics. Increasing situational awareness, identifying errors and near misses, and reporting them using organizational incident reporting systems enables mitigation of harm.

Methods: We designed and tested a brief, interactive, and easily replicable simulation activity for medical students, and emergency medicine interns and pediatric interns to strengthen their skills and enhance their self-efficacy in identifying and reporting patient safety hazards. Hazards fell into the categories of situational safety, patient identification and privacy, infection prevention, treatment errors, and issues with electronic health records (EHRs).

Results: The simulation training significantly increased the self-efficacy of medical students and interns in identifying and reporting patient safety hazards. Learners were very satisfied with the simulation training, successfully recognized key patient safety hazards, provided feedback to improve the training, and improved their ability to report hazards through organizational incident reporting systems. Patient safety hazards associated with patient misidentification were recognized most frequently, whereas safety hazards associated with EHRs were missed with the greatest frequency.

Conclusions: The simulation training enabled learners to identify hazards and near misses and enhanced their ability to report hazards through organizational incident reporting systems. Learners at all levels of training identified safety hazards at comparable rates, which demonstrates the role that trainees play in critically observing clinical settings with fresh eyes and identifying and reporting patient safety hazards. Interventions to promote patient safety need to prioritize building situational awareness of potential hazards associated with EHR use.

Key Words: patient safety, simulation training, education

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Adverse events that affect patient safety are a significant concern in pediatrics and occur because of a variety of factors, including medications errors, health care–associated infections, patient falls, and breaches in patient privacy.[1–3] Improving patient safety in pediatrics requires increasing clinicians' awareness of patient safety issues, developing a transparent and nonpunitive culture of reporting errors and near misses, submitting informative incident reports, and increasing adherence to best practices for patient safety.[3–5]

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Patient safety is a key focus area for health professions training programs.[6] Increasing situational awareness and learning how to report identified errors and near misses enable mitigation of current and future harm. With the goal of providing hands-on experiential learning in hazard identification and reporting of safety lapses to medical students and clinical trainees, we designed and tested a brief interactive simulation activity. Novel methods of training such as simulation demonstrate promise in enhancing situational awareness and preventing patient safety adverse events.[7–9] Our overall goals were to strengthen learners' skills and enhance their confidence in identifying and reporting pediatric safety hazards. The objectives of the simulation activity were to enable learners to understand the significance of patient safety hazards in clinical care, identify patient safety hazards commonly encountered in the course of clinical care, and learn how to report patient safety hazards using an incident reporting system.

METHODS

Our patient safety simulation activity was created and implemented at a multispecialty academic health system in the United States. Using a modified Delphi technique, patient safety experts prioritized 20 pediatric patient safety hazards likely to be encountered by medical students, interns, residents, fellows, nurses, and physicians. Hazards fell into the broad categories of situational safety, patient identification and privacy, infection prevention, treatment errors, and issues with electronic health records (EHRs).

Simulation activities occurred in May and June 2019 with a total of 221 learners. Four groups of learners were included—102 second-year medical students starting clinical clerkships, 91 fourth-year medical students transitioning to residency training, 15 emergency medicine interns, and 13 pediatric interns. Learners were briefed by facilitators for 5 minutes on learning objectives of the simulation exercise involving a 5-year-old boy in the emergency department with cough, fever, and acute asthma exacerbation. Groups of 3 to 5 learners then entered identically setup simulation suites with low-fidelity mannequins and safety hazards (Fig. 1). Groups were homogenous in terms of the level and specialty of learners. They were given 10 minutes in the suite to identify and note hazards. Learners then gathered in an adjoining room for a 15-minute debrief during, which they described safety hazards identified. Facilitators identified safety hazards that were missed and facilitated a discussion on the significance of each hazard and the importance of situational awareness.

Learners then viewed a 5-minute instructional video on reporting near misses and errors using our hospital's incident reporting system, followed by a 15-minute discussion with the facilitator on the importance and process of reporting such incidents. The simulation activity closed with a summary of key learning points and their application to clinical practice. Before leaving the simulation suite, each learner completed an evaluation questionnaire with 5 questions, requiring approximately 3 minutes to complete. The total time for the simulation activity was 60 minutes. A

FIGURE 1. Examples of the patient safety simulation suite setup using low-fidelity mannequins and safety hazards.

checklist with resources used to set up the simulation activity is included in Figure 2. Paired *t* tests for each of the four types of learners were performed to determine if the simulation activity was associated with changes in self-efficacy in identifying and reporting patient safety hazards in clinical settings.

RESULTS

A total of 221 medical students and interns participated in the simulation activity. Self-efficacy in identifying and reporting patient safety hazards increased after the simulation activity across all groups of learners, as shown in Table 1. On a 0-to-10 scale (0, not at all confident; 10, very confident), self-efficacy in identifying patient hazards increased for all groups of learners, with the largest increase in second-year medical students starting clinical clerkships. Before the simulation activity, self-efficacy in reporting patient safety hazards using a hospital incident reporting system was low across all learner groups. Increase in self-efficacy in reporting patient safety hazards using the organizational incident reporting system was the highest in second-year medical students starting clinical clerkships as well, although pediatric interns and emergency medicine interns significantly increased their self-efficacy in reporting patient safety hazards as well. All changes were statistically significant with *P* values of <0.01 (Table 1).

The 5 most commonly identified safety hazards were identification band not on the patient (98.1%), choking hazards (96.2%), incorrect patient's discharge paperwork at the bedside (96.2%), food present in a room with nil per os orders (96.2%), and presence of a slip hazard on the floor (94.3%). The 5 least commonly identified safety hazards were multiple patient charts open in the EHR (9.4%), unsigned orders open (33.9%), unsecured medications at the bedside (47.2%), undated intravenous catheter in the patient (49.1%), and wrong patient name and date on the white-board (69.8%). Across all learner groups, EHR-related safety hazards were identified at the lowest frequency compared with hazards related to situational safety, patient identification, infection risk, and treatment errors (Fig. 3). Details on the frequency of safety hazards identified by learner group are included as a supplement in Table 2 (Supplemental Digital Content 1, http://links.lww.com/PEC/A647).

Overall satisfaction with the simulation as a learning experience was rated on a 0-to-10 scale (0, not at all satisfied; 10, very satisfied). Mean ± SD learner satisfaction scores were 8.5 ± 1.5,

- ☐ Simulation room (can be set up in real patient care space or simulation suite)
- ☐ Mannequin
- ☐ Patient gurney or examination table
- ☐ 1 2 facilitators trained in patient safety and institution's incident reporting system
- ☐ Feedback from institution's patient safety leadership on high-priority patient safety hazards
- ☐ Information on institution's incident reporting system
- ☐ Creation of null patients in the electronic health record practice/demonstration environments
- ☐ Realistic printed labels and discharge instructions with discordant names
- ☐ Computer: Using institution's electronic health record, screen shot with hazards
- ☐ Inaccurate information regarding patient's clinician and date on white board or similar information-sharing device
- ☐ Copy of institution's Room Precaution signs.
- ☐ Allergy bracelet
- ☐ Patient identity bracelet
- ☐ Wrong patient's discharge instructions
- ☐ Ear speculums
- ☐ Gloves (one empty box of gloves to demonstrate lack of personal protective equipment, one glove blown up to demonstrate choking hazard, one open latex glove packet to demonstrate missed latex allegy)
- ☐ Over-the-counter medications
- ☐ Visible spill on floor
- ☐ Airborne precaution sign
- ☐ Empty or inappropriate mask box
- ☐ Hand foam dispenser
- ☐ Bloody gauze on ground
- ☐ Oxygen mask/tubing/outlet or tank

FIGURE 2. Patient safety simulation room setup checklist.

TABLE 1. Self-efficacy in Identifying and Reporting Safety Hazards Before and After Patient Safety Simulation, 0-to-10 Scale (0, Not at All Confident; 10, Very Confident)

	Second-Year Medical Students Starting Clinical Clerkships (n = 102)			Fourth-Year Medical Students Transitioning to Residency Training (n = 91)			Emergency Medicine Interns (n = 15)			Pediatric Interns (n = 13)		
	Before, Mean (SD)	After, Mean (SD)	Mean Difference (95% CI)	Before, Mean (SD)	After, Mean (SD)	Mean Difference (95% CI)	Before, Mean (SD)	After, Mean (SD)	Mean Difference (95% CI)	Before, Mean (SD)	After, Mean (SD)	Mean Difference (95% CI)
Self-efficacy in identifying patient safety hazards	6.2 (1.9)	8.7 (1.2)	2.5 (2.1–2.8)*	6.9 (1.7)	8.5 (1.2)	1.6 (1.3–2.9)*	7.5 (0.9)	8.6 (0.7)	1.1 (0.6–1.5)*	6.2 (1.5)	8.3 (1.1)	2.1 (1.3–2.9)*
Self-efficacy in reporting patient safety hazards using hospital incident reporting system	2.8 (2.7)	8.1 (1.6)	5.3 (4.8–5.8)*	4.8 (1.0)	7.5 (1.8)	2.7 (0.68–4.7)*	4.9 (1.9)	8.0 (1.5)	3.1 (2.3–3.9)*	3.1 (2.2)	8.2 (1.3)	5.1 (3.7–6.5)*

*All *P* values are <0.01.

CI indicates confidence interval.

7.8 ± 1.7, 8.1 ± 0.9, and 8.9 ± 0.9 for transition to clerkship medical students, transition to residency medical students, emergency medicine interns, and pediatric interns, respectively. Learners reported that the most useful part of the simulation was demonstration of how to report near misses and hazards, active learning, and team-based learning with peers. Suggestions to enhance the simulation included incorporating practice in reporting a simulated patient safety hazard, creating a competition between groups based on number of hazards identified, and including real-life examples of safety reporting that yielded system-level changes.

DISCUSSION

Our experience demonstrated that a brief interactive and easy to set up patient safety simulation activity increased self-efficacy in identifying and reporting patient safety hazards in clinical settings. Learners were very satisfied with the simulation activity as an educational experience, successfully recognized key patient safety hazards, and provided feedback to improve the activity. Medical students at all levels of training and interns successfully identified safety hazards at comparable rates, which demonstrates the valuable role that health professional trainees can play in critically observing clinical settings with fresh eyes with the goal of increasing patient safety. Significant increases in self-efficacy in identifying reporting patient safety hazards occurred in medical students at all levels of training and interns, which demonstrates the need for such training for a range of learners. Patient safety hazards associated with EHRs were missed with the greatest frequency across all levels of trainees in our analysis, which indicates the need to prioritize building situational awareness of potential hazards associated with EHR use.

Fostering a culture of patient safety requires a multipronged approach. Organizations must support easy and anonymous reporting of adverse events; develop an environment where errors are approached from a systems perspective; promote organizational structures that value expertise, transparency, and continual learning; and create strategic training approaches such as patient safety simulation activities to enable clinicians to identify and use nonpunitive medical-error reporting systems.[4,5]

Patient safety simulations for health professions students and trainees have been well received and have led to improvements in

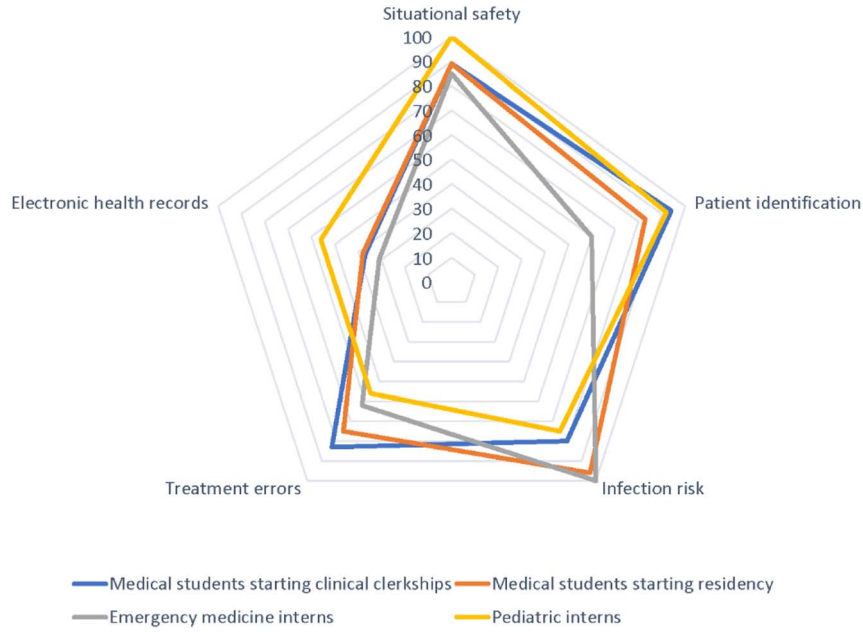

FIGURE 3. Patient safety hazard recognition rate by type of learner.

medical-error identification.[7–9] Although a growing number of medical schools outline patient safety content in their curriculum, relatively few integrate meaningful skill-building activities in identifying and reporting errors and hazards.[7]

Limitations of our training are that it was implemented at one academic health system, learner teams did not have interprofessional composition, and we did not assess changes in safety hazard reporting behavior in clinical settings. We intend to enhance the training by developing a facilitated exercise to include practice in reporting a simulated safety hazard using the hospital reporting system, adapting the training to an online format, and assessing which learners benefit most from the simulation activity. Our next steps also include longitudinal analyses of the effects of the simulation activity on the number of incident reports filed by learners and evaluating its impact on patient safety events.

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