Teaching Students How to Improve Safety and Quality in Two Children's Hospitals: Building a Pediatric Clerkship Patient Safety and Quality Experience

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WHAT'S NEW

This report describes a novel method to enhance medical student understanding of systems-based practice and patient safety through experiential learning, assessing the perceived value of student-identified patient safety and systems vulnerabilities, and their proposed interventions at academic children's hospitals.

BACKGROUND

IN 2007, A medication overdose accompanied by a series of other preventable medical errors led to the death of a healthy 3-year-old boy within the University of Florida (UF) hospital system.[1] Subsequent to this tragic event, UF rededicated itself to establishing a culture of safety at every level, creating a robust curriculum for students in patient safety. This curriculum built upon existing components but vastly increased the scope of learning activities and expectations for students. A longitudinal 8-semester required course was implemented and integrated into preexisting courses and clerkships, with learning activities that consisted of formal lectures, interprofessional workshops, self-directed learning assignments, and small group activities. As a result, using a backwards design methodology, the UF College of Medicine developed the following curricular goals:

- Improve students' understanding of the impact of preventable, adverse medical events on patients, physicians, and other medical professionals.
- Prepare students to identify and participate in corrective strategies that improve quality and safety.
- Develop and nurture a culture of quality and safety that enhances patient satisfaction and quality of care outcomes.[2]

The first 2 years of the curriculum were intended to introduce terminology and concepts in preparation for clinical experiences during clerkships, including principles of quality improvement. By the time students at the UF College of Medicine reached third-year clerkships, they were knowledgeable in the concepts of quality improvement and patient safety within the clinical realm. These major concepts of competency were error, quality, identification of critical or "near miss" incidents, root cause analysis, and understanding the utility and necessity of system-level improvements. Secondary to their preclinical learning experiences, it was anticipated that students would be more actively involved in patient safety issues during their clinical rotations and more likely to continue this practice into their future experiences. Clerkship directors were tasked to develop a safety activity during the required clinical clerkships that would encourage medical students to apply their preclinical safety training within the clinical arena.

In 2010, the UF pediatric clerkship directors at our 2 major clinical sites (Shands Children's Hospital at the University of Florida and Jacksonville Wolfson Children's Hospital) implemented a new required patient safety experiential educational activity during which third-year

clerkship students collaboratively identified and reported on at least one adverse or "near miss" event during their 4-week inpatient experience. It was the responsibility of each clerkship student, as a member of a collaborative inpatient student team, to accomplish the following objectives through self-directed learning and investigation during their 4-week inpatient clerkship experience:

1. Identify and analyze common clinical adverse events through a systematic and interdisciplinary approach to investigation.
2. Differentiate the impact of system failures and human factors in the development of adverse events and discuss approaches to preventing and mitigating those events.
3. Identify and describe system-level improvements that will improve patient safety and reduce adverse events.
4. Identify and be able to apply individual strategies and approaches to improve patient safety and reduce adverse events.

During their 4-week inpatient rotation, students worked together as an inpatient team to explore an identified safety event utilizing their preclinical safety training in conjunction with self-directed learning and investigation. Students then reported their findings via a formal presentation to their peers and an interdisciplinary group of hospital stakeholders (clerkship director, quality officer, chief residents, nursing leadership, pharmacy leadership, and pediatric hospitalists, among others). Following the student presentation, an open discussion was encouraged between students and hospital stakeholders to offer additional insight and further explore the safety event and proposed solutions, in addition to also providing informal feedback to the students regarding their presentation.

Educational Approach and Innovation

Between July 2010 and June 2013, 52 medical student teams (N = 397 students) developed and delivered safety presentations as described above. Following institutional review board approval, we abstracted these presentations and reviewed them as 2 separate teams (2 authors on each team). Each team reviewed all of the projects as independent and separate units to assess proposed interventions and feasibility. When discrepancies in analysis existed, the researchers deliberated as a larger group until a consensus was reached.

First, we categorized the nature of the proposed interventions using a rubric adapted from the Institute for Safe Medication Practices (ISMP) rank order of error reduction strategies to address the nature of the proposed interventions.[3] We translated the ISMP's hierarchy into a 7-point ordinal scale to classify students' suggestions for intervention from low to high: 1, informal education; 2, formal education; 3, rules and policies; 4, checklists; 5, standardization and protocols; 6, automation and computerization; and 7, forcing functions and constraints. Second, we estimated the feasibility of the students' proposed interventions—that is, the likelihood that the institution would undertake or adopt the interventions. Feasibility was evaluated on a 7-point scale from 1 (very/highly unlikely) to 7 (very/highly likely). Following this scoring, the cohorts came together, discussed discrepancies in group scoring, and worked to reach mutual agreement.[4]

Fifty-one of 52 (98%) projects presented recommendations and solutions and were further evaluated. Students astutely identified patient safety issues that are both locally and nationally recognized, including security of pediatric floors, infection control, error reporting, handoffs, environmental health issues, and communication between teams and families.[5] Presentations proposed an average of 1.9 recommendations or proposed solutions for each identified safety concern. Proposed interventions were distributed across all levels of the ISMP risk reduction hierarchy; however, some projects presented sophisticated solutions at higher levels.

We evaluated the feasibility of interventions in aggregate, as often students proposed multiple interventions that sought to address a single safety issue. In all, 57.7% of proposed interventions scored 5 or greater on the feasibility scale, although none of the interventions proposed received the maximum score of 7 (very or highly likely). A minority (26.9%) scored 3 or less on the feasibility scale, and 2 (3.8%) received a score of 1. Examples of strategies in each category across the hierarchy and their feasibility are presented in the Table.

Discussion and Next Steps

Improvements in quality of care require physicians with competence, curiosity, and self-awareness. In addition, physicians must be committed to establishing a climate where patient safety is strongly emphasized and protected.[6] Medical students should receive in-depth training in patient safety and quality improvement throughout their curriculum. Accrediting bodies have codified the importance of safety and quality education, but few, if any, best practices for safety education exist.[7]

By the time UF students reached the third-year pediatric clerkship they were competent to apply concepts of quality improvement and patient safety. System-level improvements suggested by the student teams were reviewed with educational, clinical, and administrative leaders, and over time they attracted an even broader interprofessional audience that was impressed with their level of competence. Especially important is that meaningful changes were implemented as a result of student recommendations. Examples include the following:

- Standardization of the patient weights to utilize only kilograms in all computerized and paper medical records
- Providing impetus toward the development of an electronic patient sign-out process within the electronic medical record
- Ensuring that bypasses in and out of locked units are secure

Table. Examples of Medical Student Safety Issues Analyzed

Error Reduction Strategy	Efficacy	Safety Issue Identified	Intervention Proposed	Feasibility Score
Forcing functions and constraints	High	Lack of communication regarding direct admission to hospital resulting in inadequate level of care	Prohibit direct hospital admission unless initially evaluated in the pediatric emergency department.	Slightly unlikely (3)
		Weight recorded in pounds rather than in kilograms	Remove scales that provide weight in imperial units.	Slightly likely (5)
Automation and computerization with redundancies		Burdensome templates and documentation process in the EMR	Create order sets that streamline reporting of pertinent information in the EMR.	Moderately likely (6)
		Information documented in the EMR not always accurate	Set up an EMR alert for when entered values are outside of the expected/feasible range.	Moderately likely (6)
Standardization and protocols		Handoff miscommunication	Standardize sign-out mnemonic systems such as I-Pass.	Moderately likely (6)
		Patients using home medications in hospital setting	Search parents/patients upon entry to rooms.	Extremely unlikely (1)
Checklists and double-check systems		Incorrect IV fluids administered	Require 2-step verification between nurses prior to hanging an IV bag.	Slightly likely (5)
		Patient receiving discharge information with incorrect prescription	Pharmacist should recheck discharge prescriptions.	Slightly likely (5)
Rules and policies		Delay in treatment as patient is transferred to floor during transition	Change work hours so that physician and nursing shift changes are staggered.	Neither likely or unlikely (4)
		Parents co-sleeping with patients	Enforce safe sleep and crib safety during inpatient stays.	Slightly likely (5)
Formal education/information		Contact precautions not used when indicated	Develop and implement a training program on contact precautions.	Moderately likely (6)
		Poor team performance during patient code	Provide training related to critical response/codes.	Moderately likely (6)
Informal education: "be more careful"	Low	Inappropriate distribution of clonidine resulting in an overdose	Obtain proper history with specific attention to details.	Slightly likely (5)
		Nonclinical staff noticing loose gastrostomy tube on patient and reattaching tube to incorrect port	Encourage reporting of all patient safety events/concerns.	Moderately likely (6)

EMR indicates electronic medical record; IV, intravenous.

- Optimizing the visibility of infection control signs for providers and families
- Standardization of parental and patient education on contact precautions
- Creating access to a formal error reporting system and providing education for students and other non-hospital employees

An unexpected component of this educational intervention was students' self-directed interprofessional approach to identified concerns. The activity was not designed as an interprofessional endeavor; yet, many teams sought out the expertise and assistance of non-physicians while engaged in this activity. Students included the input and expertise of patients and family members, in addition to clerical, nursing, information technology, pharmacy, and even security personnel during their safety investigations. This outcome reflects the interprofessional focus at the UF Health Science Center.[8,9]

Our experience provides additional evidence that medical students are an underutilized resource on the front lines of safe patient care at academic medical centers.[10] Because they demonstrated their capability to assess patient safety issues, we anticipate that medical students will be given increased opportunities to contribute to efforts to prevent adverse events. Future studies should assess the outcomes of student-proposed interventions as part of ongoing institutional quality and safety efforts.

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