Learning to Speak Up for Patient Safety: Interprofessional Scenarios for Training Future Healthcare Professionals

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ABSTRACT

BACKGROUND: Preventable medical errors represent a leading cause of death in the United States. Effective undergraduate medical education (UME) strategies are needed to train medical students in error prevention, early identification of potential errors, and proactive communication. To address this need, a team of faculty from A.T. Still University’s School of Osteopathic Medicine in Arizona developed four digital patient safety case scenarios for second-year medical students. These scenarios were designed to integrate interprofessional collaboration and patient safety principles, increase student ability to identify potential errors, and promote proactive communication skills.

METHODS: Faculty used Qualtrics to create four digital case scenarios on patient safety covering the following domains: communicating about potential drug-to-drug interactions; effective handoffs; human factors errors, such as fatigue, illness, and stress; and conflicts with supervising resident. In fall 2018, 97 second-year medical students completed the entire safety module in dyad or triad teams. As they worked through each case study, student teams completed 11 assessment questions with instant feedback, and participated in short case debrief discussions. Next, each individual student took a 12-question post-test to assess learning. Descriptive statistics were reviewed for the assessment questions, and case critical thinking discussion answers were reviewed to evaluate student comprehension.

RESULTS: The mean score for the module was 95.5% (SD=6.36%, range = 75%-100%). Seventy-eight students completed the post-test, which had a mean score of 96.5% (SD = 6.51%, range = 66.7%-100%). Student written responses to the four case critical thinking discussion prompts indicated a high level of comprehension.

CONCLUSION: Our results demonstrated that digital case studies can provide an innovative mechanism to introduce key patient safety concepts and experiential practice of interprofessional communication in early UME. Our design and implementation of these engaging interprofessional patient safety training modules provided an opportunity for students to learn key communication and safety concepts in small teams. This training method was cost-effective and could be replicated in other online learning or blended learning environments for a wide range of health professions.

KEYWORDS: Interprofessional education, patient safety, mobile learning, medical education

Introduction

In 2000, the Institute of Medicine reported that up to 98,000 patients die annually because of preventable medical errors.1 Despite extensive work in this area, medical errors remain the third leading cause of death in the United States.2 This finding has highlighted the need to train undergraduate medical students in medical error identification and in proactive, early communication of patient safety concerns.

To improve patient safety, health educators have proposed an interprofessional approach.3 This approach is supported by a recent systematic review that reported interprofessional education (IPE) and interprofessional practice enhanced collaboration and improved patient outcomes.4 Like many other healthcare agencies, the National Center for Interprofessional Practice and Education emphasizes the importance of collaboration among a team of providers in the delivery of high quality healthcare.5-7 To guide effective training and development, the Interprofessional Education Collaborative developed core competencies for interprofessional collaborative practice that are being implemented into the health professional curricula.8 In response to changing models of practice,9 the Commission on Osteopathic College Accreditation and the Liaison Committee on Medical Education each added IPE as an accreditation standard.5,10
To prepare medical students to function well in healthcare teams, medical schools need engaging, educational curricula that foster interprofessional collaboration skills.11,13 These curricula should include experiential learning opportunities to communicate respectfully and effectively within teams and to address situations that could lead to errors related to patient safety.13,14 Health profession students need to identify when and how to speak up. These are essential skills that align with the Accreditation Council for Graduate Medical Education common program requirement (IV.B.1.d0.[1].(d)) and Core Entrustable Professional Activities (EPAs), such as EPA 9, which states that students must be able to collaborate as a member of an interprofessional team before entering residency.15,16

The healthcare team training literature prescribes setting a culture of psychological safety. This means establishing an environment where healthcare members feel safe voicing their professional opinions.17 Okuyama et al18 suggest that healthcare workers who are able to speak up in the workplace are generally more satisfied and that the more practice with communication workers have the more functional the team. Some of the factors that cause hesitancy include concerns over causing a conflict with team members or appearing incompetent, the attitude of superiors, the prediction that nothing will be done, or fear of reprisal.19 At some institutions, there is a culture of silence.19 For instance, team members such as nurses sometimes avoid expressing concerns directly and instead communicate with the nurse manager.18,19 Similarly, as shown in one study, residents did not always feel safe or empowered enough to speak up proactively for organizational change.20

When communication is not direct and in the moment, it may occur too late to stop an avoidable error.

The Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) program21,22 from the Agency for Healthcare Research and Quality (AHRQ) trains future healthcare professionals to work together to improve patient safety. The training program focuses on communication, completing handoffs with accuracy, voicing concerns with team members, listening for safety cues, and monitoring provider mental and physical status while on shift. Several studies23,24 indicate TeamSTEPPS21,22 techniques are used in some hospitals to structure communication. For this reason, many healthcare schools and residency programs now incorporate these fundamentals into team training. A study by Pian-Smith et al25 found that teaching residents some of these techniques increased advocacy and inquiry.

To prepare medical students for various healthcare settings and cultures, a team of faculty from A.T. Still University’s School of Osteopathic Medicine in Arizona (ATSU-SOMA) surmised that training vignettes, which specifically provided practice in raising concerns and speaking up directly, politely, and confidently would be beneficial. Medical education games and digital case studies have been found to be engaging, provide a safe learning environment, and facilitate formative learning by providing swift feedback.26 Furthermore, interactive clinical scenario-based games improve medical student awareness of and attitude toward patient safety.27,28 Given these benefits, the purpose of the current study was to design an electronic suite of case studies for medical students to learn how to speak up about patient safety in a team setting and to evaluate student understanding of specific methods for voicing concerns with respect, assertiveness, and accountability.

Methods

The current study was conducted at ATSU-SOMA in October 2018. Second-year medical students in an epidemiology and biostatistics course were recruited to participate. Second-year medical students at ATSU-SOMA are embedded into federally qualified health centers (FQHC) around the United States in groups of about 10 students, where they receive onsite clinical training in addition to in-person and online didactic instruction. This unique model requires the development of innovative online training modules to enhance and support the in-person clinical training. The current study was approved by the A.T. Still University-Mesa Institutional Review Board, (#2017-019).

Participation in the study was voluntary. Participating students were consented, and informed via email that their participation/non-participation would not affect their course grades.

The learning intervention: 4 digital case scenarios

Based on prior experience in this medium,29 a team of 7 faculty—5 physicians and 2 health education experts—designed a patient safety training module consisting of four, 10-minute digital case studies, complete with 11 quiz items, 4 critical thinking discussion questions, and a post test. After an initial literature review to identify key skill domains, the workgroup team met several times to discuss situations that often lead to safety errors. As a result of these discussions, the team decided to draft four case studies on the following themes: potential drug-to-drug interactions; patient handoffs and communication; provider errors, from fatigue, illness, and stress; and conflicts with supervising resident. After development, the team peer-reviewed each other’s scenarios, resulting in revisions and consensus decisions about final content (see Figure 1: Digital Case Scenarios).

Authors used TeamSTEPPS strategies when designing the module for the four short digital case studies. The module addressed patient safety by including videos, educational information, and adapted quiz questions from the AHRQ program. Competencies for each case study are provided in Table 1, and were reflected in the focus questions/quiz items for each module.

Implementing the digital case studies with second-year medical students

During the epidemiology and biostatistics course, 108 second-year medical students were invited to complete the module. Students, located at 1 of 11 separate FQHCs, met with instructors in pods of 10. For the module, students formed
Table 1. Competency alignment for each of the 4 digital case scenarios.

| TARGET COMPETENCY                                                                 | CASE 1 | CASE 2 | CASE 3 | CASE 4 |
|----------------------------------------------------------------------------------|--------|--------|--------|--------|
| Core Entrustable Professional Activities (EPAs) for entering residency<sup>16</sup> |        |        |        |        |
| EPA 8: Give or receive a patient handover to transition care responsibility.     | X      |        |        |        |
| EPA 9: Collaborate as a member of an interprofessional team.                     | X      | X      | X      | X      |
| EPA 13: Identify system failures and contribute to a culture of safety and improvement. | X      | X      | X      | X      |
| Core competencies for interprofessional collaborative practice<sup>8</sup>       |        |        |        |        |
| Interprofessional team and teamwork                                             | X      |        |        |        |
| TT 7: Share accountability with other professions, patients, and communities for outcomes relevant to prevention and healthcare. | X      | X      |        |        |
| Interprofessional communication (CC)                                            |        |        |        |        |
| CC 3: Express one’s knowledge and opinions to team members involved in patient care and population health improvement with confidence, clarity, and respect, working to ensure common understanding of information, treatment, care decisions, and population health programs and policies. | X      |        |        |        |
| Interprofessional roles/responsibilities (RR)                                   |        |        |        |        |
| RR 5: Use the full scope of knowledge, skills, and abilities of professionals from healthcare and other fields to provide care that is safe, timely, efficient, effective, and equitable. | X      |        |        |        |
| Interprofessional values/ethics (VE)                                            |        |        |        |        |
| VE 5: Work in cooperation with those who receive care, those who provide care, and others who contribute to or support the delivery of prevention and health services and programs. | X      |        |        |        |
| VE 7: Demonstrate high standards of ethical conduct and quality of care in contributions to team-based care. | X      |        |        |        |
| TeamSTEPPS procedures<sup>21</sup>                                              |        |        |        |        |
| Two-challenge rule: Team members assertively voice a concern at least 2 times to ensure it has been heard. If the concern is not resolved, the provider needs to take stronger action. | X      |        |        |        |
| Call-out: A strategy used to communicate important or critical information.       | X      |        |        |        |

(Continue)
Table 2. Assessments and objectives.

| INSTRUMENT                  | LEARNING OBJECTIVES                                                                 | DESCRIPTION                                                                 |
|-----------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| Quiz                        | 1. Identify best practices for checking drug interactions.                          | While working through 4 scenarios, student teams completed 11 multiple choice and matching quiz items. |
|                             | 2. Intervene to prevent drug to drug interactions.                                 |                                                                              |
|                             | 3. Use the two-challenge rule.                                                      |                                                                              |
|                             | 4. Use the SBAR method during a handoff.                                            |                                                                              |
|                             | 5. Use the SBAR method during a handoff.                                            |                                                                              |
|                             | 6. Use the SBAR method during a handoff.                                            |                                                                              |
|                             | 7. Use the SBAR method during a handoff.                                            |                                                                              |
|                             | 8. Speak up as an accountable member of the team.                                  |                                                                              |
|                             | 9. Inform a supervisor about a discovered error.                                   |                                                                              |
|                             | 10. Speak up in a timely way to avoid an adverse event.                             |                                                                              |
|                             | 11. Respond to criticism using the DESC Script.                                    |                                                                              |
| Critical thinking discussion questions | 1. Identify best practices for checking drug interactions. | At the end of each scenario, student teams submitted a short answer written response to a critical thinking prompt. |
|                             | 2. Use the two-challenge rule.                                                      |                                                                              |
|                             | 3. Use the CUS strategy to express safety concerns.                                |                                                                              |
|                             | 4. Identify human factors that contribute to medical error.                        |                                                                              |
| Post-test                   | 1. Confirm roles and responsibilities in team settings.                            | Students individually completed a 12-item multiple choice post-test.          |
|                             | 2. Articulate clear team goals during patient care huddles.                        |                                                                              |
|                             | 3. Speak up in a timely way to avoid an adverse event.                             |                                                                              |
|                             | 4. Speak up in a timely way to avoid an adverse event.                             |                                                                              |
|                             | 5. Use the SBAR method during a handoff.                                            |                                                                              |
|                             | 6. Use the CUS strategy to express safety concerns.                                |                                                                              |
|                             | 7. Use the CUS strategy to express safety concerns.                                |                                                                              |
|                             | 8. Demonstrate the call-out procedure to communicate rapidly during an emergency.  |                                                                              |
|                             | 9. Use the check-back method to verify information exchanged.                      |                                                                              |
|                             | 10. Respond to criticism using the DESC Script.                                    |                                                                              |
|                             | 11. Speak up as an accountable member of the team.                                 |                                                                              |
|                             | 12. Identify human factors that contribute to medical error.                       |                                                                              |

Abbreviations: CUS, I’m Concerned, I’m Uncomfortable, this is a Safety issue; DESC, describe, express, specify, consequences; SBAR, situation, background, assessment, recommendation and request; TT, team and teamwork; VE, values/ethics.
Module assessment data were collected through an electronic case learning analytics system (Qualtrics experience management software). Table 2 describes the assessments and their learning objectives.

Data analysis

Descriptive statistics were calculated for the student quizzes scores and post-test. Each question was evaluated to determine the percentage of students who selected the correct answer. The mean, range, and standard deviation (SD) were calculated using SPSS version 25 (IBM Corp., Armonk, NY).

Analysis of critical thinking short answer responses focused on whether, after reading the case vignette, the team was able to correctly answer the prompt in their own words, as opposed to selecting the correct answer from a list. To analyze student responses, researcher AH first downloaded the short answer data reports from Qualtrics, and shared these reports with researcher LM. Next, using a consensus scoring method, two study researchers (AH and LM) independently rated all of the team discussion responses as correct or incorrect. Raters used specific pages of the scenarios to confirm correct answers. They also reviewed through the range of student responses to identify a few examples that best summarized the procedural knowledge requested. For example, if the discussion prompt was, “How did the medical student (in the case study) realize there could be a potential drug-to-drug interaction?,” researchers determined, from the related case study page, whether the student team accurately described the process. Upon review of the students’ responses, researchers stratified responses into two categories, correct and incorrect, and later met to resolve any differences in scoring. Finally, researchers constructed Table 3, and added sample student responses to illustrate student procedural knowledge.

Results

Of 108 second-year students, 97 (90% response rate) students, grouped into 44 dyad or triad teams, voluntarily completed the module, including 11 quiz questions. The mean score for the quiz was 95.5% (SD = 6.4%, range = 75%-100%).

Seventy-eight students (72.9% completion rate) completed the voluntary post-test. The mean score was 96.5% (SD = 6.51%, range = 66.7%-100%). The most commonly missed question addressed interrupting an attending physician while they were busy dictating to deal with an emergency with a pediatric patient (12.8% incorrect).

Qualitative data from the four critical thinking debrief questions indicated students were able to recall, explain, and use the key patient safety concepts, including avoiding drug-to-drug interactions and using the two-challenge rule, CUS statements (I am concerned, I am uncomfortable, this is a safety issue), and strategies to mitigate fatigue. Table 3 reports the themes and example answers for each of the critical thinking discussion questions.

| CRITICAL THINKING DISCUSSION QUESTION | % CORRECT, (TEAM N) |
|---------------------------------------|---------------------|
| Case 1: Drug-to-drug interaction       |                     |
| 1. How did the medical student (in the case study) realize there could be a potential drug-to-drug interaction? While reviewing the patient’s medical record, the med student remembered the importance for checking drug-to-drug interactions due to the patient taking Warfarin. | 64.52% (31 Teams) |
| 2. Explain the two-challenge rule. A rule to allow for decreased chance of error in patient care by presenting the concern 2 different times, in 2 different ways. The first way is to state your concern in the form of a question. The second way is to state your concern as a question with support of your concern. The rule forces the team to acknowledge your concern as well as provide a response. After the two-challenge rule, if there is still no change, you can work up the administrative chain of command to give your patient the best care. | 100% (23 teams) |
| Case 2: Effective handoffs             |                     |
| 3. Recently, you tried to hand a patient off to a resident. The conversation was rushed and you hesitated to state your concern about a potential drug-to-drug interaction. Work with your partner to write some CUS statements that you could have used. | 100% (32 teams) |
| C. First, state the concern.           |                     |
| I am concerned that there is a drug-to-drug interaction with this patient. |                     |
| U. Next, explain why you are uncomfortable |                     |
| I am uncomfortable leaving this patient without addressing their drug-to-drug interaction. |                     |
| S. You feel the conflict is not resolved. Explain the safety concern. |                     |
| This is a safety concern because the patient’s life is on the line. |                     |
| Case 3: Errors due to human factors    |                     |
| 4. What other factors contribute to your feeling of fatigue? Poor diet, stress, lack of physical activity, not drinking enough water, family responsibilities, over studying, and overworking. | (100%) 33 teams |

Abbreviation: CUS, I’m Concerned, I’m Uncomfortable, this is a Safety issue.
For Q1 (How did the medical student realize there could be a potential drug-to-drug interaction?) 31 teams responded, drug interactions (64.52% correct). For Q2, (Explain the two-challenge rule), 23 teams responded, with 100% accuracy. For Q3, (Recently you tried to hand a patient off to a resident. The conversation was rushed and you hesitated to state your concern about a potential drug-to-drug interaction. Work with your partner to write some CUS statements that you could have used), 32 teams responded with 100% accuracy. For Q4, (What other factors contribute to your feeling of fatigue?) 33 teams responded with 100% accuracy.

Discussion
This study provided students with an electronic suite of case studies which helped them learn how to speak up about patient safety in a team setting. This project also allowed us to evaluate student understanding of specific methods for voicing concerns with respect, assertiveness, and accountability. Our results suggested that digital patient safety case scenarios that focus on interprofessional teamwork can be a useful tool for teaching patient safety best practices. The overall scores of the second-year medical students on the four case scenarios and post-test and their answers to the critical thinking debrief discussion questions indicated a high level of recall and understanding of the topics addressed, although due to the “voluntary” nature of the discussion questions, not all teams responded. High mean scores on the module also indicated a need to develop more challenging questions for future student cohorts. Nevertheless, we believe this digital case scenario module for our second-year medical students was an innovative mechanism for introducing and enhancing understanding of patient safety, interprofessional practice, and the TeamSTEPPS content. In addition, these scenarios can easily be integrated into the medical school curriculum because of their short time commitment and online availability. Furthermore, after our digital care scenarios were completed, the critical thinking group discussions reinforced the concepts and ensured student comprehension.

Two other studies related to teaching TeamSTEPPS with digital media or scripted scenarios rendered mixed results. In 2014, Shah et al33 developed and implemented a TeamSTEPPS communication module using simulation (scripted scenarios) with 23 fourth-year medical students. These authors used a pre-post intervention design involving several measures, but failed to show an impact on student knowledge, attitudes, and performance. Caylor et al34 designed a TeamSTEPPS communication module using Second Life, and piloted it with 21 students from nursing, medicine and pharmacy. Following a pre-post intervention model, measures included the TeamSTEPPS Teamwork Attitudes Questionnaire (T-TAQ) and the Interdisciplinary Education Perception Scale (IEPS). There were technical challenges, such as students feeling awkward to interact with people in Second Life. Medical students showed increases in all the subscale mean scores, except for the IEPS perceived need for cooperation and T-TAQ leadership scores. These studies point to the potential uses of the TeamSTEPPS evaluation tools and the IEPS as useful for measuring student knowledge and attitudes.

In the current study, we demonstrated a method to introduce patient safety into our curriculum that is both effective and efficient. The process of developing these digital case scenarios provided several insights. After many conversations with our potential education games partner and because of mounting additional annual costs, we chose the Qualtrics experience management software to create and manage these cases because our university had already purchased it. This platform also provided privacy and confidentially for our students, and could be completed on computers and mobile devices. Thus, this learning medium was useful for providing a quick review of procedures and concepts and reflected the just-in-time access that occurs during fast-paced clinic learning environments, such as busy clinical rotations.

The module provided valuable practice with TeamSTEPPS concepts, such as the two-challenge rule, check-back, call-out, and CUS statements. Our digital case scenarios referenced the online videos and handouts that are associated with each TeamSTEPPS concept. As a result, the team looked for opportunities to incorporate this learning exercise within the curriculum. The team eventually published the case studies for public access on the ATSU-SOMA Virtual Community Health Center website, which is available at vchc.atu.edu/Patient Safety.

The current study had several limitations. For instance, the module was voluntarily tested in a single cohort of second-year medical students, so the results cannot be generalized to other healthcare professions students or other IPE case study activities. Furthermore, our results cannot show cause and effect but may show associations that can guide additional research. Given these limitations, we are planning to continue testing this module with more students to increase our sample size. Likewise, the inclusion of a pre-module quiz in future studies may determine the degree of baseline knowledge and further elucidate the impact of this program. Because of the high mean scores in our study, we plan to review and rewrite the assessment items so they are more challenging. Also, in future studies we will set the expectation with students that they should not use other devices to look up answers to the quizzes. Facilitators will be asked to observe discussions to ensure compliance with this. We did not receive any reports that students utilized other devices. However, we will be proactive about this in the future. Although we were unable to complete a follow-up assessment 6 months after the module, this would be an excellent addition to the assessment sequence.

In the current study, the digital case scenarios module provided quality knowledge training in medical error prevention, experiential practice of interprofessional communication, and an innovative mechanism to introduce key patient safety concepts. Our design and implementation of the module
an opportunity for second-year medical students to learn key communication and safety concepts in small teams. Overall, we believe the framework of the current study can be modified by other medical schools to increase access to IPE-focused patient safety training modules. Furthermore, the training module was cost efficient and could be replicated in other online learning or blended learning environments for a wide range of health professions.

**Author Contributions**

Developed case studies and graphics: TJ, DS, AH, JL, LM. Contributed to the structure and content of the manuscript: LM, JH, AH. Made critical revisions and approved the conclusions: LM, JL, HS, DS, TJ, CM, DS, AH. All authors approved the final manuscript.

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