Assessing Nontechnical Skills in Senior Pharmacy Students Using an Innovative Simulation Setting

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ARTICLE INFO

Keywords:
- Patient safety
- Simulation
- Pharmacy education
- Gamification
- Clinical assessment

ABSTRACT

Objectives: To evaluate pharmacy students’ nontechnical skills in a simulated session by assessing their teamwork skills and ability to identify patient safety priorities.

Methods: This study involved 2 phases. Phase I was a simulated case with a total of 23 errors. Students were divided into groups and instructed to identify errors in the setting. Teamwork skills were assessed using the Individual Teamwork Observation and Feedback Tool. Phase II was a debriefing and reflection session. Quantitative data were generated using the number of errors and Individual Teamwork Observation and Feedback Tool domain scores, while qualitative data were obtained using thematic analysis.

Results: The study participants were 78 female PharmD students who were divided into 26 groups. The average number of errors identified was 8 (range: 4–13), and the most identified error was using the wrong drug (96%). The teamwork skills displayed by most groups were shared decision-making, participating in discussions, and demonstrating respect and leadership in ways that were sensitive to the needs of the team. The students described the activity as fun and novel as it encouraged them to be more detail oriented.

Conclusion: The designed simulation setting is an innovative tool to assess students’ understanding of patient safety priorities and teamwork skills.

1. Introduction

Over the past 20 years, the pharmacy profession has shifted from a medication-centered to a patient-centered one. Today, the pharmacist’s role within the medical team has expanded, as they now regularly attend rounds, lead outpatient clinics, and specialize in various clinical areas. To play a more active role in delivering these services, they are required to build certain social and cognitive skills, known as “nontechnical skills” (NTSs).

Although knowledge and technical skills remain the backbone of pharmacy education, they need to be paired with NTSs to achieve safe and efficient task performance. Technical skills can be defined as the adequacy of actions taken from a medical and technical perspective. In comparison, NTSs refer to cognitive, social, and personal resource skills, such as communication, teamwork, decision-making, and systematic thinking. NTSs are integral parts of Standards 3 (Approach to Practice and Care) and 4 (Personal and Professional Development) of the Accreditation Council on Pharmacy Education (ACPE) and encompass several kinds of NTSs, such as communication, collaboration, problem-solving, and leadership.

NTSs are especially important in the context of patient safety, given that poor communication has been associated with sentinel events. Furthermore, effective teamwork is essential in reducing harmful events that can arise from the misunderstanding of others’ roles and responsibilities. Thus, in healthcare education, students must be able to learn and acquire the skills of interprofessional teamwork and communication prior to graduation. This can be achieved through the use of simulation activities.

To acquire NTSs, students must be given opportunities to perform tasks in real-life situations, allowing them to recognize limitations and knowledge gaps by making mistakes, learning from errors, and reflecting on events. Experiential learning is crucial in education, but with the increasing number of students and growing emphasis on patient protection and privacy, access to clinical sites that are able to
accept pharmacy students as trainees is limited. Therefore, a shift to “simulation-based learning” (SBL) has become a trend, especially because the ACPE has approved the use of simulation in the Introductory Pharmacy Practice Experiences (IPPE) for up to 20% of the total experiential education requirements.2

SBL is defined as emulating a real patient, clinical situation, or environment by using a device, such as a mannequin, a task trainer, or virtual reality, aiming to teach medical concepts and decision-making to healthcare professionals.1 This approach relies on the principle of learning from experience, which embodies the adage, “Never the first time on a patient.”2

Several studies have demonstrated the positive impacts of SBL. In Nicolaide and colleagues, a systematic review conducted on undergraduate medical education, the authors aimed to evaluate the learning strategies for NTSs and encouraged the use of SBL along with other teaching methods. Another systematic review by Sarfati and colleagues,10 which assessed the effectiveness of human simulation in reducing errors, concluded that a well-designed simulation program that integrates human factors and NTSs is effective in preventing iatrogenic risks related to medication errors.11 Furthermore, Daupin and colleagues12 study that tested simulated medication-use system errors found that simulation is an effective and innovative educational approach. In pharmacy education, several studies have used simulations in the form of a prescription review, which does not involve interactions with a human. These have been shown to improve students’ knowledge, confidence, and application of medication safety principles.13,14

In Frenzel and colleagues15 study, simulations were used to prepare students in identifying and reducing medication errors; the students’ knowledge, skills, and attitudes were measured before and after the activity, and the results showed improvements in these outcomes related to medication errors through this process. Morbitzer and colleagues' review explored how teamwork is taught, measured, and assessed within pharmacy education. A total of 18 studies were identified, of which 17 used students’ self-reported assessment tools. The teamwork training identified in these studies was either integrated within the course or was a standalone workshop. The most common learning activity used was patient cases and the most common skill assessed was leadership; 72% of the studies demonstrated improvements in students’ skills-related outcomes. The authors concluded that further studies in assessing teamwork in pharmacy education are warranted.16 Our study aimed to use a simulated patient case to evaluate pharmacy students’ NTSs by assessing their teamwork skills, such as leadership, shared decision-making, working in a team, and ability to identify patient safety priorities. In addition, we assessed students’ feedback and reflection on the experience.

2. Methods

The King Saud University PharmD program is a 6-year ACPE-accredited program (after high school) that involves didactic courses, including IPPE and pharmacy practice laboratories (PPLs) for 5 years and an internship in the sixth year. The program is offered on 2 separate campuses for men and women.17

This was a cross-sectional observational study included in an organized simulation for a patient safety course taken by final-year PharmD students. The activity was held in February 2020; it aimed to assess students’ collaboration and understand their situational awareness based on the number of errors identified in a short period of time by each group. The study involved 2 phases: phase I for simulation activity and phase II for reflection. The study was conducted at the women’s campus of the College of Pharmacy at King Saud University in Riyadh.18 Saudi Arabia. All final-year, preinternship female PharmD students who were enrolled in the required “Patient Safety” course and had completed 6 weeks of didactic education were included in this study. Ethical approval was obtained from the King Saud University Medical City Institutional Review Board Committee (number E-21–5892). The

students provided informed consent for study participation.

For this study, a “working group” was formed involving 2 faculty members and 3 APPE students. The group was responsible for preparing the case, equipment, and setting, as well as overseeing the activity and evaluation.

The simulation case scenario was written based on the International Patient Safety Goals and World Health Organization patient safety curriculum taught to students in the course.18,19 The students had to incorporate their knowledge and common sense to ensure the “5 rights” in the medication-use process: selecting the appropriate antibiotics based on patients’ diagnoses, identifying basic infection control measures, allergies and drug-food interactions, identifying patients with a high risk of falls, and observing correct medication storing conditions. The case was designed and piloted on 2 students not included later in the study. A total of 23 errors are presented (Table 1). The cutoff for the number of errors was decided (post hoc) by the working group based on the average number of errors identified by all the students.

For the settings and equipment, 2 identical simulated inpatient rooms were designed with guidance from Farnan and colleagues,20 study which used a patient safety “room of horror” as part of their safety-focused simulation with medical students and interns, with the aim of assessing knowledge regarding the hazards of hospitalization. Details of the case are presented in Supplementary Appendix I.12–20

Phase I was the simulation activity; the students were allocated into groups of 3, and each group was assigned a number between 1 and 26. Before entering the room, the students were given an orientation about the activity and were told that it consisted of 2 stages: the room of horror itself and the debriefing. After orientation, each student signed a consent form to ensure confidentiality and secure their permission to publish the study results, after which they were given a clipboard with a blank list. The activity counted for 2% of the total course grade.
Abbreviation: iTOFT, Individual Teamwork Observation and Feedback Tool.

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Table 2
Likert Scale Descriptors for the iTOFT.

<table>
<thead>
<tr>
<th>Likert Scale Descriptors</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not applicable to this activity</td>
<td>It is not possible to demonstrate this behavior in this activity, in this context.</td>
<td>There may be no reason/opportunity to have a discussion about team performance.</td>
</tr>
<tr>
<td>Inappropriate</td>
<td>The student’s teamwork behavior is not appropriate in this context.</td>
<td>Does not respond when asked a question; disrespectful or insufficient communication; insensitive behavior; inadequate or incorrect information given; does not gain informed consent; does not disclose an error; aggressive behavior.</td>
</tr>
<tr>
<td>Appropriate</td>
<td>The student is engaged with the team in the activity. However, does not take the opportunity to further develop teamwork behaviors.</td>
<td>Gives accurate responses to questions when asked but does not ask questions or seek clarification; listens to feedback but does not initiate discussion; does not offer suggestions.</td>
</tr>
<tr>
<td>Responsive</td>
<td>The student is actively engaged with the team in the activity and demonstrates commitment to learning about teamwork.</td>
<td>Speaks up, asks for information; integrates the perspectives of others; reflects back to others; clarifies, motivates, acknowledges the contribution of others; builds upon the ideas of others; encourages others.</td>
</tr>
</tbody>
</table>

Abbreviation: iTOFT, Individual Teamwork Observation and Feedback Tool.

Adapted from Thistlethwaite and et al.24

Table 3
iTOFT Item Analysis Measuring Teamwork Among the 26 Groups.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Item</th>
<th>Inappropriate, n (%)</th>
<th>Appropriate, n (%)</th>
<th>Responsive, n (%)</th>
<th>Not applicable, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shared decision-making</td>
<td>Plans patient/client care or group/community intervention with team members</td>
<td>0 (0.0)</td>
<td>12 (46.2)</td>
<td>14 (53.8)*</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Working in a team</td>
<td>Participates in interprofessional discussions about patient/client care or group/community intervention</td>
<td>1 (3.8)</td>
<td>10 (38.5)</td>
<td>15 (57.7)*</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td></td>
<td>Demonstrates respect for others in and outside the team</td>
<td>1 (3.8)</td>
<td>3 (11.5)</td>
<td>22 (84.6)*</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Leadership</td>
<td>Invites the opinions of other team members</td>
<td>1 (3.8)</td>
<td>11 (42.3)</td>
<td>14 (53.8)*</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td></td>
<td>When leading, is sensitive to the needs of the team</td>
<td>1 (3.8)</td>
<td>16 (61.5)*</td>
<td>8 (30)</td>
<td>1 (3.8)</td>
</tr>
<tr>
<td></td>
<td>Provides constructive feedback to team members about their performance</td>
<td>3 (11.5)</td>
<td>15 (57.7)*</td>
<td>7 (26.9)</td>
<td>1 (3.8)</td>
</tr>
<tr>
<td>Patient safety</td>
<td>Discusses patient safety issues with the team</td>
<td>1 (3.8)</td>
<td>8 (30.8)</td>
<td>17 (65.4)*</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td></td>
<td>Works with other team members to manage conflict</td>
<td>1 (3.8)</td>
<td>13 (50.0)</td>
<td>11 (42.3)</td>
<td>1 (3.8)</td>
</tr>
</tbody>
</table>

Abbreviation: iTOFT, Individual Teamwork Observation and Feedback Tool.

* indicate higher percentage

Each group entered a patient’s room and inspected the patient’s file and existing settings in the room to identify and record errors. Each room had a faculty member and student intern who assisted the former in arranging and organizing the room. The duration to inspect the room was 5 min, which was decided as the optimal time based on the pilot study, and the purpose of the task was only to identify errors. Students’ teamwork skills were evaluated by the faculty and the intern using the Individual Teamwork Observation and Feedback Tool (iTOFT).24-25 This is a work-based assessment tool for interprofessional teamwork behaviors and has 2 versions: basic and advanced.24-25 The advanced version was used in this study. It has 10 observable behaviors under 4 headings: “shared decision-making,” “working in a team,” “leadership,” and “patient safety” (Supplementary Appendix II). Although iTOFT was originally designed for interprofessional teamwork, it was chosen because of its general concept of measuring teamwork applied to teams working within the same profession. Additionally, it included 2 themes on patient safety. The students were evaluated on a 4-point Likert scale with the following options: “inappropriate,” “appropriate,” “responsive,” and “not applicable.” The evaluators provided a Likert score based on the descriptors in Table 2. The iTOFT data were electronically entered into Google Forms so that the data could be easily collected.

Phase II was the reflection and debriefing phase; after completing the activity, the group was debriefed. The debriefing was facilitated by the intern. The groups were given time to reflect on their experience, during which they summarized their experiences and wrote about what happened in detail using a predesigned form (Supplementary Appendix I).

The outcomes assessed were as follows: the number of errors identified by each student group, types of errors most frequently identified, and iTOFT rating in each group.

The data were coded and entered into Microsoft Excel. For quantitative data, the numbers and percentages were reported, while thematic analysis of the debriefing and reflection exercises was conducted for qualitative data.

3. Results

A total of 78 students were divided into 26 groups. All groups were able to complete the activity within the allotted time. Students identified an average of 8 errors per group. The highest number of errors identified was 13 and the lowest was 4. The most frequently identified errors were patients being given ampicillin despite a documented penicillin allergy and incorrect patient name written on the medication record/identification bracelet. The least frequently identified errors were medication being given orally instead of intravenously and the mannequin lying flat, creating a risk of aspiration pneumonia (Table 1).

The iTOFT survey analysis showed that students in a group were mostly rated “responsive” in 2 items: shared decision-making and working in a team. Regarding leadership, the groups were mostly rated “appropriate.” Finally, regarding patient safety, they had 1 item rated “responsive” and another item rated “appropriate” (Table 3).

In the reflection and debriefing phases, the students answered several questions and shared their views and experiences related to the activity. The majority reflected on how this activity improved their awareness of patient safety by helping them think differently, be more attentive to details, and become highly aware of the importance of double-checking. Students identified gaps in their knowledge, such as the importance of drug interactions and infection control, and in the skills needed to deliver safe and effective patient care. They commented on the teamwork experience and how each person had their own
viewpoint during the activity. The majority expressed positive feed- back, such as how the simulation was a novel and fun experience. Regarding the design of the simulation setting, they noted that it was designed well to imitate reality and commented on the precision of the details. The students highlighted several issues in the activity that could be improved, such as the importance of students from other healthcare professions being present during the activity to communicate with and ask questions. Examples of quotes from the students are available in Supplementary Appendix III.

4. Discussion

Patient safety education is a priority for pharmacy schools and is typically delivered using static, didactic-based instructional methods. The current study demonstrated a novel approach that investigated the feasibility of assessing pharmacy students’ NTSs in a simulated session focused on patient safety by exploring their teamwork and communication skills, and then having them reflect on their experiences.

In our study, the students were able to detect an average of 8 of the 23 errors presented to them. The most commonly detected errors were a patient being given the wrong drug and an incorrect patient name written on the medical record/identification bracelet. The IPPE and PPLs did not appear to prepare students to detect all the errors presented.

The use of an SBL in teaching patient safety seems feasible and easy to replicate. Similar models have been developed and applied across a wide range of healthcare disciplines. The resources used were easily obtainable from any inpatient hospital environment, and the errors can be modified and customized to address specific areas of patient safety. Thus, this project is customizable and can be used in different settings.

The iTOFT was developed to assess collaborative, interprofessional, interdisciplinary, and multidisciplinary behaviors, as well as different aspects of teamwork. The room of horror, which is an SBL activity, appeared to be a feasible setting for assessing these collaborative, interprofessional, interdisciplinary, and multidisciplinary behaviors based on the study’s results. Over half of the groups showed responsive behaviors in shared decision-making and working in a team. However, the groups only showed the “appropriate” level of behavior in the leadership category. Regarding patient safety behaviors, more than half were rated “responsive” for discussing patient safety issues with the team but were only rated “appropriate” for working with other team members during conflict management. Experts in the education field recommend that health professional students should be given the opportunity to engage in interprofessional learning activities and develop teamwork behaviors and competencies.

Although these behaviors have been assessed individually in different courses, such as the IPPE and PPLs, while students are in the program, the room of horror could be a powerful tool to demonstrate and assess these competencies at once during their senior year before their internships start.

The iTOFT is a valid tool that can be feasibly used to evaluate students in their experiential year and can be adapted by preceptors to evaluate students and provide feedback on their interprofessional teamwork. The iTOFT assesses students’ shared decision-making, leadership skills, and teamwork skills which reflect the core competencies of interprofessional education (values/ethics, communication, teams, and teamwork). Although this activity is conducted in a group with all pharmacy students, it cannot assess the students’ understanding of other professionals’ roles and responsibilities. However, using the iTOFT in a group with all pharmacists can help in assessing students before their internships to understand how they show mutual respect to their colleagues and to identify the communication skills they need to effectively work in a team.

The working group completing the iTOFT within the assigned time of 5 min means that the iTOFT may be used during actual practice and does not significantly interfere with workflow. This is consistent with the work of Margolis and colleagues and Crowl and colleagues, who used the iTOFT during APPE.

This activity helped students demonstrate cooperative learning. Cooperative learning is a learning strategy that emerged from the social interdependence theory, which posits that the learning outcomes of each learner are affected by their own and others’ actions. Cooperative learning consists of 5 elements: face-to-face interaction, positive interdependence, individual accountability, group processing, and interpersonal skills, such as decision-making, leadership, and communication. The activity clearly demonstrated all these 5 elements, as evident from errors identified by the iTOFT scores and students’ reflections. The students identified patient safety priorities through discussion, where each student shared their own experience with their team members, which then led them to recognize the different viewpoints held by each team member. Such an interaction helped identify cues for learning and gaps in knowledge that varied among the students. The impact of this activity, as described by the students in their reflections, was that it taught them to be more alert and attentive to details in delivering patient care in the workplace. In addition, the activity highlighted students’ weaknesses, such as not noticing expired medications or not being able to understand standard medical abbreviations, such as “NPO” (nothing by mouth). Thus, these insights will be incorporated into the continuous PharmD program system to address such gaps in knowledge and skills, helping improve the curriculum.

One strength of this study was that it included both qualitative and quantitative data. Furthermore, this technique is novel and has not been implemented in other pharmacy schools in Saudi Arabia. It also demonstrated feasibility as a teaching or assessment exercise. Additionally, the students received a group-by-group debriefing, which facilitated further student interactions through discussions and enabled them to express their views.

Our study limitations included the use of a single school and cohort, a single gender and thereby limiting the generalizability of the results. Site-specific outcomes cannot be evaluated as no data are available to compare. Furthermore, the cross-sectional assessment did not allow us to evaluate results before and after the didactic parts of the course.

4.1. Future Directions

Our study’s findings warrant the inclusion of the room of horror in the patient safety curricula for training and assessment purposes in a co- ed learning environment to improve generalizability. Before and after assessment tools can be used to compare changes in students’ knowl- edge and skills after completing a specific pharmacy course. A room of horror can also be used to assess interprofessional education outcomes, given that patient safety is a common subject among all healthcare professionals and the room of horror was designed based on the World Health Organization’s curriculum for patient safety. Finally, the room of horror can be applied in an outpatient setting to highlight that patient safety issues exist in different settings and must be managed accord- ingly.

5. Conclusion

The room of horror is an innovative tool to assess students’ understanding of patient safety priorities and teamwork skills. The tool measured shared decision-making, participation in discussions, and demonstrating respect and leadership. It can also enhance the student learning experience in a safe environment through cooperative learning.

Acknowledgments

The authors thank the Center for Excellence in Learning and Teaching at the King Saud University for funding the project titled,
“Assessing the non-technical skills of senior pharmacy students at King Saud University using the room of horror,” as part of the Center’s Teaching Excellence Grant initiative, which aims to support students’ skills in the job market. All data used in this research were collected from a project supported by the center.

Author Contributions
All authors contributed extensively to the work presented in this paper and have approved the manuscript and agree with its submission to the American Journal of Pharmaceutical Education.

Declaration of Competing Interest
None declared.

Funding/Support
None.

Appendix A. Supplementary Material
Supplementary data associated with this article can be found in the online version at 10.1016/j.ajipe.2022.12.008.

References

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