

Impact of an Emergency Department Simulation on Pharmacy Students' Interprofessional Team Skills and Attitudes

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ABSTRACT

Objective: To evaluate the impact of an emergency department simulation on pharmacy students' interprofessional team skills and attitudes as measured by a novel mixed methods approach.

Methods: A simulated emergency department encounter was executed by interprofessional teams consisting of pharmacy and medical students. Two rounds of the same encounter were separated by a short debriefing session facilitated by pharmacy and medical faculty. A full, comprehensive debriefing session occurred after conclusion of the second round. Pharmacy faculty evaluated pharmacy students using a competency-based checklist after each round of the simulation. Pharmacy students completed a baseline self-assessment of their interprofessional skills and attitudes pre-simulation, and again post-simulation.

Results: Pharmacy students demonstrated significant improvement in providing clear and concise verbal interprofessional communication and using shared decision making to develop a collaborative plan of care, based upon student self-assessment and faculty observational ratings. Student self-assessments also showed significant perceived growth in contributing to the team's plan of care, and demonstrating active listening skills within the interprofessional team. Through qualitative analysis, pharmacy students noted perceived self-improvement in a variety of team-based skills and attitudes including confidence, critical thinking, role identification, communication, and self-awareness.

Conclusion: This simulation provided a learning opportunity for pharmacy students to improve their skills related to teamwork and interprofessional collaboration. Based upon a novel mixed methods assessment, both student self-assessment and faculty observational ratings were associated with significant growth in interprofessional skills and attitudes. This simulation provides a template experience for colleges/schools to meet, at least in part, ACPE Standards related to interprofessional education in collaboration with medical students.

Keywords: simulation, interprofessional education, emergency department

INTRODUCTION

The importance of interprofessional education (IPE) has been recognized and emphasized in healthcare education. The literature supports that IPE can promote autonomy, understanding of professional roles, teamwork and interprofessional collaboration, skills that can contribute to the improvement of healthcare and patient safety.¹⁻⁴ The Institute of Medicine (IOM) and Interprofessional Education Collaborative (IPEC) have published recommendations that can be used to guide development and assessment of IPE for healthcare professional student learners across multiple disciplines.^{5,6} Accreditation Council for Pharmacy Education (ACPE) Standards 2016 and the American Association of Colleges of Pharmacy Special Report "Core Entrustable Professional Activities for New Pharmacy Graduates"¹¹ emphasize the importance of pharmacy graduates to develop and practice interprofessional skills related to communication and teamwork while completing their pharmacy education.^{7,8}

ACPE Standard 11, which is a subsection of ACPE Standards 2016, highlights the need for interprofessional learning

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opportunities prior to advanced pharmacy practice experiences (APPEs).⁷ These learning opportunities can be in didactic, early experiential, and/or co-curricular coursework and may include simulated patient care experiences.⁷ It is noteworthy that while ACPE Standard 11 encourages IPE with a variety of healthcare professional students, it requires schools of pharmacy to include IPE with student prescribers in its curriculum.^{7,9}

An assortment of assessment tools and research methodologies have been used to measure IPE learning outcomes.¹⁰⁻¹⁷ In 2017, Schrader et al. completed a systematic review of quantitative assessment tools published in the literature and their overall usefulness in pharmacy education; however, qualitative and/or mixed method assessments were not reviewed.¹⁰ The reviewed assessment tools were mapped to the expanded Kirkpatrick outcomes model, which is a commonly described model in healthcare education literature for categorizing levels of learning.^{5, 10-12} Schrader et al also mapped the reviewed assessment tools to the IPEC competencies and ACPE Standards 2016.¹⁰ Assessments of IPE using quantitative tools, within both pharmacy and student prescriber literature, have generally included either direct observation of student performance and/or student self-assessment.¹⁰⁻¹⁶

The IOM Committee on Measuring the Impact of Interprofessional Education on Collaborative Practice and Patient Outcomes has recommended the use of assessments that employ mixed methods to gain a more robust understanding of the way learning occurs in IPE.⁵ McLaughlin, et al previously discussed the potential value of using mixed method studies in pharmacy education, including experiential education.¹⁷ However, mixed methods assessments of IPE with pharmacy students and prescribing provider students prior to APPEs are limited in the literature.^{5,10-12} Recently, Marshall et al used mixed methods including a validated quantitative assessment before and after an IPE simulation, in addition to focus groups with a smaller cohort of participants 8-10 months later. Using this methodology, they were able to demonstrate both short and long-term changes in student reported achievement of IPE learning outcomes.¹⁷⁻¹⁸

To further address how interprofessional teaching and learning is optimized in pharmacy education, faculty designed and implemented a mixed-methods study around an existing IPE simulation which is included in the school's current co-curriculum and early experiential education curriculum requirements. The objective of this study is to evaluate the impact, using this novel mixed-methods approach, of an emergency department simulation on pre-APPE pharmacy students' interprofessional team skills and attitudes that contribute to pre-APPE readiness.

METHODS

Simulation Logistics and Flow

A simulated emergency department encounter was jointly designed by faculty from North Dakota State University (NDSU) School of Pharmacy and University of North Dakota (UND) School of Medicine. The simulation was a capstone activity of the Introductory Pharmacy Practice Experience (IPPE) curriculum for third-year pharmacy students that utilized a high-fidelity mannequin presenting as a non-responsive patient. The only personal information that the students had access to was the patient's purse which contained the patient's name, age, and prescription medications. Overall goals for the learners associated with the simulation were: 1) collaborate with members of the interprofessional team to efficiently and effectively deliver patient care; and 2) manage, as a team, a patient with an emergent healthcare need according to the learners' scope of practice.

In North Dakota, the pharmacy school and medical school are professional programs at separate state-funded universities. There is only one of each type of program in the state, and they are located approximately 80 miles apart. During the 2021 simulation, third-year pharmacy students and faculty traveled to the medical school's simulation center to collaborate with second-year medical students and faculty. Prior to arriving at the simulation center, all students were briefed on the simulation's goals, logistics and flow. Pharmacy

students were also provided with a pre-recorded video tour of the simulation center and orientation regarding the capabilities and equipment of the simulation center, including availability of laboratory and bedside testing, oxygen and medication administration, and regular vital sign assessments. Pharmacy and medical school faculty (n = 15) received detailed training with a full script of the response actions/verbalizations that could occur by the high-fidelity mannequin based on the learners' various potential actions and a short debriefing guide. Prior to the start of the simulation activity, all faculty met to review the simulation scenario, discuss how to approach the short and full debriefings, and answer commonly anticipated questions.

The entire cohorts of second-year medical learners (n = 75) and third-year pharmacy learners (n = 65) participated in the simulation in interprofessional teams with two to three medical learners and two to three pharmacy learners assigned per team. There was a total of 29 teams using six simulation rooms, allowing up to six teams to complete the simulation simultaneously. Each team performed patient assessment, compiled a differential diagnosis, and recommended and implemented treatment with the high-fidelity mannequin responding according to pre-programmed vital signs, laboratory findings, and verbal expression changes based on actions performed by the team. Each team proceeded through the simulation activity twice. The first round of the activity lasted 15 minutes and the second round lasted 10 minutes. The two rounds of the simulation activity were separated by a 10-minute short debrief that occurred in the simulation room. (Figure 1). The short debrief topics were standardized between all faculty through a brief training. Each short debrief was co-led by one pharmacy and one medical faculty. This debrief was intended to focus on how the team worked together and what the team members might modify during the second round of the simulation in order to enhance their approach to care delivery for their unresponsive patient. Short debrief questions included: 1) What went well as a team?; 2) What did not go well as a team?; and 3) What as a team would you do differently? Faculty provided suggestions regarding team interactions, roles, and communication. Technical aspects of the care surrounding the unresponsive patient, such as medication dosing or the focus of the physical exam, were not discussed in detail during the short debrief.

A 25-minute full debrief occurred after the second round of the simulation and was held in a traditional classroom setting. Six interprofessional teams (n = approximately 30 students in total) attended the full debrief simultaneously; this was conducted four times to accommodate all the teams. The full debrief was co-led by two pharmacy and two medical faculty. It was designed using the Promoting Excellence and Reflective Learning in Simulation (PEARLS) framework and a script was designed jointly by the pharmacy and medical faculty to address the four phases associated with the PEARLS framework: reaction, description, analysis and

application/summary.¹⁹ This was a highly interactive session with medical and pharmacy students each asked to voluntarily contribute their emotions and thoughts associated with the scenario initially (reaction), followed by one student from each discipline voluntarily sharing a summary of the main points of what happened during the simulation (description). Faculty used additional guided questioning when necessary to ensure there was shared understanding of the simulation case. Then, faculty asked students to informally and verbally self-assess their performance (analysis) using the following questions: 1) What aspects of the team's communication went well?; 2) What aspects of establishing the differential diagnosis and conducting the physical exam would you do differently?; 3) How did you work together to decide on the treatment plan? Could this have been done better?; 4) What information about the patient's medications did you use and how did you use it? Directive feedback and teaching by the faculty was included to close gaps in knowledge/performance and explain rationale for recommended actions in future practice. The full debrief session was concluded by asking students to collectively arrive at three key take-aways from the simulation activity (application/summary).

Assessment Data Collection

A variety of assessments were conducted to evaluate the simulation's impact on the pharmacy students' interprofessional skills and attitudes (Figure 1). Of note, medical students were not formally evaluated in this study. One pharmacy faculty in each simulation room assessed student performance in the four domains outlined by the IPEC Core Competencies for Interprofessional Collaborative Practice in each round of the simulation (Table 1).⁶ To do so, faculty utilized a paper checklist to verify whether each IPEC domain was achieved by each student or not. The checklist was developed based upon IPEC competencies and ACPE Standards related to IPE; it has not been repeatedly validated in studies to date. During preparation meetings for the simulation, the pharmacy faculty discussed grading consistency related to the checklist, since there was a different faculty assigned to each of the six simulation rooms.

In order to control for previous IPE learning activities across the curriculum, the pre-assessment asked questions characterized by learning that had previously occurred, and the post-assessment included all previous IPE activities, including the simulation. First, the researchers requested all pharmacy students to voluntarily complete an electronic self-assessment by responding to various open-ended reflective survey prompts up to one week prior to (pre-simulation) and immediately after the simulation (post-simulation) (Table 2). Second, a six-item self-evaluation survey was disseminated to assess the four domains outlined by the IPEC Core Competencies for Interprofessional Collaborative Practice (*Values and Ethics for Interprofessional Practice, Roles and Responsibilities, Interprofessional Communication, and Teams and Teamwork*) (Table 3) pre- and post-simulation.⁶ Table 3

outlines the IPEC competencies and sub-competencies with their associated survey prompts.⁶ Students self-rated themselves on a scale of 0-100 in regards to their interprofessional contributions pre- and post-simulation. To calibrate responses, students were told that a ranking of 0 correlated to "poor" and a ranking of 100 correlated to "exceeding expectations of a pharmacist." Students were familiar with this scale as they had utilized it in other coursework throughout the pharmacy curriculum.

Data Analysis

Quantitative data from the student self-assessment numeric responses were analyzed using paired samples t-tests to assess average reported score for each question on the pre- and post-survey as well as percentage change between surveys. To analyze differences between faculty evaluations of student accomplishment in each round, a paired-samples sign test was utilized.

Three researchers conducted thematic analysis of qualitative reflection responses (as noted in Table 4) using conventional content analysis. This included an initial inductive approach and then a deductive analysis.²⁰ First, memoing was completed by each researcher to bracket their assumptions. Then, each researcher independently read through all responses and coded the data, labeling key concepts or ideas expressed by the students. To establish consensus, all three researchers met to define consensus codes. Similar codes were then consolidated through development of a consensus codebook, which included agreed upon definitions to clarify code meaning. An iterative process of coding and peer debriefing occurred until all cohort reflections were fully coded. Codes were then organized into clusters that represented overarching themes in the data. The researchers identified student responses that best embodied each code and then codes were grouped into categorical themes with corresponding illustrative quotations. The NDSU Institutional Review Board approved this study.

RESULTS

Of the 65 pharmacy students that participated in the simulation, 58 (89.2%) voluntarily completed the pre- and post-simulation surveys and consented to allow the researchers to use their responses and faculty evaluation data. Faculty evaluations of student performance shown in Table 1 revealed 100% of the students successfully achieved all of the interprofessional competencies upon completing round 2 of the simulation. Competencies that showed significant growth from round 1 to round 2 were: 1) verbally communicated key issues and findings in a clear and concise manner; and 2) used shared decision making to develop a collaborative plan of care. As shown in Table 3, students' pre-survey self-evaluation scores revealed the highest confidence in the *Values and Ethics* core competency for interprofessional practice, with average scores of 93.95 and 93.86 for the two prompts respectively. The competency of *Teams and Teamwork* had

the largest increase in self-perceived ability from pre- to post-simulation by students with a mean increase of 22.22 points from 65.67 to 87.90 ($p < .05$).

Qualitative analysis of responses to questions in Table 2 describes overall themes related to baseline feelings/perceptions/abilities pertaining to previous IPE experiences, and changes that occurred after completing the simulation. Pre-simulation, during their previous community and institutional IPPE experiences, students commented that their contributions were primarily in an observational or introductory role.

“I observed my preceptor making recommendations to the team on patients’ plan of care. I would discuss the patient with my preceptor prior to rounding, however, I did not have the opportunity to personally contribute to the large group discussion.”

Pre-simulation activities completed included responding to drug information requests, medication therapy management, rounding with a team, patient advocacy, and observing roles of pharmacists and other healthcare professionals.

“I helped with medication therapy management at the pharmacy I was at and it helped to decrease pill burden and make sure patients were on medication for a necessary reason. By communicating with the patient’s doctors, we were able to discontinue those meds that were not necessary.”

Students, pre-simulation, identified a need to improve upon their communication and active listening skills, confidence, accepting constructive feedback, and defining their own role on a team.

“I want to practice active listening more so that I can learn how to incorporate other people’s ideas in my thought process for a patient’s care plan.”

Post-simulation, as noted in Table 4, the cohort highlighted the value of working with and learning from medical students. Often, they observed how much the medical students relied upon the pharmacy students’ ability to provide drug information, and how often the medical students valued the pharmacy students as team members and collaborators to work through the patient scenario.

“I was most surprised to know that the medical students didn’t know a lot about the medications and were actually depending a lot on us to give them more information specific to medications.” “I was surprised by ideas generated as a team. Though from different disciplines, we had the same goal and our ideas worked well to determine what was wrong with the patient.”

Pharmacy students noted personal improvement in a variety of areas as a result of the simulation. Examples include confidence, critical thinking, role identification, communication, and self-awareness.

“I believe that I improved with my communication when handing off medications that will be administered, looking up needed drug information, and being more assertive with my recommendations/ideas.”

DISCUSSION

The design of the simulation, offering two consecutive attempts, allows for students to learn from their first attempt during the short debrief and then practice what they have learned during the second attempt. The yes/no, competency-based faculty checklist was specifically designed for ease and efficiency of use and was adapted from a checklist used in the Interprofessional Healthcare Practice course taught at NDSU. By adapting a previously utilized checklist, student progression towards meeting IPEC competencies can be tracked over time. The greatest areas of improvement were seen with the checklist prompts related to contribution to the plan of care, from the point of view of roles and responsibilities and teams and teamwork. The positive change seen between the student pre- and post-assessment in these areas indicates that students were able to see and demonstrate the value that a pharmacist can have on an interprofessional healthcare team. This is something that may have been inconsistently demonstrated during the students’ direct patient care IPPE experiences prior to this simulation. During the large group debrief, medical students provided positive comments regarding the value of and appreciation for having a pharmacist on the interprofessional team, which could have increased the student’s self-confidence and therefore increased their post-assessment self-ranking.

According to the faculty assessment not all students contributed to the plan of care or used shared decision making during the first occurrence of the simulation. However, after the short debrief and second occurrence of the simulation, all students were able to achieve these items (Table 1). This supports the increase in student self-assessment that was seen in these areas (Table 3). Similarly, only 81% of students verbally communicated key issues in a clear and concise manner during the first simulation occurrence, but all students fulfilled this competency during the second occurrence (Table 1). Also, students self-assessed clear and concise communication lower prior to the simulation, but expressed improvement after the simulation (Table 3). In the area of active listening, faculty assessed all students as achieving this skill during both instances of the simulation (Table 1). However, students’ self-assessment showed improvement in this area following the simulation (Table 3). This increase could be due to the ability to practice and demonstrate the skill, an opportunity in which they may not have been able to demonstrate in experiences prior to this simulation. Overall

as a result of completing the simulation, students noted perceived self-improvement in a variety of skills and attitudes including confidence, critical thinking, role identification, communication, and self-awareness (Table 4).

During the second occurrence of the simulation, faculty felt that all students achieved all four of the IPEC core competencies, based on the prompts in the yes/no checklist. This improvement from round one, where competency achievement ranged between 81-100%, could be an overall improvement in skills between the rounds and the grader wanting to be sure to capture the improvement. Given that the case was the same, and the encounters were close in proximity, it is unclear how this improvement could relate to skill mastery, which would require transfer of the skill to a new situation. This poses an area for further exploration into the utility of the yes/no, competency-based, faculty checklist.

The methods and outcomes of this simulation may serve as a roadmap to assist similar schools in meeting the ACPE standards related to IPE. The mixed methods approach that encompassed student qualitative and quantitative self-assessment along with faculty assessment data of student performance strengthens the findings. As with Marshall et al, the addition of qualitative data in the evaluation of this IPE simulation allows a more full description of the impact of this simulated activity on achievement of IPE learning outcomes, further confirming that a well-designed activity can be very impactful in IPE.¹⁸ Moreover, including qualitative self-reflective data gives the researcher (and subsequent reader) additional constructive feedback on the instructional methods used, and further explanation of the quantitative data results.^{5,17}

This study has some limitations. Even though all students were required to be present during the large group debriefing sessions post-simulation, not all students actively (and equally) contributed to the group discussion, and therefore it cannot be assumed that all students agreed to the summarized reflection points shared by students in these group sessions. Also, students were aware that their reflections would be read by the faculty; thus, their responses may have been influenced by this fact. Additionally, self-rating of soft skills does not always predict performance, though the provision of feedback through debriefing may support more accurate self-ratings.²¹ As students were asked to reflect upon past IPPE encounters, recall bias may have influenced student survey responses pre-simulation as most expected IPE during IPPE would have occurred one to two years prior to the simulation. Although faculty met prior to the simulation to discuss the grading checklist, the possibility of low interrater reliability on the checklist cannot be dismissed entirely and was not formally assessed by the researchers. Lastly, despite the fact that the student self-evaluation surveys and faculty evaluation checklist were developed based upon IPEC

competencies and ACPE Standards related to IPE, these tools have not been validated.

CONCLUSION

This simulation provided students a learning opportunity to improve their skills related to teamwork and interprofessional collaboration and a template experience for pharmacy colleges/schools to address, at least in part, ACPE Standards related to interprofessional education in collaboration with medical students. Based upon a mixed methods approach encompassing both student self-assessment and faculty observational ratings, pharmacy students improved in providing clear and concise verbal interprofessional communication and use of shared decision making to develop a collaborative plan of care with this single educational intervention with medical student prescribers placed at the end of the pre-APPE curriculum. Additionally, through qualitative analysis, pharmacy students noted perceived self-improvement in a variety of skills and attitudes including confidence, critical thinking, role identification, communication, and self-awareness.

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REFERENCES

1. Alzamil H, Meo SA. Medical students' readiness and perceptions about interprofessional education: A cross sectional study. *Pak J Med Sci.* 2020;36(4). doi:[10.12669/pjms.36.4.2214](https://doi.org/10.12669/pjms.36.4.2214)
2. Brock D, Abu-Rish E, Chiu CR, et al. Republished: Interprofessional education in team communication: working together to improve patient safety. *Postgrad Med J.* 2013;89(1057):642-651. doi:[10.1136/postgradmedj-2012-000952rep](https://doi.org/10.1136/postgradmedj-2012-000952rep)
3. Imafuku R, Kataoka R, Ogura H, Suzuki H, Enokida M, Osakabe K. What did first-year students experience during their interprofessional education? A qualitative analysis of e-portfolios. *J Interprof Care.* 2018;32(3):358-366. doi:[10.1080/13561820.2018.1427051](https://doi.org/10.1080/13561820.2018.1427051)
4. Peeters MJ, Sexton M, Metz AE, Hasbrouck CS. A team-based interprofessional education course for first-year health professions students. *Curr Pharm Teach and Learn.* 2017;9(6):1099-1110. doi:[10.1016/j.cptl.2017.07.006](https://doi.org/10.1016/j.cptl.2017.07.006)
5. Institute of Medicine (U.S.), ed. *Measuring the Impact of Interprofessional Education on Collaborative Practice and Patient Outcomes.* The National Academies Press; 2015. Accessed July 5, 2021. <https://www.ncbi.nlm.nih.gov/books/NBK338360/>

6. Interprofessional Education Collaborative. Core Competencies for Interprofessional Collaborative Practice: 2016 Update. Published online 2016. Accessed November 4, 2022. <https://ipec.memberclicks.net/assets/2016-Update.pdf>
7. Accreditation Council for Pharmacy Education. Accreditation Standards and Key Elements for the Professional Program in Pharmacy Leading to the Doctor of Pharmacy Degree. Published online February 2, 2015. Accessed November 4, 2022. <https://www.acpe-accredit.org/pdf/Standards2016FINAL.pdf>
8. Haines ST, Pittenger AL, Stolte SK, et al. Core entrustable professional activities for new pharmacy graduates. *Am J Pharm Educ*. 2017;81(1):S2. doi:[10.5688/ajpe81152](https://doi.org/10.5688/ajpe81152)
9. Accreditation Council for Pharmacy Education. Guidance for the Accreditation Standards and Key Elements for the Professional Program in Pharmacy Leading to the Doctor of Pharmacy Degree. Published online February 2, 2015. Accessed November 4, 2022. <https://www.acpe-accredit.org/pdf/GuidanceforStandards2016FINAL.pdf>
10. Shrader S, Farland MZ, Danielson J, Sicut B, Umland EM. A systematic review of assessment tools measuring interprofessional education outcomes relevant to pharmacy education. *Am J Pharm Educ*. 2017;81(6):119. doi:[10.5688/ajpe816119](https://doi.org/10.5688/ajpe816119)
11. Reeves S, Boet S, Zierler B, Kitto S. Interprofessional education and practice guide No. 3: evaluating interprofessional education. *J Interprof Care*. 2015;29(4):305-312. doi:[10.3109/13561820.2014.1003637](https://doi.org/10.3109/13561820.2014.1003637)
12. Reeves S, Fletcher S, Barr H, et al. A BEME systematic review of the effects of interprofessional education: BEME Guide No. 39. *Med Teach*. 2016;38(7):656-668. doi:[10.3109/0142159X.2016.1173663](https://doi.org/10.3109/0142159X.2016.1173663)
13. Egelund EF, Gannon J, Domenico L, Nobles P, Motycka CA. Recognizing opioid addiction and overdose: An interprofessional simulation for medical, nursing and pharmacy students. *J Interprof Educ Pract*. 2020;20:100347. doi:[10.1016/j.xjep.2020.100347](https://doi.org/10.1016/j.xjep.2020.100347)
14. Brennan LF, McBride A, Akinola M, et al. Improving health professions students' understanding of interprofessional roles through participation in a patient stabilization simulation. *Am J Pharm Educ*. 2021;85(3):848-116. doi:[10.5688/ajpe848116](https://doi.org/10.5688/ajpe848116)
15. Begley K, O'Brien K, Packard K, et al. Impact of interprofessional telehealth case activities on students' perceptions of their collaborative care abilities. *Am J Pharm Educ*. 2019;83(4):6880. doi:[10.5688/ajpe6880](https://doi.org/10.5688/ajpe6880)
16. Tilley CP, Roitman J, Zafra KP, Brennan M. Real-time, simulation-enhanced interprofessional education in the care of older adults with multiple chronic comorbidities: a utilization-focused evaluation. *mHealth*. 2021;7:3-3. doi:[10.21037/mhealth-19-216](https://doi.org/10.21037/mhealth-19-216)
17. McLaughlin JE, Bush AA, Zeeman JM. Mixed methods: Expanding research methodologies in pharmacy education. *Curr Pharm Teach and Learn*. 2016; 8(5): 715-721. doi:[10.1016/j.cptl.2016.06.015](https://doi.org/10.1016/j.cptl.2016.06.015)
18. Marshall C, Van Der Volgen J, Lombardo N, Hamasu C, Cardell E, Blumenthal DK. A mixed methods approach to assess the impact of an interprofessional education medical error simulation. *Am J Pharm Educ*. 2020;84(2):7133. doi:[10.5688/ajpe7133](https://doi.org/10.5688/ajpe7133)
19. Eppich W, Cheng A. Promoting excellence and reflective learning in simulation (PEARLS): development and rationale for a blended approach to health care simulation debriefing. *Simul Healthc*. 2015;10(2):106-115. doi:[10.1097/SIH.0000000000000072](https://doi.org/10.1097/SIH.0000000000000072)
20. Hsieh H-F, Shannon SE. Three approaches to qualitative content analysis. *Qual Health Res*. 2005;15(9):1277-1288. doi:[10.1177/104973230527668](https://doi.org/10.1177/104973230527668)
21. Karpen SC. The social psychology of biased self-assessment. *Am J Pharm Educ*. 2018;82(5):6299. doi:[10.5688/ajpe6299](https://doi.org/10.5688/ajpe6299)

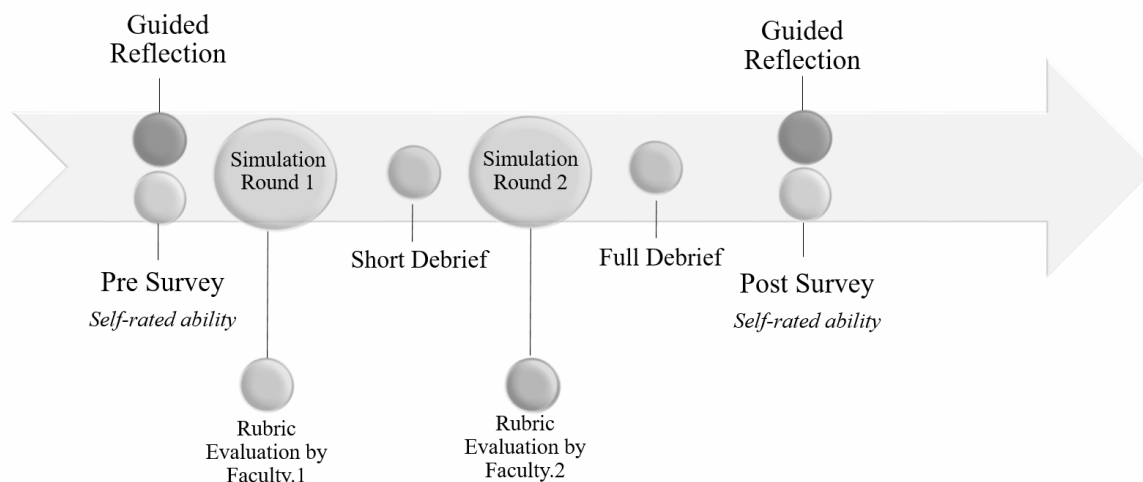


Figure 1. Timeline and outputs from study

Table 1. Faculty Observation of Students' Simulation Performance (n = 58)

VALUES/ETHICS FOR INTERPROFESSIONAL PRACTICE	Round 1 Student Results	Round 2 Student Results	p value
Demonstrated respect to all members of the team. (Interprofessional Education Collaborative (IPEC) Values/Ethics Sub-competency 4)	100%	100%	NA
Was professional throughout the simulation (dress, communication, behaviors). (IPEC Values and Ethics Sub-competency 7)	100%	100%	NA
ROLES AND RESPONSIBILITIES			
Contributed to the plan of care within the scope of their practice. (IPEC Roles/Responsibilities Sub-competencies 5 and 9)	93%	100%	.125
INTERPROFESSIONAL COMMUNICATION			
Demonstrated active listening to encourage ideas and opinions of others. (IPEC Interprofessional Communication Sub-competency 4)	100%	100%	NA
Verbally communicated key issues and findings in a clear and concise manner. (IPEC Interprofessional Communication Sub-competency 3)	81%	100%	.001
TEAMS AND TEAMWORK			
Used shared decision making to develop a collaborative plan of care. (IPEC Team and Teamwork Sub-competency 4)	84%	100%	.004

Table 2. Guided Reflection Survey Prompts

Pre-Simulation
Briefly describe one example of an interprofessional encounter during your introductory pharmacy practice experiences (IPPE). How did you feel you personally contributed to the collaborative plan of care? (approx. 5 sentences) What would you identify as 2 areas for PERSONAL improvement within your interprofessional interactions?
Post-Simulation
Reflect on your thinking, learning, and work today. What was most surprising to you? Reflect on your thinking, learning, and work today. What are you most proud of? What would you identify as 2 areas for PERSONAL improvement within your interprofessional interactions? Identify at least 3 of YOUR skills or traits which you believe were advanced because of your interaction and practice today.

Table 3. Student Self-Evaluation Survey Prompts Pre-/Post-Simulation

VALUES/ETHICS FOR INTERPROFESSIONAL PRACTICE	Pre-Survey Mean* (SD)	Post-Survey Mean* (SD)	Mean Difference	p value
I demonstrated respect to all members of the interprofessional team during my Introductory Pharmacy Practice Experience (IPPE). (Interprofessional Education Collaborative (IPEC) Values/Ethics Sub-competency 4)	93.95 (14.43)	98.12 (4.79)	4.17	.041
I was professional throughout interprofessional encounters on my IPPE (dress, communication, behaviors). (IPEC Values and Ethics Sub-competency 7)	93.86 (14.46)	96.60 (7.56)	2.74	.213
ROLES AND RESPONSIBILITIES				
I contributed to the plan of care along with other members of an interprofessional team within the scope of my practice during my IPPE. (IPEC Roles/Responsibilities Sub-competencies 5 and 9)	66.48 (27.66)	87.76 (16.82)	21.28	<.001
INTERPROFESSIONAL COMMUNICATION				
I demonstrated active listening to encourage ideas and opinions of others on the interprofessional team during my IPPE. (IPEC Interprofessional Communication Sub-competency 4)	78.78 (21.48)	91.43 (12.31)	12.66	<.001
I verbally communicated key issues and findings in a clear and concise manner to an interprofessional team during my IPPE. (IPEC Interprofessional Communication Sub-competency 3)	64.88 (28.23)	84.10 (17.32)	19.22	<.001
TEAMS AND TEAMWORK				
I used shared decision making to develop a collaborative plan of care with other healthcare professionals during my IPPE. (IPEC Team and Teamwork Sub-competency 4)	65.67 (29.36)	87.90 (15.68)	22.22	<.001

* Student response scale: 0 = poor to 100 = exceeding expectations of a pharmacist

Table 4. Post-Simulation Qualitative Themes and Associated Illustrative Quotes

Themes	Illustrative Quotes
Value of working with medical (MD) students and observing team dynamics	
Learned from MD/MD role	I was surprised that the medical students were calm and reserved during a state of emergency. They were able to gather critical values quickly and the scribe wrote them down quickly as well.
Valued pharmacist as team member	I was most surprised to know that the medical students didn't know a lot about the medications and were actually depending a lot on us to give them more information specific to medications.
Teamwork and collaboration	I was surprised by ideas generated as a team. Though from different disciplines, we had the same goal and our ideas worked well to determine what was wrong with the patient.
Personal improvement achieved through participation in the interprofessional education (IPE) simulation	
Confidence	I felt like I became more confident with my clinical decisions.
Critical thinking	Using clinical reasoning to contribute to patient care.
Role identification	Improved confidence in and understanding of pharmacist's role during an interprofessional care situation.
Communication	I believe that I improved with my communication when handing off medications that will be administered, looking up needed drug information, and being more assertive with my recommendations/ideas.
Working under pressure	Staying calm and collected in an emergency situation.
Learned from MD/MD role	Knowing how to approach providers with an idea for patient care.
Communication	I am more comfortable with interacting with a patient and gained more skills in counseling on medications.
Areas identified where personal improvement is still needed within IPE interactions	
Communication	Communicating my thoughts out loud instead of keeping opinions to myself.
Confidence	Being confident in giving reasons why certain medications should be administered.
Role in interprofessional teams	Knowing when to present your information, especially in an emergent situation.
Self-awareness	I would like to be less hesitant to voice my ideas or clinical reasoning. I had discussed my ideas with my pharmacy partner, but I was slow to speak up in front of the whole group.
Critical thinking	One area of personal improvement I can make is to advance my critical thinking skills during a medical emergency.
Didactic knowledge	I would like to get better/more familiar with my dosing of emergency medications like naloxone.
Hands-on readiness	Having a quicker response to the issues at hand and being assertive once I came to a conclusion.