

ABSTRACT

Background: Patient simulation is being used by medical and nursing schools, but has yet to be introduced into the pharmacy curriculum. By utilizing simulation, pharmacodynamics of medications can be demonstrated in a controlled environment. The simulation of patient cases allows facilitators the luxury of controlling the learning environment for each student, adapting the simulation to level of student performance, and provides for immediate debriefing and assessment. We believe that students' interest levels and retention of knowledge may be further increased by interacting in a simulated environment during introduction of new pharmacology and therapeutics. The objective of this report is to discuss the design and implementation of a mannequin simulation-based patient case assessment for critical care pharmacotherapeutic education of Doctor of Pharmacy students and to evaluate student satisfaction after the simulation.

Methods: During the second year of the pharmacy curriculum at the University of Pittsburgh School of Pharmacy, all students are required to complete the *Introduction to Critical Care* course. Patient information was programmed into a simulation mannequin, which demonstrated characteristics of a critically ill human. Students were surveyed post-simulation to determine effectiveness of the learning experience. The project will be continued throughout the pharmacy curriculum to assess students' attitudes and satisfaction with simulation-based learning.

Results: Overall, 98 students completed the patient simulation sessions and 94 of 98 (96%) completed the post-simulation survey. The average grade for the simulation session was 22 of 25 total points or 88%. The majority of students, 88%, were extremely satisfied with the experience. The facilitator was considered to be extremely useful in 75% of responses.

Conclusion: By simulating a patient case, the facilitator is able to control students' learning environment, adapt simulation to the level of students' performance, and debrief students immediately. Ultimately, this type of education can produce pharmacists with a high level of expertise and confidence when entering the workforce by involving the student in actual patient cases very early during the pharmacy curriculum.

INTRODUCTION

The recommendations from the panel on General Professional Education of the Physician of the Association of American Medical Colleges and the subsequent Edinburgh Declaration supported a shift in medical education from large classroom instruction to interactive, competency-based learning.^{1,2} Simulation-based training represents one way of accomplishing these recommendations. Patient simulation has been introduced into medical and nursing schools, but has yet to be introduced into the pharmacy curriculum.^{3,4}

The *Introduction to Critical Care* course is a required course at the University of Pittsburgh School of Pharmacy to introduce students to acute care concepts with a focus on the operative and intensive care patients. Over the past 5 years, the student's application of the knowledge presented in a didactic format has -

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been applied to direct patient care by utilizing patient case discussion in large and small group formats. We have introduced simulation-based learning at the end of this course for assessment of the critical care pharmacotherapeutic education received throughout the course and to evaluate the ability of students to solve advanced patient cases. We also evaluated the student satisfaction and attitude toward this innovative teaching technique.

METHODS

The *Introduction to Critical Care* course is a required course in the second professional year of the University of Pittsburgh School of Pharmacy's curriculum. At this point in the students' education, they have completed three therapeutic courses: *Pharmacotherapy of Cardiovascular Disease, Pharmacotherapy of Infectious Disease, and Nephrology*. In addition, the students had the following courses in the first professional year of the curriculum: *Anatomy and Physiology, Drug Development, Principles of Drug Action, Service Learning, and Biochemistry*. All students attended didactic lectures, case discussions, and intensive care unit visits. For the final component of the course, students completed a graded clinical assessment at the Peter M. Winter Institute for Simulation, Education, and Research (WISER).

Several cases were programmed into the simulation mannequin, including acute myocardial infarction, hemorrhagic shock, cardiogenic shock, ventricular fibrillation, ventricular tachycardia, hemodynamically unstable atrial fibrillation, and hypertensive crisis. Each case included subjective and objective information paralleling actual clinical practice. All laboratory, procedural, and other clinical data were available for students as needed. Students were given the patient chart/written patient case one week prior to the scheduled simulation experience to allow for adequate preparation. Upon arrival to the WISER Institute, students were oriented to the simulation mannequin and asked to begin the simulation by performing a basic physical exam, including blood pressure and pulse. Students were then asked to diagnose the patient's clinical condition and to develop a pharmacotherapeutic plan as a group. This plan was presented to the facilitator and the recommended therapy was given to the patient. Actual clinical responses were programmed into the mannequins so that students could monitor the patient and adjust therapy as warranted.

At the end of the simulation session, each group was given immediate feedback through a debriefing session with the facilitator and was provided the group grade for the session. The students were then asked to write a graded pharmacotherapy note for this patient. Immediately after the session, students were asked to complete an online, anonymous survey instrument regarding the simulation learning experience.

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Students were given a group grade for the session which was 10%, 25 points, of their overall course grade. A maximum of 15 points were given for the patient simulation session, 5 points for group participation, 10 points for critical thinking skills assessment by the debriefing tool, and 10 points for the preparation of the pharmacotherapy note.

RESULTS

Overall, 98 students completed the patient simulation sessions and 96% (94) of students completed the post-simulation survey instrument. This survey was voluntary and anonymous.

Table 1. Demographics of Second-Professional Year Students

Demographic	Result N=98
Gender	
Male	28
Female	70
Average Age, yrs (range)	24 (21-51)
Race	
Caucasian	90
Asian	4
African Americans	4
Students with prior degrees	16

The average grade for the simulation session was 22 of 25 total points or 88%. Ninety of 94 students (96%) made positive comment about the simulation experience. Some students were uncomfortable in the lifelike situation, stating

Figure 1. Facilitator Debriefing



RESULTS

"It was frustrating to some extent to agree as a group what to do quickly, however, this is something I'm sure occurs in practice." "I thought it was a little stressful to think on my feet like that," and "It really made me nervous and actually made me afraid of doing this for real."

Table 2. Post-Simulation Survey Results

Question	Student Response, No. (%)				
	Likert Scale				
	1	2	3	4	5
The patient simulation stimulated my interest in critical care	0 (0)	6 (6.4)	15 (15.9)	37 (39.4)	36 (38.3)
The patient simulation allowed me to use the knowledge that I have learned in this course	0 (0)	0 (0)	7 (7.5)	32 (34)	38 (40.4)
This experience has helped develop my ability to solve problems	0 (0)	1 (1.1)	22 (23.4)	33 (35.1)	38 (40.4)
I have enjoyed this patient simulation	0 (0)	3 (3.2)	8 (8.5)	26 (27.7)	57 (60.6)
This patient simulation should be further incorporated into the pharmacy curriculum	0 (0)	0 (0)	4 (4.3)	24 (25.5)	66 (70.2)
The facilitator was helpful in my learning experience	0 (0)	4 (4.3)	0 (0)	20 (21.2)	70 (74.5)

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