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Experiences in Teaching and Learning

## Virtual simulation to personalize student learning in a required pharmacy course

Kayla Ambroziak, Nour Ibrahim, Vincent D. Marshall, Sarah E. Kelling\*

University of Michigan College of Pharmacy, Ann Arbor, MI, United States

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## ABSTRACT

**Background and purpose:** Virtual simulation is used to provide a realistic and safe environment for student pharmacists to learn and practice a variety of skills in the didactic and experiential settings.

**Education activity and setting:** The simulation program, MyDispense, that is used to teach medication dispensing in the outpatient setting was incorporated into a 2-credit hour required first-year pharmacy practice skills course. A total of 30 optional and 16 required exercises were completed by students.

**Findings:** There was a total of 2,457 attempts (mean = 28.9 attempts per student) at optional practice exercises and students completed an average of  $16.6 \pm 7.9$  (range 1–30). While variation in the number of optional practice exercises completed was observed between students with varying levels of pharmacy experience, the difference was not statistically significant. A component of the final exam utilized the virtual simulation program and all students passed this portion of the exam based on a minimum requirement of 70.0% (mean 92.9%, range 74.5–100%).

**Discussion:** Students generally identified that the use of virtual simulation was an effective tool to learn medication dispensing skills in a classroom setting. Furthermore, this created an opportunity for pharmacy practice residents to develop teaching skills. The biggest barrier to implementation was the amount of time required to create and test each exercise.

**Summary:** The virtual simulation program allowed students to self-identify the amount of practice they thought was necessary in order to gain specific skills related to medication dispensing.

## Background and purpose

Doctor of Pharmacy programs in the United States are required to ensure that graduates have the ability to safely and accurately prepare and dispense medications and provide appropriate patient education.<sup>1,2</sup> The Pharmacists' Patient Care Process summarizes many of the key skills required to meet this expectation, including the ability of students to 1) collect subjective and objective information about the patient; 2) assess medications to determine whether they are appropriate, safe, effective, and if the patient is adherent, as well as a variety of other factors such as patient preferences; 3) create a patient-centered plan to optimize use of medications; 4) address medication-related problems and provide effective patient education and 5) monitor continued appropriateness, safety, efficacy, and adherence of the plan and follow-up to ensure that progress is being made towards goals of therapy.<sup>3</sup> Examples of pertinent skills that the Accreditation Council for Pharmacy Education (ACPE) require students learn in order to promote

\* Corresponding author.

E-mail address: [skelling@med.umich.edu](mailto:skelling@med.umich.edu) (S.E. Kelling).

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accurate and safe dispensing of medications include preparation and dispensing of prescriptions; development and maintenance of patient medication profiles; identification and prevention of medication errors and drug toxicity; assurance of safety in the medication-use process; preparation and compounding of drug products and assurance of patient safety through accurate labeling.<sup>4</sup>

Simulations using mannequins, simulated patient instructors, role playing, and computers are increasingly being used to provide a realistic and safe environment for health care professional students to learn and practice a variety of skills. Examples include arthroscopy skills for medical students, dental implant training for dental students, and pain management education for nursing students, and interprofessional education in which students from multiple disciplines work as a team.<sup>5-11</sup>

Schools of pharmacy have utilized simulations in the didactic and experiential settings to teach topics and skills including medication dispensing, preparation of intravenous medications, disease state management, medication therapy management, problem solving, decision-making, communication, professionalism, and interprofessional teamwork.<sup>12-22</sup> Some activities have relied on easily accessible technology, such as an advanced elective self-care course that used email to correspond with students on a weekly basis related to fictional health care concerns in order to improve knowledge and communication skills.<sup>12</sup> Others have required specific programs, such as a vPSim that uses a branched-outcome decision-making model where students make choices that lead to consequences specific to their choice.<sup>13,14</sup> Virtual environments that incorporate 3-D glasses and a wireless controller for navigation have been used to teach USP 797 requirements and increase awareness of medication errors.<sup>15</sup> Another study used photographs and video images representing a pharmacy setting in order for students to role-play with each other and explore the use of nonverbal communication in patient-pharmacist interactions.<sup>16</sup> A recent review article found that students enjoyed learning activities using virtual simulation and the amount of learning was significant.<sup>23</sup> Several studies have specifically focused on incorporation of virtual simulation to support the learning of medication dispensing among student pharmacists and, while implementation strategies varied, students generally reported that this approach was an effective and efficient way for students to learn.<sup>24-26</sup>

One study has been conducted among student pharmacists that evaluated usage patterns and correlations between use and grades in classroom assessments when using a web-based tool. Zlotos et al<sup>27</sup> reported that when undergraduate students were provided a virtual program that contained prescriptions with errors and immediate feedback, they accessed the software an average of 23 times during the academic year, with the majority of activity occurring within 48 hours of an assessment. While students reported satisfaction with the tool overall, there was no consistency between utilization of the program and differences in pass rates.<sup>27</sup>

The primary objective of this study was to implement virtual simulation cases focused on medication dispensing in an outpatient setting for first-year doctor of pharmacy students in Pharmacy Practice Skills I, a required skills-based course. Specifically, researchers aimed to determine if there was a significant difference in utilization of the virtual simulation software based on the previous pharmacy experience. Secondary objectives were to determine if previous pharmacy experience and utilization of virtual simulation impacted grades on the virtual simulation component of the final exam and to assess student perception of their learning using this program. The principles of the NLN/Jeffries Simulation Framework informed the development of the simulation and research study.<sup>28</sup> Specifically, the exercises were designed to replicate pharmacy practice yet be appropriate for the first-year students regardless of whether they had previous pharmacy experience, active learning and problem solving was emphasized, and there was interaction between the students and facilitator for all in-class exercises. Health care simulation research guidelines were used to help report results.<sup>29</sup>

## Educational activity and setting

### *Virtual simulation program*

Virtual simulation cases were implemented. Given the small number of residents who facilitated activities, a formal evaluation was not conducted related to their participation. However, both stated that having the opportunity to teach using this format was a positive experience. They appreciated being trusted to facilitate a small group session independently while also having support available in the adjacent classroom if the need arose. It appeared that the residents grew more confident in their delivery of material, facilitation skills, and classroom management while working in a small group and they believe this helped prepare them for teaching the recitation session that included all students.

Virtual simulation was integrated into the Pharmacy Practice Skills I course in order to create a more realistic learning environment, personalize student learning given the wide variety of pharmacy practice backgrounds that students presented with, and increase the amount of practice available in the course. Prior to implementation of the program, students would spend up to one hour preparing and dispensing each medication in the lab setting that left little time for other classroom activities, such as practicing pharmaceutical calculations.

MyDispense is a virtual medication dispensing program that was developed in Parkville, Australia at Monash University.<sup>30</sup> The rationale behind the development of this avatar-based program was to create a simulation of medication dispensing in an outpatient setting that would allow students to practice and develop their skills in a safe environment. While using the open-source software, students develop and utilize the critical thinking skills necessary for pharmacists to prepare and dispense medications in a community pharmacy setting. Examples are skills that students are able to practice using this program include gathering information by asking the patient questions and reviewing the medication dispensing record, reviewing a prescription to determine if it is appropriate and legal, calling a prescriber to ask clarifying questions, using drug information resources, and obtaining a new prescription via voicemail. When it is appropriate to dispense a medication, students prepare a label, select and medication, and can provide education to the patient. This program was selected because of the ease of use for faculty and students, ability to share information between institutions, and lack of cost by the institution.

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