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Letter to Editor

USE OF SIMULATION IN PHARMACY PRACTICE AND IMPLEMENTATION IN UNDERGRADUATE PHARMACY CURRICULUM IN INDIA

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ABSTRACT

The use of simulation and related technology in healthcare education will continue to increase in the coming years and there is a collective role for this technique within pharmacy curricula. It is anticipated that increasing the amount of simulation in pharmacy curricula will have a positive impact on education and training of pharmacy students, and ultimately produce positive benefits for patients and the healthcare team. The apparent objective of introducing simulation techniques into the training program for pharmacy students is to advance the education and training of pharmacists with the ultimate objective of improving patient care and safety. Simulation experiences could never substitute experiences in real clinical settings, but has a great potential to complement clinical education as well as to use as a provision to develop skills required for a competent pharmacist. In addition to the development of technical skills such as procedural and clinical skills, simulation techniques have been used in pharmacy education in addressing general cognitive and social skills, notably in communication, decision-making, ethical issues, prioritization and teamwork. Pharmacy programs which aim to provide an opportunity for theoretical knowledge to be applied to a real clinical setting, simulated learning environments could enable a more systematic approach to both the training of clinical skills. Simulation provides a consistent, predictable experience to basic sciences, dispensing and medication supply. Ideally, it was recognized that simulation training should be integrated across all levels of pharmacy education and training.

Keywords: Simulated Learning Program, Experiential education, Pharmacy practice, India

INTRODUCTION

Health care education has, during the past decade, perceived a significant increase in the use of simulation technology for teaching and assessment. Current changes in the healthcare environment, education in healthcare and prominently healthcare student; that are comfortable with technology and any changes acquaint the needs of new tools in the curriculum. Existing academic environments that limit patient availability as educational opportunities will focus towards patient safety, assessment and demonstration of competence in an outcome-based education, considered additional factors contributes to this increasing drift in the use of simulation technology for health care education. Conversely, the use of simulation in pharmacy education has not advanced to the same degree as in nursing and medical education [1, 2].

The use of simulation and related technology in healthcare education will continue to increase in the coming years, and there is a collective role for this technique within pharmacy curricula. It is anticipated that increasing the amount of simulation in pharmacy curricula will have a positive impact on education and training of pharmacy students, and ultimately produce positive benefits for patients and the healthcare team [3-5]. The apparent objective of introducing simulation techniques into the training program for pharmacy students is to advance the education and training of pharmacists with the ultimate objective of improving patient care and safety [1]. Simulation experiences could never substitute experiences in real clinical settings, but has a great potential to complement clinical education as well as to use as a provision to develop skills required for a competent pharmacist [1, 6, 7].

In addition to the development of technical skills such as procedural and clinical skills, simulation techniques have been used in pharmacy education in addressing general cognitive and social skills, notably in communication, decision-making, ethical issues, prioritization and teamwork [8, 9]. Pharmacy programs which aim to provide an opportunity for theoretical knowledge to be applied to a real clinical setting, simulated learning environments could enable a more systematic approach to both the training of clinical skills. Simulation provides a consistent, predictable experience to basic sciences, dispensing and medication supply [4]. Ideally, it was recognized that simulation training should be integrated across all levels of pharmacy education and training, including undergraduate B Pharm degree, Pharm D program, and postgraduate M Pharm degree.

Looking to the future trends in health care education, the need for such changes in pharmaceutical education should be addressed even in countries where Simulated Learning Program (SLP) is still at infancy. The majority of US colleges and schools of pharmacy use simulation training to some extent in the pharmacy curricula, nature of simulation training in other academies is not well familiar [2]. Pertaining to our experience in conducting simulations in different levels of undergraduate pharmacy education in International Medical University (IMU), Malaysia; it's our desire to share our teaching and learning activities using simulation methodology in this review. The content of this paper also provides insights on some models available from educational institutions practicing simulations in the pharmacy curriculum.

Definition and types of simulation

"Simulation" is a technique, not a technology, to substitute or strengthen real experiences with guided experiences that evoke or replicate substantial characteristics of the real world in a fully interactive fashion.

Gaba, stresses that simulation should be interpreted as a strategy–not a technology–to the mirror, anticipate, or amplify real situations with guided experiences in a fully interactive way [10].

Ross J. Scalese *et al.* clarify aims of "medical simulations" as an imitation of real patients, anatomic regions, or clinical tasks, and/or mirroring the real-life circumstances in which medical services are rendered. While "simulators", refers to particular simulation devices, which can take many forms and span the range from low to high fidelity, and from devices for individual users to simulations for groups of trainees [7].

Simulation in health care education varies in the level of technology used and in which skills features are highlighted. Standardized patients are

one of the most regularly used methods of simulation by all health disciplines including pharmacy. Types of simulation technology used and in which skills features are emphasized are given in table 1.

Table 1: Types of simulation technology used in health care education [1, 2]

1	High-fidelity patient simulator or mannequin: able to mimic human actions and physiology and respond to physiologic and pharmacologic interventions.
2	Task trainer: designed to help learners practice, specific skills and do not have the extensive programming capabilities of high-fidelity models. It can be considered as *low-fidelity simulators or moderate-fidelity* simulators depending on the sophistication of the model.
3	Standardized patients: live people who are coached to portray patients, usually referred as simulated patients.
4	Virtual reality simulator: in which a computer display simulates the physical world and user interactions are with the computer within that simulated (virtual) world.
5	Full environment simulation: it involves the incorporation of high-fidelity mannequins, standardized patients, healthcare professionals, and ancillary equipment to recreate a real-life clinical environment.

Simulation-based training: does it work in a real scenario?

Simulation-based training is a technique or strategy of training that comprises the use of several scientific, theory-based approaches to training, and includes information, demonstration, and practice-based methods [11]. Simulation learning serves as a bridge between classroom learning and real-life clinical experience. Simulation-based training can provide opportunities for students to develop prerequisite competencies through practice in a simulated environment that is representative of the real setting. Students receive constructive feedback related to specific events that occur during simulated training that can support them to develop reflective responses for further development in their understanding and skills. Hence, students are free to build on their current knowledge base and develop important clinical skills before they work with real patients. The healthcare community can gain significantly from using simulation-based training to reduce errors and improve patient safety when it is designed and delivered appropriately [11].

Evidence from different studies indicates that simulation is non-inferior to other educational methodologies.[12] Technology-enhanced simulation is associated with a small but statistically significant benefit for outcomes of knowledge and skills. Both virtual patients and technology-enhanced simulation in comparison with no intervention are consistently associated with statistically significant benefits in the areas of knowledge, skills, and behaviors (in the context of actual patient care) [13, 14]. For direct patient effects (e. g., major complications, mortality, or length of stay), the benefits are smaller but still significant [12]. As per the findings from various studies, technology-enhanced simulation confirmed theory-based predictions that feedback, repetition, the range of difficulty, cognitive interactivity, clinical variation, distributed practice, individualized training, and longer training time significantly improve skill outcomes [13].

Table 2: Simulation tools could potentially be used to deliver education and training within pharmacy school curricula [1, 2, 4, 6, 13–28]

Functional area	Probable competency element*	Simulation tools
Clinical skills development	Demonstration of knowledge that incorporates an understanding of important drug principles, Use of evidence to support recommendations , demonstrate good communication skills, able to assess patients' response & monitor the outcomes of drug treatment.	High and low tech high-fidelity simulators, virtual soft-wares, virtual reality models, simulated patients, case-based scenarios and role-play, electronic medical record, video and teleconferencing facilities.
Professionalism and ethics	Comply with legal requirements, demonstrate personal and professional integrity, behave in a professional and ethical manner, maintain professional practice	Case-based scenarios using role-plays
Interpersonal relationships	Apply communication skills, participate in negotiations, address problems, manage conflict, apply assertiveness skills	Role plays through simulated patients, use of interactive mannequins and virtual reality programs, case-based scenarios, written and telecommunication, video and teleconferencing
Dispensing skills	Use of communications and interpersonal skills, systematic approach to screening prescriptions, ensure safe and effective drug use, provide appropriate information and advice, supply prescribed medicines	Mock pharmacy-computers, label printers, medicines and medicinal devices, barcode scanners, dispensing software. Using counseling tools such as fact cards, cmi leaflets, and placebo medication devices. Electronic prescription, simulated patient/prescriber, tele-conversation, role play
Optimal use of Medicines	Participate in therapeutic decision making, provide ongoing pharmaceutical management, promote rational drug use	Simulated patients, virtual reality models, and interactive mannequins
Drug information	Able to retrieve information, evaluate and synthesis information and disseminate information in a manner that supports decision-making. Us communication skills to respond to medicines information query	Simulated cases, role play, tele-conversation
Self-directed learning and Problem-based learning	Not available	Virtual patient software based on a branched narrative decision-making model, Virtual cases in therapeutics
Primary healthcare	Assess primary health care needs, Address primary healthcare needs of patients	Simulated patients, Virtual reality models and interactive mannequins, model pharmacy
Competency-based Assessment & enhancing Learning through feedback And reflection	Simulation in competency assessment: objective structured clinical examination Video facilities/video cameras can enable feedback to be even more comprehensive. Repeating vision of the particular task and breaking it down to analyze more closely can be of huge benefit for the participant. This footage can be shown to other participants and reflect upon, thereby widening the scope of the learning experience.	

*Probable competency elements were extracted from 1) pharmacy curricula, International Medical University (IMU), Malaysia 2) studies tested on the outcome of simulation in pharmacy education [1, 2, 4, 6, 13–28].

However, there is less evidence available that shows a link between these improved skills and better patient care and safety. Majority evidence supporting simulation-based training in pharmacy curriculum is with the use of high-fidelity mannequins [2]. Even though the best evidence are lacking compared to other health care programs, it can be postulated clearly that simulation-based education works even in pharmacy curriculum—at least when compared with do nothing.

Simulation in pharmacy practices education

Simulation in pharmacy education improves students' essential knowledge, develops learner confidence, enhances clinical performance, stimulates critical thinking, and decreases medication errors [15]. Many pharmacy colleges and schools have integrated simulation as part of their curricula. We have listed some of the renowned simulation tools may applicable to some of the functional areas in pharmacy practice curricula in table 2. The list has been generated on the basis of available evidence as well as from our perception, considering the experience in conducting a simulation in pharmacy practice education [1, 2, 4, 6, 13-28].

When it comes to pharmacy practice training, standardized patients including case-based scenarios, role playing, considered the most common methods of simulation ubiquitously [29-31]. The use of high and low tech high-fidelity simulators in pharmacy curricula was restricted to some specific areas, but virtual reality simulators can contribute in many ways in the different functional areas. Computer-based programs and simulations were involved such as "Second Life" and a program using a 'talking head' which were used to assist with the delivery of some material in pharmacy practice and communications [4, 27].

Simulations have an important role in the competency assessment, which will incorporate assessment of clinical skills and competencies necessary for advancement in the pharmacy education [31, 32]. According to the report concerning to the use of SLPs within the pharmacy schools located in Australia [4] and considering other best available simulated approaches in different schools, established that SLPs could be used to assist with the delivery of many elements in the core pharmacy curricula table 3.

Table 3: Key areas where SLPs can assist in pharmacy curricula [4]

1	Clinical skills development and awareness
2	Enhancing Learning through Feedback and Reflection
3	Competency-Based Assessment
4	Communication skills
5	Inter-professional learning and interaction
6	Cultural training and awareness, including rural and remote healthcare delivery
7	Dispensing, including preparation and optimal use of medicines

Table 4: Simulation in dispensing

Mode of learning	Learning outcomes to be achieved	Examples of simulation
Practical	• Dispense medication	Students can review prescriptions to assess it for safety and appropriateness. Telecommunication with simulated prescriber for clarification and discussion if there are concerns with prescriptions. Students are expected to pack, label and prepare the medication for dispensing if the prescription is deemed to be safe and appropriate. Debriefing is provided at the end of the exercise.
Self-directed learning	• Systematic approach to screening prescriptions	Students can analyse computer aided simulated prescription to identify and describe omissions and commission errors as well other clinical issues. Provide an opportunity to respond in a systematic way to the problems. Feedback is provided at the end of the exercise.

Table 5: Illustrative of learning activities within PSD sessions

Domain	Learning outcomes to be achieved	Examples of simulation
Drug Information	• Handle phone inquiries	A dedicated room complete with resources and a phone will be provided to the students. Students will receive a phone inquiry. Students are expected to gather relevant information using drug information form, and to utilize all resources provided. The session can be used to role play interactions with the patient, doctor or other healthcare professionals such as a nurse. Feedback and debriefing are provided at the end of exercises.
Prescription Review	• Identify issues with prescription • Communicate with health care professional	Students will be given prescriptions and expected to review it for safety and appropriateness. The session will allow interactions with prescriber (doctor) in which students may clarify, discuss and address the issues or concerns with the prescriptions. At senior semesters, students can be provided with more complex prescriptions. Feedback is provided at the end of exercises.
Responding to symptoms	• Elicit relevant clinical Information • Provide advice on non-medicinal management options • Develop communication skills	A room simulating the community pharmacy will be provided to the students. Simulated patients are used to allow students on responding to symptoms such as appropriate questioning to suitable identify management Students can be given barriers to communication such as time pressures and demanding customers. Students are required to explore options for overcoming these issues. Feedback is provided at the end of exercises. At senior semesters, role play with video recording is also used. Students in groups are provided keywords such as "prevention of motion sickness", "worried customer", "customer only understands Bahasa Melayu". Students required planning a script and act and recording the role play based on their script. Students are to submit a video with a reflective critique on the scenario. The video will also be peer assessed in which students obtained feedback from other students on the pharmacist-patient interaction in the video.
Drug counseling and device counseling	• Elicit relevant clinical Information • Provide advice prescribed medications • Develop communication skills	Use the similar method of domain-"responding to symptom".

With the increasing use of information technology and system (ITC), the programme can also be supported with an electronic case note table 6. Describes how online simulation within the programme can be done.

Table 5 shows the examples of learning activities within PSD sessions. In order to assess the clinical skills and competencies acquired from the pharmacy practice curricula, this program can use objective structured clinical examination (OSCE) in two levels [32]. Students can be given the opportunity to undergo a minimum of two mock OSCE sessions prior to the real examination.

Simulation in pharmacy practice: how to implement?

Simulation in pharmacy practice can be implemented in the Bachelor of Pharmacy practice courses in India which is an emerging field. The aim of this program was to produce competent pharmacy graduates who are experts, professionals and leaders who are agents of change with the ability to communicate well, solve problems, work cooperatively, as well as being endowed with positive attitude and an ability to reflect and recognise their responsibility as servants of society who endeavour to contribute to the well-being of all in their community. This four-year, eight-semester undergraduate pharmacy programme is an integrated program consisting of lecture, practical, tutorial, workshop, computer aided learning, problem-based learning, experiential learning through clinical placements and simulated learning environments. The use simulation in this course is a form of experiential learning. The main focus of simulation training is to allow students to practice application of pharmacy knowledge and skills in a safe, consistent and simulated environment. The sessions are expected to develop communication skills, problem-solving skills, critical thinking and enhance professional development; as well as technical skills such as dispensing skills.

The development of extemporaneous/compounding and dispensing techniques using simulation in pharmacy education is not an uncommon. In India, the training can be extended to include interaction with prescriber with the mimic real setting. Table 4 provides an example of simulation in dispensing practical. Pharmacy

Skills Development (PSD) sessions can be the main component of simulation training sessions within the course. The course can introduce PSD sessions at Year 1 or Semester 2.

Table 6: Online simulation

Domain	Learning outcomes to be achieved	Examples of simulation
Online simulation	• Building pharmaceutical care plan	Students are provided access to electronic case bank. Students are expected to develop and submit a pharmaceutical care plan. Feedback is provided at the end of the session.

Computer aided simulated prescription: Described in table 4.

Summary

Despite the lack of best evidence support simulation in pharmacy education, simulation techniques are being used in many colleges and schools of pharmacy as a complementary tool for teaching and learning activities. Even though simulated patients are being used as the leading simulation techniques in different schools, other technology-oriented approaches could be considered after identifying appropriate areas to integrate into pharmacy curriculum. With the limited placements opportunity, there is a need to enhance these learning opportunities to accommodate the requirements of the profession to produce a graduate with the core skills of a pharmacist.

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CONFLICT OF INTERESTS

Declared none

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