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Impact of Simulation-Based Learning on Clinical Skills Acquisition among Medical Students

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Abstract

Background: Simulation-based learning (SBL) is an educational intervention technique used in medical schools which provides students with chances to hone their clinical skills in a secure and controlled environment. Traditional methods may not provide adequate chances for practicing clinical skills, and at times, patients are put under risk in the process of learning.

Objectives: This paper seeks to determine the influence of simulation-based learning on the acquisition of clinical skills among undergraduate medical students.

Methodology: Quasi-experimental research was carried out among a sample size of 100 undergraduate medical students comprising third- and fourth-year medical students who participated in a well-structured simulation-based training program in areas such as patient assessment, communication, clinical exam, and procedural skills. OSCE and self-efficacy assessments were carried out prior to and after the training using descriptive and inferential analysis methods.

Results: There were remarkable changes in the clinical skills competency of the participants post simulation-based training. The average OSCE score rose from 65.2 ± 8.4 before training to 82.7 ± 6.1 after training. There were also remarkable gains in confidence in performing the skills.

Conclusion: SBL may be crucial for improving the process of learning clinical skills and increasing medical students' confidence and preparedness. Incorporating simulation into the educational program for undergrad medicine will participate to learning results and increase patient safety.

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INTRODUCTION

Clinical skills development is one of the essential aspects of medical education [1]. Doctors need to gain experience in conducting history taking, physical exam, communication, clinical reasoning, procedures, etc [2]. Although these competencies are usually obtained through lectures, bedside instructions, and practices, they have their difficulties including limited availability of patients, inadequate number of practices, and possible harm to patients [3]. Recently, SBL has been considered to be an effective solution to solve certain challenges created by traditional learning methods [4]. SBL involves various methods, such as standardized patients, task trainers, mannequins, computer/virtual reality systems or their combinations [5]. The theoretical framework that explains the use of simulations for educational purposes is called experiential learning theory [6]. It indicates that, apart from acquiring knowledge during activities, a person also learns through reflections about those activities [7]. As a result of using simulation, it will be possible not only to apply theoretical knowledge to practical actions but also to gain different non-technical competences such as teamwork, communication, leadership, and decision making [8]. Simulation training may have positive impacts on the skills of students in clinical practice [9]. In some instances, students undergoing training by means of simulations feel more confident about performing particular tasks in the clinical setting than learners following the traditional curriculum without experiencing simulations [10]. The key role belongs to high-fidelity simulations in this context because they contribute to developing critical thinking and prepare for emergency situations [11]. Simulation training has become increasingly popular because of the rising concern about patient safety and quality improvements at health facilities [12]. Many medical universities use simulation training as a way to ensure their graduates possess a good level of education. Still, some issues need to be raised regarding the effectiveness of the training as well as its potential influence on the skills of students in clinical practice [13]. Therefore, this research aimed to investigate the influence of simulation-based learning in relation to clinical skill acquisition among medical students through the comparison of the medical students' performances and levels of self-confidence in the period before and after the simulation training process.

METHODOLOGY

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A quasi-experimental design approach incorporating the pre-test/post-test technique was utilized to investigate the effectiveness of simulation-based learning for this study. The experiment was carried out at a medical education institution for a period of six months. A sample size of 100 undergraduate medical students in their third and fourth years of the curriculum was involved in the study, employing convenience sampling technique. Medical students went through the simulation training program involving six simulations of skills including patient assessment, history-taking, physical examination, communication skills, basic life support, and procedural skills. Simulations were accomplished through the utilization of simulated patients, task trainers, and high fidelity simulation mannequins. The competence of the participants in the area of clinical skills was measured based on the findings from OSCE test conducted both before and after the intervention. Self-efficacy and confidence levels of the participants were evaluated based on the results obtained from the administration of an established survey tool made up of self-assessment questions answered on scale from one to five points. Among other data that was gathered from the participants included demographic details, OSCE test score, and self-score. Data analysis involved the use of SPSS 26 for Windows software. From the data analyzed, means, standard deviation, frequency, and percentage distributi*on were obtained. In Contrast* of pretest and posttest scores, *paired sample t-test was submitted where the level of consequences* was set at p-value less than 0.05.

RESULTS

From the data collected, the total number of participants in the study is 100 in counting, and therefore, response rate is 100%. Out of the total number of participants, 51% are males, and 49% are females. Among the total number of participants, 56% are third year students, whereas 44% are fourth-year students. 29% of participants have experience in conducting simulation exercise.

Table 1. Demographic Characteristics of Participants (N = 100)

Variable	Frequency (%)
Male	51 (51%)
Female	49 (49%)

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Variable	Frequency (%)
Third-Year Students	56 (56%)
Fourth-Year Students	44 (44%)
Previous Simulation Experience	29 (29%)
No Previous Simulation Experience	71 (71%)

After participation in the simulated based learning training, there was an improvement in all the clinical skills determined. Mean score on the OSCE increased from 66.3 ± 8.5 pre-training to 83.8 ± 6.2 post-training. This showed an overall improvement of about 26.9% which was suddenly high significant ($p < 0.001$). An improvement that was considered to be highly significant in communication skills was noted. Average scores improved from 3.2 ± 0.8 to 4.5 ± 0.6. Students were noted to demonstrate proper conducting of interview, information gathering skills, active listening skills and professional interaction between themselves. This improvement in communication skills was noted in the self-assured nature of students in their interaction with the patients. There was a marked improvement in clinical exam skills. There was an increase from an average score of 3.4 ± 0.7 to 4.4 ± 0.5. This was a statistically highly significant difference ($p < 0.001$). Clinical exam techniques were better performed by the students as a result of best practice in the simulated laboratory setting. Procedural competence witnessed the highest improvement, with mean scores rising from 2.*9* ± *0.8* to 4.3 ± 0.6 ($p < 0.001$). Students noted higher levels of understanding regarding clinical procedures and enhanced procedural performance when assessed after the intervention period. Regular practice with the use of simulation mannequins helped students gain muscle memory and confidence in their skills without putting patients at risk. Similar to the previous result, t*here was significantly improved* in clinical confidence after simulation training, with *mean scores increasing from 3.1 ± 1.*8 prior t*o training to 4.6 ± 0.6* af*ter training (p < 0.001). Over 86*% of participants stated that simulation training had prepared them more effectively for dealing with clinical situations. The ability to make mistakes, get immediate feedback, and perform tasks repeatedly was highly valued by students.

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Table 2. Comparison of Clinical Performance before and After Simulation Training

Assessment Variable	Pre-Training Mean ± SD	Post-Training Mean ± SD	Percentage Improvement	p-value
OSCE Score (%)	66.3 ± 8.5	83.8 ± 6.2	26.9%	<0.001
Communication Skills	3.2 ± 0.8	4.5 ± 0.5	42.8%	<0.001
Physical Examination Skills	3.4 ± 0.7	4.4 ± 0.5	36.4%	<0.001
Procedural Skills	2.8 ± 0.9	4.3 ± 0.6	48.4%	<0.001
Clinical Confidence	3.1 ± 1.8	4.6 ± 0.6	51.0%	<0.001

On the whole, the findings of this study suggest that simulation-based training had a positive impact and was statistically significant in contributing towards developing clinical skills among medical students. It was clear from the objective performance scores as well as the subjective scores indicating levels of confidence of the students. These findings support the application of simulation-based training methods in undergraduate medical training programs.

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DISCUSSION

From the observations and findings of this study, it can be examined that simulation-based learning is very effective in improvement of clinical skills among medical students [14]. The participants show us the marked improvement in their objective performance, procedural skills, communicative skills, and other levels of confidence in the following the process of simulation training [15]. One of the most effective changes is the increase in the OSCE score from 66.2% to 83.7% [16]. It indicates that the use of the simulation technique contributes to mastering theory through practice. Students can use not only the lecture method but can also be more engaged in the learning process by thinking and having experience in order to master and apply knowledge properly [17]. Communication skills developed during this research will surely be one of the key issues since they are necessary for professional success in the future [18]. Patient-centered care, which provides patients with high-quality medical services and their satisfaction, depends mostly on

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communication skills [19]. The improvement in the area of procedural skills demonstrates that repeating procedures and receiving feedback contributes to becoming more skilled [20]. However, it is rather difficult to practice clinical skills because of the insufficient number of patients available. Increased levels of confidence are another important result obtained during this project. Confidence level is one of the important elements in the practice of clinicians [21]. It affects their willingness to take part in the process of interaction with the patients and in making decisions. This kind of experience gives learners an opportunity to make mistakes within the simulation and thus learn from those mistakes and become more self-efficient in the real practice. This study is also in line with other scientific studies on the same issue, which state that simulation training can be used to improve the performance of learners [22]. In addition, simulation is considered as one of the most efficient approaches to ensure competency-based medical education as healthcare systems have started paying more attention to safety issues [23]. However, the presented study has its own limitations. In particular, there is only one health care institution involved into the research and there is no evaluation of long-term acquisition of the acquired skills.

CONCLUSION:

There is no doubt that the application of simulation as a mode of training with the intention of helping learners develop clinical competencies is an entirely suitable approach. From this study, it becomes clear that there have been many successes in the development of clinical competencies, communication skills, procedural skills, and even confidence.

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