The Effect of Simulation Techniques on Nursing's Student Knowledge and Practice

تاثير تقنية المحاكاة على معارف وممارسات طلبة التمريض

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الخلاصة:
الهدف: تهدف الدراسة الحالية الى تقييم اثر تقنية المحاكاة على معارف وممارسات طلبة التمريض المعرضين للاجهزة المحاكاة عالية الدقة.
المنهجية: في هذه الدراسة اشترك (80) طالبا" من الصف الرابع ونفذت في كلية التمريض بجامعة الموصل. استخدم التصميم شبه التجريبي لتقويم تاثير دمى المحاكاة عالية الدقة على معارف وممارسات طلبة التمريض. جَمعت البيانات على ثلاث مراحل: قبل استخدام المحاكاة، بعد الاستخدام مباشرة، و بعد اسبوعين من الاستخدام.
النتائج: الاختلاف بين متوسط الدرجات للمجموعة الضابطة ومجموعة الدراسة وفي الاختبارات 1,2، و3 احتسبت باستعمال اختبار تاء المستقل والذي كان معنويا.
الاستنتاجات: في حين أن آثار المحاكاة لا تزال بعيدة المنال، فإن هذه الدراسة تضع الأساس لمزيد من البحث. النتائج تَظهر لنا فكرة أن التجربة سريرية في تركيبة مع التدريب بالمحاكاة يمكن أن توفر نتائج أداء أفضل.
التوصيات: بحوث إضافية مع اعداد كبيرة من المتعلمين و المعرفة المكتسبة من هذه الدراسة يمكن أن توفر أدلة أفضل لفوائد التدريب القائم على المحاكاة.

Abstract
Objective: The study aims to examine knowledge acquisition, improvement in nursing students exposed to high fidelity human patient simulation manikins.
Methodology: This study, in which (80) fourth year nursing students participated, took place in a college of nursing. A quasi-experimental design was used to evaluate the effect of the level of manikin fidelity on knowledge acquisition and practice levels. Data were collected at three points in time: prior to the simulation, immediately after, and two weeks later.
Results: Differences in mean scores between the control and experimental groups for exams 1, 2 and 3 were calculated using independent t tests and were statistically significant.
Conclusion: While the effects of simulation remain elusive, this study lays the foundation for further research. The findings present us with the notion that clinical experience in combination with simulation training may provide better performance outcomes.
Recommendation: Additional research with large cohorts of learners and the Knowledge gained from this study can provide better evidence as to the benefits of simulation-based training.
Keywords: **Simulation, Techniques**, **Nursing's Student, Knowledge, Practice**

INTRODUCTION

Nursing education programs are adopting simulation more than ever in both undergraduate and graduate curricula. Reasons for doing so include restricted clinical settings, acceptance of simulation as a valuable accessory to clinical teaching, and the potential of simulation to develop clinical learning [1, 2]. Technology is allowing nurse educators to develop innovative techniques to teach students the knowledge and skills they will need to practice their profession. Due to the current nursing shortage, an increase in the number of nursing education programs, and a shortage of clinical learning sites, many nursing programs are utilizing simulation to help students learn the roles and responsibilities of a nurse. These teaching tools include the use of a simulated clinical environment in which students practice with manikins or actors as patients and may include being observed via cameras by faculty and colleagues. The equipment and methodology support learning, but may also cause stress and anxiety for some students, which may in turn impact their ability to learn [3]. Despite the increased use of simulation in nursing programs, there is limited research on how the simulation should be used in nursing education and how it may enhance technical and nontechnical performance, clinical understanding, or critical thinking. The objectives of the

study were to examine the differences between the traditional clinical experience and simulation as teaching methods in nursing education, and to analyze how simulation training may impact knowledge and clinical performance of undergraduate students.

MATERIAL AND METHODS:

A quasi experimental design with repeated measures of pre- and post intervention design was used to achieve the objectives of the present study. All students who belonged to two separate cohorts (2013/2014) of 4th grad baccalaureate nursing students (n=80) and who were enrolled in a required Adult Nursing course at the College of Nursing, University of Mosul, were invited to participate. A total of 60 (group 1=30; group 2=30) chose to participate in the study.

Students who chose not to participate were assigned to the usual study group, which of the course was the simulation experience alone. The simple random selection was used to determine group composition to one of the three practicum experiences. Knowledge acquisition and retention were assessed with written examinations, pre and post clinical and/or simulation experience. The scores from the examination after clinical and/or simulation experience were used as proxy measures for knowledge acquisition and retention, using pretest scores as a control. The pre- and post intervention examinations were equivalent in content and were slightly modified from existing examinations for the course. All examinations were graded on a scale from (0–100%), with higher scores indicating higher levels of knowledge. The written examinations consisted of 50 items reflecting the content taught in the course. Clinical performance was assessed based on the students' performance in providing care during three patient care scenarios, which were portrayed by standardized patients. The three patient care scenarios were (1) Supraventricular Tachycardia; (2) Bradycardia from AV block and (3) Unstable Angina. Each of these scenarios was developed to present the student with a situation in which they had to assess and begin primary intervention. The scenarios were designed to last approximately (15 to 20) minutes. Scores for each scenario were generated from a blueprint, which was developed by four nurses who were experts in the care of critically-ill clients using the nursing process as a guide. These blueprints reflected and included the following principles: the student asks appropriate, focused questions that provide relevant information leading to problem identification; the student performs appropriate physical assessments to confirm the patient's subjective data and obtain objective data; the student initiates basic nursing interventions appropriate to the patient's condition; the student evaluates the effectiveness of these interventions. Multivariate analyses of variance with repeated measures were performed to examine differences among groups in outcome measures before and after clinical and/or simulation experience. The outcome variables included scores of written examinations and the indicators of the clinical performance with standardized patient scenarios between groups. All values were represented as mean; standard deviation and mean differences were considered significant for a P value less than (0.05). Bonferroni corrections were applied as appropriate.

RESULTS:

Table 1: Knowledge test scores for the study and control groups, Tests 1, 2 and 3.

Group	Test 1 (pre)			Test 2 (post 1)			Test 3 (post2)		
	Mean	SD	SE	Mean	SD	SE	Mean	SD	SE
Study	55.2	0.3	0.16	77	0.1	0.16	80.1	1.1	0.12
Control	53.9	0.8	0.11	62	0.4	0.19	67.6	0.4	0.36
	t.= 0.2 df=58			t.= 3.3 df=58			t.= 6.9 df=58		

(**p <.001).

Table 2: Participant scores for technical skills following simulation

Group	skill 1			skill 2			skill 3		
	Mean	SD	SE	Mean	SD	SE	Mean	SD	SE
Study	88.5	0.1	0.71	89.4	1.4	0.32	87.8	0.2	0.19
Control	85.1	0.5	0.26	83.3	1.1	0.37	85	0.6	0.13
	t.= 6.6 df=58			t.= 8.4 df=58			t.= 8.9 df=58		

(**p < .001).

DISCUSSION:

The results demonstrated that the simulation method teaching nursing leads to a significant increase in knowledge retention of students compared to the method of demonstration and lecture using slides and images.

The findings of the present study were in agreement with other four studies that examined knowledge acquisition [4, 5, 6, 7, 8]. In these studies, the authors reported a significant increase in knowledge gain in groups exposed to HPSM. One study [4] compared the effectiveness of a classroom lecture versus use of HPSMs on knowledge gain. The investigators developed a (20-item) multiple-choice Acute Myocardial Infarction Questionnaire (AMIQ) designed to measure students' knowledge related to the nursing care of patients experiencing an acute myocardial infarction, with higher scores indicated higher levels of cognitive skills[4]. The results indicated that students who received HPSM instructional methods achieved significantly higher AMIQ posttest scores than did those who received instruction through a traditional lecture [4]. Similar findings were reported in a multisite study involving (403) undergraduate students. Students were randomly assigned to one of three types of simulation groups, namely paper-and-pencil case study, static manikin, and HPSM[7]. The three groups were provided with the same scenario and worked in groups of four students. The data about the students' experience was gathered with the Educational Practices in Simulation Scale (EPSS) and the Simulation Design Scale (SDS)[7]. The SDS was designed to evaluate five features: objectives/information, support, problem solving, feedback, and fidelity, with 20 items on a 5-point Likert-type scale. The EPSS, a 16-item tool using a 5-point Likert-type scale, was used to measure four educational practices: active learning, collaboration, diverse ways of learning, and high expectations of the simulation activities[7].

The results showed statistically significant differences between pre- and posttest scores for students in the paper and-pencil group (p <. 001), indicating knowledge gain among students in this group. The other two groups also showed improvement in knowledge gain as assessed by the EPSS and SDS[7]. The multisite study by Howard (2007), in addition to

measuring critical thinking, compared the acquisition of medical-surgical nursing knowledge. Participants were randomly allocated to either an HPSM group or a group that completed a written case study. The analysis of covariance in knowledge gain between the two groups revealed that the HPSM group scored significantly higher on the posttest[6]. A study by Hoffmann et al. (2007) utilized a pre- and post test repeated measure design to compare knowledge attainment of 29 students participating in a combination of HPSM and seven weeks traditional clinical experience. Knowledge attainment was measured using the Basic Knowledge Assessment Tool-6 (BKAT-6). The BKAT-6 had 100 item paper and pencil test that measured both the recall of basic information and the application of basic knowledge in practical situations. Results of pre and post BKAT-6 showed significant improvement at three months post HPSM overall and in the following six subscales: cardiology, monitoring lines, pulmonary, neurology, renal nursing and other ($p < 0.05$)[5]. However, there was no statistical difference on the two subscales of endocrine and gastrointestinal nursing [5].

Clinical Skill Performance

In addition, this study indicates that evaluating the impact of simulation-based training on clinical performance remains a significant challenge. The clinical performance demonstrated by simulation-based assessment between the study and control groups indicated significant differences in terms of the overall means of the ratings.

Two studies[1, 8] evaluated the effect of HPSM on clinical skill performance. Although clinical skill performance was assessed at various intervals and with different methods, the results indicate statistically significant improvement post simulation. In the study by Alinier et al. (2004), 2nd-year diploma nursing students were assessed pre intervention by an initial administration of Objective Structured Clinical Examinations (OSCEs) to determine the students' baseline clinical and communication skills. The OSECs were composed of 15 stations that addressed a range of clinical and psychomotor skills (11 stations) and cognitive skills (4 stations). The difficulty level of the stations was such that it was difficult to score 100% at any of the stations, even during the posttest period[1]. The experimental group was exposed to HPSM while the other students followed their usual nursing course. The baseline OSCE scores between the two groups were very similar: 49.59 for the control group and 50.19 for the experimental group. Outcomes were assessed with the OSCEs at 6 months in both groups. Although both groups improved their OSCE scores, the scores of the experimental group improved by 13.4%. On the other hand, the control group improved by 6.76%, and this difference was statistically significant ($p < .05$)[1]. The study by Radhakrishnan et al. (2007) used a faculty developed Clinical Simulation Evaluation Tool (CSET) to measure the effect of practice with an HPSM on various skill levels, including the clinical practice parameters of safety, basic assessment, focused assessment, interventions, delegation, and communication skills. Students received points for any observed behavior if it was included in the CSET checklist[8]. Students in the intervention group practiced with the HPSM in addition to their usual E-learning teaching method of caring for groups of complex patients, and those in the Effectiveness of Simulation in Teaching Clinical Reasoning.

CONCLUSION:

The study concluded that the current results support the use of simulation in undergraduate nursing education. However, a very important point needs to be considered: a good tool is only as good if it is well used. The integration and design of the simulation have a great influence on what students can learn from it. This issue is further emphasized in that simulation design is a significant factor in its inferiority or superiority over other training methods. Thus the trainer or facilitator's teaching and training skills, and the simulation

course are of great significance in what can be learned and remembered during and after a simulation session.

RECOMMENDATIONS:

The study recommended that the simulation must form part of the learning environment and be used appropriately to ensure effective learning. In addition to the cost, another major barrier to the adoption of simulation technology is the lack of experienced trainers that are using it. It is expected that the results of this study will help and support other institutions which are in the process of purchasing simulation equipment. Hopefully it will also influence the design of future nursing curricula inside and outside the institution to incorporate such teaching tools and training methods. Finally, as well as the simulation experience can be, it cannot entirely replace any of the traditional teaching methods. Students will still need to learn at the bedside with real patients.

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