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Simulation in Teaching Nursing Students Cardiopulmonary Resuscitation Through

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Abstract

This study was designed to examine the effectiveness of using simulation versus traditional teaching methods in teaching cardiopulmonary resuscitation for nursing students. Experimental study design was used. The results confirm that student nurses' knowledge and skills have benefited from simulation method more than the traditional one.

Keywords: Teaching methods; Simulation; Traditional; CPR; Nursing students

Highlights

1. Many nursing schools have used different teaching methods to improve the retention of student's CPR knowledge and skills.
2. Simulation in nursing education has become an important element, specifically, teaching the necessary skills and knowledge to develop competent nurses.
3. High-fidelity simulation is an interactive manikin driven by computers, and has many features that replicate the physiological parameters such as the ability to produce pulse, breathing and blinking.
4. The participants within the HFS group gained greater CPR knowledge and skills than the static manikin group.

Introduction

Simulation in nursing education has become an important element, specifically, teaching the necessary skills and knowledge to develop competent nurses [1,2]. Instructors can control the manikin's responses, and the High-Fidelity Simulation (HFS) can respond to interventions provided by the student [3]. Furthermore, HFS allowing nursing students to practice, develops, and applies knowledge and skills in a realistic clinical situation and safe environment as they participate in interactive learning experiences without fear of harm [4,5].

High-fidelity simulation is an interactive manikin driven by computers, and has many features that replicate the physiological parameters such as the ability to produce pulse, breathing and blinking [6,7]. In addition, HFS enables educators to implement clinical scenarios, which give the opportunity to students to practice the critical situations such as cardiac arrest without risk to patients [8,9]. Furthermore, High-fidelity simulation enhances the experimental learning that gives the students the opportunity to practice skills in a safe environment, demonstrate clinical decision making, and observe other students and learn from feedback during debriefing sessions [10,11]. However, there is a gap in literature related to the effectiveness of using HFS as a supportive approach to traditional lecture teaching method [12].

Cardiopulmonary Resuscitation (CPR) has been a concern for years [1,3]. Other studies showed that CPR knowledge and skills decline rapidly, often within weeks of completing a course [13,14]. Thus, either nurses need to attend multiple trainings each year, or new methods of training that enhances retention of CPR knowledge and skills are needed.

Many nursing colleges have used different teaching methods to improve the retention of student's CPR knowledge and skills [5,13,15]. A combination of teaching methods and repetition of skills has been found to increase CPR skills retention [14,16,17]. Nursing students have positively valued simulation based learning in terms of increased confidence in the ability to do CPR as effective as in real settings [18].

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Despite the reported use of simulation in nursing, little research has been studied the effectiveness of using HFS on CPR knowledge and skills acquisition and retention. As the demand on the quality level of nursing students increased, necessities for alternatives teaching methods are needed and effectiveness of the teaching methods must be evaluated [19]. The purpose of this study was to evaluate the simulation method on CPR teaching versus traditional methods.

Methods

Study design

Experimental study design was used in this study. Participating students were assigned randomly into two equivalent groups; intervention and control group.

Procedure

All students took pretest CPR knowledge, then they received CPR lecture. Random assignment to control and intervention group was performed. The control group was students in a 240 minute session of traditional training, which consisted of Microsoft PowerPoint presentation of AHA Adult Basic Life Support (BLS) including Automated External Defibrillator (AED), and demonstrations on static CPR manikin. The intervention group received the same power point lecture in addition to training on HFS.

Ethical considerations

The study protocol was reviewed by the ethical committee at the School of Nursing at The University of Jordan. The students who participated in the study have received information on the purpose, content and duration of the study. The confidentiality of the participants was protected by providing a code number for each participant. The Participants were assured that withdrawal from the study at any time will have no penalty.

Sample and sampling

All nursing students enrolled in the adult health nursing course were targeted for participation. Any student who have experience in CPR, or who have BLS certificate, or who are bridging from the associated degree to the baccalaureate degree was excluded from the study. The sample size for eligible students who completed the study was 90 (45 students in each group).

Instrumentation

The instrument has two sections; the first section is the Demographic data sheet to identify any potential group variances. The first part in the questionnaire was the demographic data sheet. The second part was the CPR pretest and posttest, which consists of 14 multiple-choice questions on CPR knowledge. Reliability and validity of this tool were assessed. CPR skills checklist are consistent with the 2010 guidelines for adult CPR by AHA. The items in the checklist include; the correct assessment of the victim responsiveness, calling for help, checking the pulse with the correct location, chest compressions with appropriate rate and depth, opening the airway, perform rescue breathing causing the chest to raise using either bag-mask or face mask, and correct attachment of AED pads and delivering the shock.

Results

The number of female participants was 71 (79%). The participants' age ranged from 18 to 28 years (M=19.9, SD=1.8). Both groups were almost equal in terms of gender and age. Independent sample's t-test revealed that there were no significant differences (p=0.53) in the baseline CPR knowledge between the interventional group (M=5.8, SD=1.2) and the control group (M=5.9, SD=1.2) (Table 1).

Table 1: Independent samples t test of CPR knowledge before training.

Variable	Control group M (SD)*	Interventional group M (SD)	t	p
Pretest CPR knowledge	5.9 (1.2)	5.8 (1.2)	0.68	0.53

*M: mean; SD: Standard Deviation

Table 2: Within the group's difference in the level of CPR knowledge paired sample t test.

Group	Pretest knowledge M (SD)	Posttest knowledge M (SD)	t
Control group	5.9 (1.15)	11.2 (0.9)	-38.6*
Intervention group	5.8 (1.2)	12.7(1.1)	-59.6*

*p<0.01

Table 3: Acquisition of the CPR knowledge in both groups.

Variable	Control group M (SD)	Intervention group M (SD)	t
Posttest CPR knowledge	11.2 (0.90)	12.7 (1.1)	-6.9*

*p<0.01

Table 4: Acquisition of the CPR skills in both groups.

Variable	Control group M (SD)	Intervention group M (SD)	t
Posttest CPR skill acquisition	11.58 (1.631)	13.13 (1.014)	-5.435*

*p<0.001

A paired t-test was done to examine the differences within each group in CPR knowledge. The results revealed that both groups gained CPR knowledge from either teaching methods. The control group showed significant difference between CPR knowledge before and after CPR training with a static manikin (t= -38.6, p<0.01). The interventional group showed significant difference between CPR knowledge before and after CPR training with HFS training (p<0.01) (Table 2).

Independent sample's t-test was used to determine if a significant difference exists between the control and the interventional group on the posttest knowledge test. The results revealed that there was a significant difference between groups on the posttest of CPR knowledge (p<0.01), whereas the interventional group has greater knowledge (M=12.7, SD=1.1) than the control group (M=11.2, SD=0.9) (Table 3).

Independent sample's t-test was used to determine if a significant difference exists between the control and the interventional group on the posttest of CPR skills. The results revealed that there was a significant difference between both groups on the posttest CPR skills (p<0.01), whereas the interventional group has greater CPR skills (M=13.1) than the control group (M=11.6) (Table 4).

Discussion

This study showed that the participants in both groups have a low level of CPR knowledge at baseline phase. The American Heart Association emphasized the concept of a chain of survival to clarify the component of an effective response that would improve the chances of survival from cardiac arrest [20]. The chain comprises four links: calling for help, beginning CPR, defibrillation and advanced life support. The first two links are dependent on the available individual on the scene; nursing students during their clinical rotation may be the first to discover and respond to cardiac arrest victims [19,21].

Although the participants in this study are nursing students and showed a lack of basic knowledge in CPR, this study was needed to emphasize the importance of providing the participants with the needed knowledge of CPR.

The results from this study showed a significant difference in CPR knowledge and skills between the two groups. CPR knowledge and skills have significantly increased for both groups; however, the participants within the HFS group gained greater CPR knowledge and skills than the static manikin group. These results are consistent with the findings of the previous studies who supported the learning outcome from the training on HFS by increasing nurses knowledge and skills [8,22,23].

The significant result from this study is consistent with study that emphasized the added value of the HFS such as the ability of reproducing physiologic responses and respond to interventions provided [24]. Furthermore, the HFS has additional features not present in the static manikins such as the ability to count heartbeat as well as listen to breathing sounds. During training on the static manikin, participants required to ask the instructor if there is a pulse or not; while the participants within the HFS group have the opportunity to count the pulse and listen to breathing sound when required.

Although many researchers support that HFS enhances critical thinking of the participants [14,21]. Knowledge acquisition through HFS has not been well integrated in teaching programs [22,25]. The findings of this study support and valued the effectiveness of using HFS over the traditional static manikin for CPR knowledge acquisition. In this study, knowledge and skills acquisition were evaluated immediately after training. This could be argued for the suitability of assessing the knowledge and skills acquisition. Further research is required to ascertain the appropriate evaluation time post training.

Implications and Recommendations

The results from this study confirm that student nurses' knowledge and skills can benefit from participation in HFS training. Furthermore, nursing educators should determine the best educational practice when HFS is integrated into nursing curriculum. The nursing educators should use simulation scenarios that are suitable to students' levels. It is recommended to replicate this study in more than one university and to have larger sample size. Additional research study that examines the use of HFS with other nursing courses to measure learning outcome is needed.

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