Original Article

Comparison of the effects of two teaching methods on the nursing students' performance in measurement of blood pressure

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Abstract

Background: New teaching methods are essential in the promotion of competence in nursing students. Measuring blood pressure, which is one of the most essential skills, is the foundation of nursing care and clinical decision-making, and students should be trained to master this skill. This study aimed to determine the impact of two teaching methods on students' performance in blood pressure measurements.

Materials and Methods: In this semi-experimental study, 36 first-term nursing students from Isfahan University of Medical Sciences, Iran, were divided into six groups of six people each. The type of training for each group was determined by random draw. Blood pressure measurement training was given to three groups on a simulator and to the other three groups on human samples. Pre- and post-test evaluation of knowledge of the methods of measuring blood pressure was conducted using a researcher-made checklist and by observation of the students' actions. The knowledge and skill scores were compared using paired and independent *t*-tests.

Results: The mean performance scores of students in simulator (19.14 ± 1.60) and human (19.64 ± 1.08) groups were not significantly different. In both methods, there was no significant difference between systolic and diastolic blood pressures measured by students and by teachers (standard). Mean knowledge scores of both groups increased significantly after training compared to before training.

Conclusions: According to the results of the study, the two training methods (on human subjects and simulator) provide the students with the necessary ability to measure the systolic and diastolic blood pressures correctly. Therefore, to enrich the educational program of nursing students, using simulators is recommended as an effective teaching strategy to facilitate learning and for the development of students' knowledge.

Key words: Blood pressure-nursing, students-patient simulation, nursing faculty practices

Introduction

Teaching methods with advanced technology have significantly increased in clinical nursing skills training over the past decade.[1] Today, due to constant technological changes in clinical environments, working with patients, especially in adverse conditions, has become more complicated for nurses. Therefore, nursing students need better training methods in order to be prepared for entering the clinical environment. Experience plays a significant role in this preparation. However, factors such as fear of mistakes and uncertainty make their clinical experience difficult. In order to overcome these problems, using high-precision simulators in nursing education has gradually expanded and become important.[2]

In the clinical skills laboratory, a safe environment for learning, students practice skills on human patient simulation manikins (HPSMs) and simulators with less stress. With the help of teaching aids and educational software in these centers, real opportunities are provided for learning and developing clinical skills, and it is also possible to objectively evaluate students.[3]

Using simulators is the most widely used strategy in nursing education.[4] Simulator manikins promote science, critical thinking, and students' satisfaction with education.[5] With simulators, the learners are engaged in learning without real-world risks.[6] Learning skills in a simulated

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environment similar to or close to reality is important.[7] Using simulators for training clinical skills is an approach with international value and it is widely used in nursing education today.[8]

Results of different studies show that students are anxious in their initial encounters with patients, and if they do not have enough practice, fear of failure and mistake impedes their proper function. Thus, universities seeking modern and efficient methods for clinical skills learning have been encouraged to advance training through this method.[9]

Using simulators enables to learn skills without compromising patients' health.[10] By getting trained through using simulators, learners can better understand the real situation by manipulating the simulator.[11] In using simulators, nursing students can practice skills without being concerned about compromising patients' health.[12] Educational simulators result in increased student satisfaction and positive results in education. Results of a study in the United States by Harlow and Sportsman indicated that in 34 nursing schools, simulators were used in internal surgery education (56%) and advanced medical surgical nursing education (64%).[13]

In this regard, blood pressure is one of the most important clinical skills to assess health; nursing students must have sufficient proficiency in it, and the necessary conditions for exact measurements should be provided for them.[14] Blood pressure measurement is a complex skill that requires considerable practice in order to gain competence in the recognition of Korotkoff sounds.[15] Blood pressure measurement provides important information about the patient's overall health status. For example, the systolic pressure provides basic information about the condition of the heart and large arteries. In addition, the diastolic pressure refers to the peripheral vascular or arterial resistance.[16]

This skill is taught to students in the clinical laboratory. The method currently used for teaching measurement of blood pressure is by the teacher measuring the blood pressure values of students. It is taught by occluding the cuff of a barometer on the arm of a student. However, since new methods should be used to teach and assess students, educational simulators can be used in teaching students to take blood pressure measurement. Results of the study by Karadag *et al*. showed that students in the experimental group who had used the simulator to learn to measure blood pressure heard Korotkoff sounds more effectively.[2]

The aim of the present study was to compare two methods of blood pressure measurement training on nursing students' performance, so that the best and most appropriate method would be used to teach students.

Materials and Methods

After obtaining approval of study from the ethics committee of Isfahan University of Medical Sciences, the study purpose was explained to the participants and informed consent was obtained from them.

In this quasi-experimental study, 36 first-term nursing students, studying in the clinical skills laboratory of the School of Nursing and Midwifery in Isfahan University of Medical Sciences, Iran, were enrolled by census sampling method.

Information was collected by direct observation, performance skills checklist of blood pressure measurements, and a questionnaire to assess students' knowledge on blood pressure measurements (including 12 open questions) prepared using scientific sources.

The checklist of blood pressure measurement included 21 items such as the right position of the patient and his/her hand and arm, palpating the brachial pulse, occluding the cuff around the arm, placing a manometer on the surface of the eye, radial and brachial pulse palpation, obtaining baseline number for blood pressure, correct use of the stethoscope, filling the cuff, emptying the cuff using control valves, and determining the systolic and diastolic pressures. The prepared checklist was handed over to some of the nursing faculty members, and based on their opinions, the validity of the questionnaire was assessed and confirmed. To assess the reliability of the checklist, test-retest was conducted.

The students (N = 36, 12 males and 24 females) were divided into six groups of six people each for clinical skills training. The 12 male students were divided into two groups by random draw and the teaching method for blood pressure measurement was randomly determined for the two groups. The 24 female students were also randomly divided into four groups by random draw and the teaching method for blood pressure measurement was randomly determined for the four groups. The students' knowledge about the blood pressure measurement methods before training was obtained using a questionnaire in order to compare the results with those obtained after the training.

From among the groups, three were trained to measure blood pressure on the right arm of a simulator and three were trained to measure blood pressure on the right arm of a student, both conducted by two professors during 2 h. Then, in the next week, during a 2-h session, the students' practice was conducted in the presence of the professor separately for each group, and the students' problems were resolved. This means that the simulator group practiced

blood pressure measurement on the simulator and the group experimenting with human subjects practiced on the students.

The evaluation of the students was done the next week using observation of blood pressure measurement on human subjects and according to the performance on the measuring blood pressure checklist, and using a double educational stethoscope by the professor. The duration of 5 min was considered for examining each student. To analyze the data, the methods of descriptive statistics (mean) and analytical statistics (independent and paired *t*-tests) were used with SPSS for Windows (version 16; SPSS Inc., Chicago, IL, USA).

Results

Table 1 shows that on determining and comparing the mean scores of the students' performance in the two methods of blood pressure measurements (simulator and human subjects), there was no significant difference between the two groups.

According to Table 2, there was a significant difference between the two study groups (simulator and human subjects) in the mean score of knowledge about the blood pressure measurement before and after training ($P < 0.05$).

Determination and comparison of measured mean systolic blood pressure by the two groups and the measured blood pressure by the professor (standard), based on Student's independent *t*-test, showed that there was no significant difference between the simulator and human subjects groups and also between the groups and the standard.

Table 1: Comparison of the mean scores of students' performance in the two studied groups

Groups	Students' performance score		Student's *t*-test
	Mean	SD	
Simulator	19.1429	1.61	*P*=0.367; *t*=−0.964
Human subject	19.6429	1.08	

SD: Standard deviation

Table 2: Comparison of the mean knowledge scores of the method of blood pressure measurement before and after training in the two studied groups

Groups	Knowledge score				Student's *t*-test
	Before training		After training		
	Mean	SD	Mean	SD	
Simulator	1.9821	1.02	9.1071	0.99	*P*<0.001
Human subject	1.8750	1.01	9.1429	1.21	*P*<0.001

SD: Standard deviation

Based on Student's independent *t*-test, there was no significant difference between the two groups regarding diastolic blood pressure considering the measured blood pressure by the professor (standard). Moreover, no significant differences were observed between the groups and the standard.

Discussion

The findings showed that there was no significant difference between the two groups in terms of mean performance scores. Thus, the two study groups were similar in terms of performance of blood pressure measurement after training. In the study by Lee *et al*., simulator arm and human subjects were used for measuring blood pressure and it was found that blood pressure measurements using these two methods were the same; there was no difference in students' performance regarding the accuracy of the measurement technique.[17]

In the present study, there was a statistically significant difference before and after training with regard to the mean score of knowledge of blood pressure measurement. This means that the two teaching methods were effective in increasing knowledge about blood pressure measurement. Results of the study by Hosseini-Nasab *et al*. indicated that mean and standard deviation of pre- and post-test scores of the two groups had increased after training. Pre- and post-test scores showed significant differences.[18]

According to the results of the present study, there was no statistically significant difference between the simulator group and the standard regarding the measured mean systolic and diastolic blood pressure levels. This means that training students in blood pressure measurement using a simulator is a good method and, by this method, students acquired the ability to measure systolic and diastolic blood pressure correctly. In recent decades, with the teaching process becoming more practical, development of educational technology, and increased importance given to assumed values in medical ethics (including respect for the patient and causing him/her less damage during the training), the traditional methods are questioned and clinical skills laboratories, which provide a simulator and secure learning environment, are used for training and managing skills. Moreover, in this environment, clinical interventions can be performed using a simulator or manikin and students can be trained in the skills with less stress.[3]

Using a high-precision simulator is effective in learning psychomotor skills because students are able to repeat the skills safely without being concerned about compromising the patients' health.[19] Based on the results of the study by

Harlow and Sportsman, 75% of educational simulators tend to result in learners' satisfaction and give very good educational results.[13]

According to the present results, there was no significant difference regarding systolic and diastolic blood pressure measurements by students on human subjects and blood pressure measurement by the professor (standard). This means that students gained correct knowledge on the ability of measuring blood pressure and that blood pressure measurement training given to students using human subjects is a good method to teach them.

The study by Hosseini-Nasab *et al*. compared computer-assisted instruction and academic views on learning vital signs measurement in nursing students and found no significant differences between the two teaching methods. This means that both teaching methods cause positive and equivalent improvement in student learning.[18]

Conclusion

According to the results, the two training methods (on human subjects and simulator) provide the necessary ability for the student to measure the systolic and diastolic blood pressures correctly. A comparison with previous studies shows that using simulators is an effective teaching strategy and facilitates learning and development of students' knowledge because simulators provide secure clinical opportunities and assist in the development of clinical skills.

Using a simulator arm is an acceptable method for teaching students the skills for measuring blood pressure. The simulator arm allows the students to practice blood pressure measurement in circumstances similar to a living example. The educational simulator is like a tolerant patient that the student can use repeatedly for hearing and distinguishing Korotkoff sounds. In addition, as an independent educational method, it results in improvement of learning for the students. Therefore, to enrich the educational programs of students, using the simulator training is recommended.

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