

The Effects of Simulation Training on Identifying Cardiopulmonary Health Problems

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ABSTRACT

Background: Management of cardiopulmonary health problems is a significant subject that should be studied in detail in nursing education.

Objective: To evaluate the effect of simulation training on pre-graduate final-year nursing students' identification of cardiopulmonary health problems.

Methods: The population and sample of this quasi-experimental study consisted of fourth year nursing students (N=62). The training took place in two stages; at school and hospital. The effectiveness of the training was evaluated using a pre- and post-test.

Results: We discovered that there was a statistically significant difference between the total mean scores of the pre- and post-test ($p < 0.001$), and the students' mean score of training satisfaction was 4.87 (range, 1-5).

Conclusions: Simulation training was found effective in increasing the students' knowledge, competence, and satisfaction level. The students were deemed competent to identify cardiopulmonary health problems. We recommend that there are further simulation practices as an effective education strategy in nursing education, and that simulation is integrated into the training programs and its clinical reflections are evaluated.

Keywords: Cardiopulmonary, simulation, nursing students

INTRODUCTION

The education process is a significant part of nursing, a discipline within the healthcare system. Nursing education requires an education system capable of delivering students as required in the modern profession and covers cognitive, affective, and psychomotor learning domains. ^[1] Ever-developing technology and pedagogy present us with methods that enable students to be active and prepare them for the real world. One of these methods, simulation, maintains a realistic setting for nursing students to experience

clinical conditions by way modern technology and is considered a vital part of education in improving patient care and ensuring patient safety. ^[2,3]

Simulation tools can involve basic plastic manikins that do not include advanced technology, three dimensional organ models, or computer- or video-based simulations that are realistic and highly in accordance with the original, and include interventional advanced technology. ^[4] The advantages of simulation in nursing education are that simulation creates a near-reality setting, ensures patient safety,

enhances active learning, allows students repetitive studies of the same case, makes it possible to demonstrate cases that are seldom experienced during clinical practice, allows constructive feedback that supports learning, and maintains the nonmaleficence principle, one of ethical principles in nursing. [5-7] Previous studies reported that students stated that simulation training was beneficial and provided effective learning. [3,8] Sundler et al. [9] also reported that simulators that are highly in accordance with the original setting made the examination realistic, the students considered receiving feedback on the scenario significant, and simulators could improve knowledge, comprehension, and competence of undergraduate nursing students.

It has been determined that nursing students find it difficult to reflect their theoretical knowledge into practice as their laboratory conditions are limited and that they feel inexperienced during practice in clinical settings. [3] Making it possible to learn through practice, supported by feedback, and adaptable to different learning styles, simulation allows students to transfer their knowledge to a clinical setting. [10] Simulated scenario practices may help students on how to behave when faced with real cases.

It is compulsory for nursing education to provide an extensive base and nurses' practice skills to enable critical thinking and instant decision-making to be able to deal with the complicated nature of cardiopulmonary health problems and the changeability of a patient's clinical condition at any moment. [7] Cardiopulmonary health problems are common, managed with difficulty, and vital; therefore, are a subject that should be studied in detail within nursing education. Although the intervention approaches to cardiac arrest are still considered a great problem in the world, [11] it is frequently mentioned amongst physicians and nurses that the quality of intervention to cardiopulmonary resuscitation is poor. [12]

Quality care is only possible with a highly-disciplined team mentality. As an important member of the team, nurses should be well-trained in this field and have the necessary knowledge and skills. It is of significance to obtain these qualities from studentship. It has been reported that near-reality high-fidelity simulation has a positive effect on advanced cardiovascular life support provider courses. [13,14] When we searched the literature, we found no study in which the effects of simulation training on nursing students' identification of cardiopulmonary health problems were investigated. Therefore, this study was performed in order to determine the effects of simulation training on identifying cardiopulmonary health problems in final-year nursing students, and their satisfaction levels.

METHODOLOGY

Purpose and Research Questions

This study was planned and put into practice in a quasi-experimental manner to determine the effects of simulation training on identifying cardiopulmonary health problems in undergraduate final-year nursing students.

Students' inclusion criteria were:

- Being a final-year student in undergraduate nursing degree programs,
- Having successfully completed internal diseases nursing, surgical disease nursing, and intensive care nursing courses
- Being willing and volunteering to participate in the study.

The research questions were as follows:

1. Is simulation training aimed at identifying cardiopulmonary health problems provided for students effective?
2. What is the students' satisfaction level with the training?
3. What is the students' clinical practice skill level?

Research Design and Sample

The theoretical and simulation laboratory training part of the study, which was designed in a quasi-experimental nature, took place in Amasya University

School of Health, and the hospital practice was performed in Amasya University Sabuncuoğlu Şerefeddin Research and Training Hospital (AUSŞRTH) in May, 2015. The population and sample of this study consisted of 66 students who had received education in their fourth year. Students (n=4) who could not complete all the stages of the education process for personal reasons were excluded from the study, and the research was performed with 62 students. The practice at the hospital was performed with only 52 students because 10 students could not participate.

The educational stages of the study and the learning and competence objectives were decided upon by the researchers. We received support from Istanbul Simulation Center (SIMMERK), an organization specialized in simulation in Turkey, in implementing the theoretical and simulation practices of the education. The study was completed in two stages as explained below: *Stage one of the study:* A pre-test was conducted for the participant students before the training. *The first day of training* involved theoretical training that contained identifying and evaluating health problems related to the respiratory tract. Afterwards, nursing care interventions concerning breathing problems were demonstrated by each student, one-to-one, on models in two application stations (Station I: Diagnosing patients with respiratory distress, Station II: Oxygenotherapy methods and endotracheal intubation). *On the second day of training*, theoretical training was provided that included identifying and evaluating cardiovascular health problems. Afterwards, nursing care interventions concerning these problems were demonstrated by each student, one-to-one, on models in three application stations (Station I: Taking and analyzing electrography, and recognizing peri-arrest rhythms, Station II: Cardiopulmonary resuscitation and defibrillation; Station III: Scenario practice of approach to a patient in shock). After the training was completed, the students were encouraged to simulate their new theoretical

and psychomotor skills in scenarios of acute asthma attack, shock, and cardiac arrest. The post-test was conducted after all steps of stage one of the training were accomplished.

Stage two of the study: This stage consisted of two-day clinical practice, which solidified the students' newly-acquired skills. The students were divided into four groups to participate in practices of morning and afternoon bedside visits. The practices were assessed by cardiologists and nursing instructors in accordance with the clinical skills checklist for diagnosing cardiopulmonary health problems.

Data Collection

The data collection tools below were used in collecting the study data:

1. *Pre-test-Post-test Questions:* 25 multiple-choice questions prepared by the instructors that focused on theoretical and skill acquisition. Each question was worth 4 points and the students' overall scores were evaluated on 100 points.

2. *Simulation Training General Assessment Form:* This form comprised 14 questions prepared by the researchers, 12 questions with 5-point Likert-type scale (1= Inadequate, 2= Partly adequate, 3= Moderate, 4= Good, 5= Very good) and two open-ended questions. In this form, the questions involved quality of education (setting, coordination, content, time period, materials, the instructors' competence, and practice), the students' general satisfaction level, and the contribution of the training to their career development and recommendations towards improving the training. The questions 1-12 were given values from 1 to 5 (range, 1-5), whereas the open-ended questions 13 and 14 were evaluated based on the students' answers.

3. *Clinical Practice Skill Checklist Form for Diagnosing Cardiopulmonary Health Problems:* This 3-point Likert-type (0= Inadequate, 1= Partly adequate, 2= Adequate) form prepared by the researchers included practices related to breathing problems (performing physical examination

on respiratory tract efficiently, identifying pathological respiratory sounds, conducting effective respiratory interventions, assessing the effectiveness of treatment), practices related to cardiovascular problems (performing physical examination on cardiovascular system efficiently, identifying pathologic cardiac sounds and dysrhythmias, conducting effective cardiovascular interventions, and assessing the effectiveness of treatment) and criteria such as timely arrival at the clinic, leadership aspects, and cooperation with the team.

Ethical Considerations

Ethics approval for this research was obtained from Amasya University, Scientific Ethics Committee in a written manner. Additionally, verbal permission was given by the students who participated in the study and the patients that underwent physical examination in accordance with the principle of willingness.

Data Analysis

The data were uploaded onto the IBM SPSS Statistics version 20.0 (IBM Co., Armonk, NY, USA) software program, and analyzed using the Independent T Test.

Statistical significance was set at the level of $p < 0.05$.

Limitations of Research

Due to the limited time and number of cases, the opportunity to perform every skill step for diagnosing cardiopulmonary health problems on the check-list form was not provided for each student in the hospital practice.

RESULTS

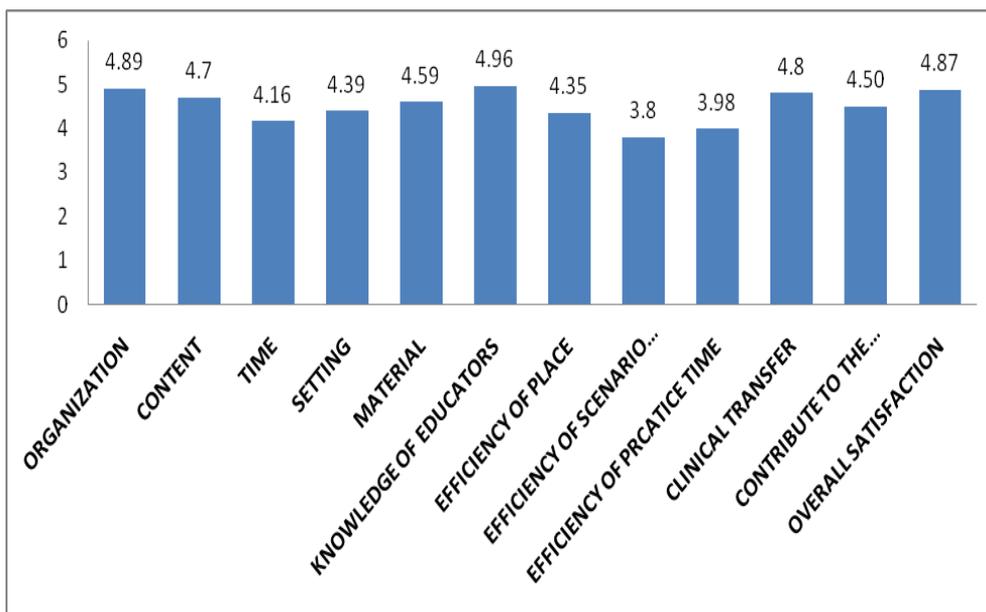
Of the students, 84% (n=50) were female and 16% (n=12) were male.

1. The effects of the simulation training provided for diagnosing cardiopulmonary health problems:

When the efficiency of the simulation training provided for the students’ skills of diagnosing cardiopulmonary health problems was evaluated based on the pre- and post-test results, it was observed that the total mean post-test scores (68.70) were higher than the total mean pre-test scores (45.72). There was a statistically significant difference between the total mean pre- and post-test scores ($p < 0.001$) (Table 1).

Table 1: Results of the Pre- and Post-test Scores (n=62)

	X	S	t	p
PRE-TEST	45.72	10.304	-13.741	<0.001
POST-TEST	68.70	11.834		



Graph 1. The simulation training overall satisfaction evaluation scores

2. The students' satisfaction levels regarding the training:

The scores given by the students for the parameters such as education (setting, coordination, content, time period, materials, the instructors' command of the subject, and simulation practice), general satisfaction, and the contribution of the training to career development were

analyzed; the mean scores of instructors' command of the subject, coordination and general satisfaction were high, and the mean scores of scenario practice quality and time period were rather low in comparison (Graph 1).

We found that the students' mean score of general satisfaction was 4.87 (range, 1-5) (Table 2).

Table 2: The Mean Scores of General Evaluation Criteria of the Students Who Received Simulation Training

Evaluation criteria	n	Min.	Max.	Mean	Std. Deviation
Training organization	62	4	5	4.89	.319
Time allocated for the training	62	2	5	4.16	.834
The content of the training	61	2	5	4.51	.698
The suitability of the training classroom	61	2	5	4.39	.759
The adequacy of the training material	62	3	5	4.52	.646
The competency of the instructors	62	4	5	4.97	.178
The adequacy of the practice space	62	3	5	4.35	.655
The sufficiency of the time for practice	62	1	5	3.81	.955
The adequacy of the scenario practice	60	2	5	3.98	.854
Contribution to professional development	61	4	5	4.80	.401
Overall satisfaction with the training	62	4	5	4.87	.338

Evaluating the students' views on theoretical and simulation training, it was discovered that more positive statements were given about simulation training (n=32, 51.62%) than theoretical training (n=25, 40.32%) (Table 3).

Table 3: The Students' Views on the Theoretical and Simulation Training (n=62)

Views on the Theoretical Training		Views on the Simulation Training		
	Statements	n (%)	Statements	n (%)
Positive Statements	"The theoretical training was quite good despite the limited time."	25 (40.32)	"The practical training was very informative and entertaining, I was very satisfied. We had the opportunity to perform exactly what we had learned in theory. It helped with memorability in learning."	32(51.62)
	"The slides were interesting and sufficient."	4 (6.45)	"The practical training will provide comfort and safety in our professional lives."	5(8.06)
	"I had the chance to see cases I have never seen before."	2 (3.22)		
	"The instructors were modest and very professional."	6 (9.67)		
	"Significant subjects were mentioned, the theoretical part was short and to the point."	2 (3.22)		
Negative Statements	"The theoretical training was quite boring."	6 (9.67)	"The time arranged for the practical training was very inadequate".	8(12.90)
	"The theoretical training could have been shorter if only the important parts were mentioned, this way there would be more time for the practical training."	7 (11.29)	"It would be beneficial for the students after us if simulation training were to be integrated in all classes."	1(1.61)
			"I am very worried about getting nervous in the clinic. I do not think I am competent enough."	2(3.22)

3. The students' clinical practice skill levels

The students' clinical practice skill levels in diagnosing cardiopulmonary health problems were analyzed, and 92.3% of the students (n=48) could efficiently perform a physical examination on respiratory tract,

44.2% (n=23) could identify pathologic respiratory sounds, 90.4% (n=47) could efficiently perform physical examination on cardiovascular system, and 73.1% (n=38) could identify dysrhythmias "adequately," whereas 55.8% (n=29) and 48.1% (n=25) were only "partly adequate" at identifying

pathologic respiratory and pathologic cardiac sounds, respectively (Table 4).

Table 4: Distribution of the Students' Clinical Skills in Diagnosing Cardiopulmonary Health Problems (n=52)

Clinical Practice Skill Criteria	Competent n(%)	Partly Competent n (%)
Practices regarding respiratory tract		
Efficiently performing physical examination on respiratory tract	48 (92.3)	4 (7.7)
Identifying pathologic respiratory sounds	23 (44.2)	29 (55.8)
Conducting effective respiratory interventions	48 (92.3)	4 (7.7)
Able to evaluate the effectiveness of treatment	44 (84.6)	8 (15.4)
Practices regarding cardiovascular problems		
Performing physical examination on cardiovascular system efficiently	47 (90.4)	5 (9.6)
Identifying pathologic cardiac sounds	27 (51.9)	25 (48.1)
Identifying dysrhythmias	38 (73.1)	14 (26.9)
Conducting effective cardiovascular interventions	44 (84.6)	8 (15.4)
Assessing the effectiveness of treatment	47 (90.4)	5 (9.6)

With respect to the students' ability to work together as a team within the clinic, 98.1% (n=51) could work in harmony with the team, 94.2% (n=49) had a good quality of leadership, and 86.5% (n=45) arrived at the clinic in a timely fashion (Table 5).

Table 5: Distribution of the Students' Teamwork Skills (n=52)

Teamwork Skills	Adequate n(%)	Partly Adequate n(%)
Timely arrival at the clinic	45 (86.5)	7 (13.5)
Leadership aspect	49 (94.2)	3 (5.8)
Working in harmony with the team	51 (98.1)	1 (1.9)

DISCUSSION

Interactive methods are one of the most effective training methods in helping students develop cognitive and psychomotor skills. One of these methods, simulation, provides a realistic learning environment in which students experience real-life situations while effectively improving their cognitive and psychomotor knowledge and skills. [3] The use of simulation in nursing education in Turkey is becoming progressively significant each day, owing to the increasing number of students and the insufficient number of instructors, and most importantly its contribution to patient safety. It has been reported that simulation should be used as an alternative training method in addition to traditional fundamental skill training with its results evaluated, [6] and it is an effective way of maintaining patient safety and improving students' psychomotor skills. [15]

In a study where the effect of simulation training on newly employed nurses' knowledge of emergency cardiac

care, clinical practice, and problem-solving skills, the knowledge and clinical practice skills of those who completed simulation training were reported to be more advanced. [16] Nursing students are not offered the opportunity to intervene in cases of acute crises during clinical practice. For this reason, simulation training is beneficial for nursing students because it allows them to practice such cases. [17] It is known that the first assigned position for new graduate nurses is usually emergency and intensive care clinics in Turkey. Therefore, we provided simulation training based on identifying cardiopulmonary health problems for our students prior to graduation, and the training was discovered to be effective. In studies with nursing students that measure the efficiency of simulation, it was reported that training with computer simulation increased students' confidence in their physical assessment skills, the training was considered realistic, and it offered students excellent experience, and the students' knowledge and skill levels had statistically significant increased. [18-21]

In a number of studies where the effects of scenario/computer simulation training on nursing students' preclinical first experiences were analyzed, it was stated that the students' communication, decision making in critical circumstances, discussion and educational skills made progress. [22,23] Goodstone et al [24] claimed that simulation training also improves critical thinking skills in time.

In our study, we evaluated the students' views regarding their satisfaction

levels in the theoretical and simulation training, and found that there were more positive statements about the simulation training than the theoretical training. Thidemann and Söderhamn [25] reported that using high-fidelity simulation in improving communication and cooperation skills increased students' satisfaction and confidence. Similarly, Wagner et al [26] stated nursing students who received simulation training took more satisfaction out of clinical experiences, were helpful towards patients, were accepted by nurse clinicians, and demonstrated better knowledge and practice skills.

Students may find applied training more entertaining than theory-based training, and pieces of information given during practice are more likely to become permanent, especially in a simulation environment. In our study, the students' view pertaining to the theoretical and simulation training showed that they found the theoretical and practical training informative, simulation training was instructive while being entertaining, and the students were satisfied with the overall theoretical and practical training. Similar to our study, research in the literature also reported that the students felt comfortable whilst working with simulation and were satisfied with such training programs; [27,28] they felt like a real nurse, simulation functioned as a guide for arranging priorities, improved professional maturing and communication within the team, raised awareness and sensitivity; [29] and it improved care skills and confidence while decreasing anxiety levels in the course of care. [30]

Accordingly, we believe simulation training based on identifying cardiopulmonary health problems is effective in preparing student nurses for the clinic, it improves students' clinical decision making, psychomotor skills, and communication within a team while increasing students' satisfaction levels.

CONCLUSIONS

Consequently, in our study, we determined that the simulation training we provided for final-year nursing students regarding the identification of cardiopulmonary health problems was effective, the students were satisfied with the training, and their abilities to perform these skills in the clinic and cooperate with the team were found adequate. Such training provided for students is of great importance in terms of diagnosing patients' life-threatening cardiac and pulmonary problems, planning interventions for effective nursing care, and feeling ready for clinical settings. It is believed that simulation improves students' psychomotor and critical decision-making skills, and their confidence while contributing to their professional development and teamwork. In Turkey, simulation training should be integrated into the nursing undergraduate curriculum, and more time should be given to various scenarios and practices. Future studies are recommended to include a higher number of and more varied cases, and to focus more on clinical practice, while also including a debriefing session.

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