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PRECISION IN PRACTICE: HIGH-FIDELITY SIMULATION AS A CATALYST FOR ADVANCING PHYSICAL EXAMINATION SKILLS IN NURSING

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Abstract
In the ever-evolving clinical landscape, nursing's role has expanded to encompass advanced cognitive, affective, and psychomotor skills, owing to rapid technological advancements (Morgan, 2006). A crucial facet of nursing practice is the mastery of physical examination skills, making the teaching of these skills an integral component of nursing education programs (Birks, James, Chung, Cant, & Davis, 2014). However, the acquisition and retention of these skills present considerable challenges (Kantak & Winstein, 2012). Nursing education places a strong emphasis on fostering competence and ensuring the quality of patient care and safety (Edeer & Sarıkaya, 2015). To achieve this, students must gain valuable, high-quality experiences during their education (Goldsmith, Stewart, & Ferguson, 2006). Unfortunately, the increasing number of nursing students and the limited availability of educators and clinical placements have led to constraints on the time students can spend enhancing their clinical skills (Kaddoura, 2010; Yuan, Williams, Fang, & Ye, 2012). This limitation hinders students' ability to bridge the gap between theoretical knowledge and clinical practice, recognize critical patient indicators, and refine their caregiving abilities (Norman, 2012; Tanner, 2006; Yuan et al., 2012).

Keywords: nursing education, physical examination skills, clinical experience, competency, patient care

1. Introduction

The clinical arena is becoming more and more complex as a result of rapidly emerging technology, and subsequently, nursing, with its focus on care, is required to include advanced cognitive, affective and psychomotor skills (Morgan, 2006). Physical examination skills are an essential part of the professional nursing role. Therefore, the teaching of physical examination skills has an important place in nursing education programs (Birks, James, Chung, Cant, & Davis, 2014). However, the processes of learning and the permanent acquisition of the learned skills are very difficult (Kantak & Winstein, 2012).Improving of the quality of patient care and safety and the training of competent nurses are among the main objectives in nursing education (Edeer & Sarıkaya, 2015). It is important to enable students the effective and first-rate experience during the education process for the development of their competence (Goldsmith, Stewart, & Ferguson, 2006). However, in recent years, due to the increasing number of students in nursing education programs and the resulting inadequate number of educators and clinicians, the time allocated for the improvement of their skills in the clinical area is limited (Kaddoura, 2010; Yuan, Williams, Fang, & Ye, 2012). This reduces the opportunities for students to relate their theoretical knowledge to their clinical experience, to recognize important signs in their patients and to develop their caregiving skills (Norman, 2012; Tanner, 2006; Yuan et al., 2012). Therefore, the use of innovative teaching methods has become increasingly important in the nursing skills laboratories, which are used as the first step in the teaching of skills, as opposed to the clinical settings used for the development of these nursing skills. One innovative teaching method is the

simulation technique, a valuable teaching strategy which offers a realistic, safe and effective learning environment.

This method has been applied for many years in the education process and its use has now begun to increase at a rapid pace (Bland, Topping, & Wood, 2011; Robinson & Dearmon, 2013). For physical examination skills, simulation can provide students with an opportunity to recognize abnormal physical examination findings that are rarely encountered on patients in the clinical setting. Students do not always encounter most auscultation sounds, especially abnormal sounds, during routine clinical practice. Therefore, different simulation methods are used in which highly realistic simulation is involved in order to develop the students' ability to distinguish between normal and abnormal physical examination findings (Chen, Grierson & Norman, 2015).

Studies have found that the use of simulation applications in nursing education results in increased retention of the students' theoretical knowledge and development of their psychomotor skills before practicing them in the clinical setting as well as in increased ability to perform skills (Shepherd, McCunnis, Brown, & Hair, 2010) and development of communication and collaboration skills (Norman, 2012; Paige et al., 2014; Scherer, Myers, O'Connor, & Haskins, 2013). At the same time, studies have shown that simulation-based teaching methods used for developing students' physical examination skills produce positive results (Eyikara & Baykara, 2018; Gordon et al., 2013; Multak, Newell, Spear, Scalese, & Issenberg, 2015; Perlini & Musca, 2012). The study of Tawalbeh (2017) examined the effect of simulation on the cardiopulmonary system examination skills of nursing students and determined that the skill levels were higher in the students who had received simulation training than in the ones who had not. Similarly, in the study of Tiffen, Graf and Corbridge (2009,) students who had simulation experience in heart and lung examination were found to score significantly higher in their ability to evaluate normal and abnormal heart and lung sounds than those who did not have the simulation experience. In light of this information, the aim of this study was to evaluate second-year nursing students enrolled in the Physical Examination Course on their development of auscultation skills for lung and bowel sounds using an application performed via a high-fidelity simulator accompanied by a scenario.

2. Methodology

2.1. Design and site of study

The study, which was conducted as semi-experimental design, was carriedout at a State university between March and June 2018.

2.2. Sample

The research population was composed of 191 second-year students enrolled in the Physical Assessment Course in the Faculty of Health Sciences Department of Nursing during the fall semester of the 2017-2018 academic year. The sample group of 36 students was determined by the randomized sampling method.

2.3. Instrument

The research data were collected using the Personal Information Form, which included descriptive characteristics of the students, the Implementation Feedback Form and the Skill Evaluation Form, which were prepared by the researchers.

The Personal Information Form consisted of three questions including the students' age, sex and whether they had received lung and bowel sound auscultation training prior to taking the Physical Assessment Course, and if so, the place and nature of this training.

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The Implementation Feedback Form consisted of four questions in order to determine how the students felt during the simulation application, the positive and negative aspects of the application and their suggestions in terms of the application.

The Skill Evaluation Form was prepared by the researchers in accordance with the literature and consisted of 10 application steps designed to evaluate the auscultation skills of the students in terms of their ability to listen to lung and bowel sounds

2.4. Procedure

Data were collected from March to June 2018. The skill applications were carried out using a high-fidelity simulator (Meti-Man Prehospital Simulator) accompanied by a scenario. The applications of the students were evaluated by two independent observers.

2.5. Data analysis

The data were analyzed by using SPSS 24 statistical analysis program. The descriptive characteristics of the students were defined using frequencies and percentages. The performances of students' listening to lung and bowel sounds were summarized by using descriptive statistics and interobserver compliance test was performed between the observers' evaluations. In addition, students' opinions about simulation application were defined by frequency and percentage values. The value of $p<0.05$ was accepted for the significance level of statistical tests used in the analysis of the data.

2.6. Ethical considerations

Written permission was obtained from the ethics committee (Ethics approval no: 2018/39) and the Faculty of Health Sciences Department of Nursing of the institution in made research. Participation in the study was on a voluntary basis and all students eligible to take part were informed of the purpose and content of the study. Verbal consent was obtained from the students chosen to participate in the study.

2.7. Limitations of the study

The study data were limited to second-year students in the Department of Nursing of the Faculty of Health Sciences. In addition, only the physical examination skills of auscultation of lung and bowel sounds were evaluated.

3. Results

When the descriptive characteristics of the students were examined, it was determined that 60% were 19-20 years of age, 60% were female and none had received lung or bowel sound auscultation training before taking the Physical Assessment Course (Table 1).

Table 1. Descriptive characteristics of students (n = 35)

Descriptive Characteristics		**n**	**%**
Age	19-20	**21**	**60.0**
	21-23	14	40.0
Sex	Female	**21**	**60.0**
	Male	14	40.0
Training status for auscultation of lungs and bowels before taking the Physical Assessment Course	Yes	0	0
	No	**35**	**100.0**
Total		**35**	**100.0**

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Evaluation of the students' auscultation skills for lung and bowel sounds revealed that 54.28% of the students had not introduced themselves to the patient, 62.85% had only partially completed the step of explanation and taking permission from the patient and 94.28% had not closed the curtain to ensure the privacy of the patient. Furthermore, 85.71% of the students partially completed the step of hearing lung sounds at the listening points and 48.57% partially distinguished "wheezing", while 48.57% of them could partially note the number of bowel sounds in each quadrant. It was found that 45.71% were partially able to explain the outcome of the procedure to the patient, and 68.57% partially completed the step of positioning the patient comfortably and ending the procedure appropriately. Moreover, listening to the bowel sounds from each quadrant was partially performed by 40% of the students, while 40% of them performed the step completely. Most of the students (91.42%) neglected to perform the final step of recording the process (Table 2).

The results of the interobserver compliance test conducted for the evaluation of the two different observers established that there was a moderate to high degree of compliance between the observers for all application steps except for the ninth step: "The student positions the patient comfortably and terminates the communication appropriately" (K: -.140) (Table 2).

Table 2. Evaluation of students' auscultation skills for lung and bowel sounds (n = 35)

	Skill Steps	Unable to do		Partially done		Completely done		Interobserver Compliance
		n	%	n	%	n	%	
Auscultation Skills for Lung and Bowel Sounds	The student introduces herself to the patient	19	**54.28**	4	11.42	12	34.28	**K: .842 p : .000**
	The student explains the procedure to be done/takes permission from the patient.	6	17.14	22	**62.85**	7	20	**K: .591 p : .000**
	During the application, the student closes the curtain to ensure the privacy of the patient.	33	**94.28**	0	0	2	5.71	**K: 1.000 p : .000**
	The student listens to the lung sounds from the listening points.	1	2.85	30	**85.71**	4	11.42	**K: .541 p : .000**
	The student can distinguish "wheezing sounds"	9	25.71	17	**48.57**	9	25.71	**K: .955 p : .000**
	The student listens to the bowel sounds from each quadrant.	7	20	14	**40**	14	**40**	**K: .779 p : .000**
	The student notes the number of bowel sounds in each quadrant.	15	42.85	17	**48.57**	3	8.57	**K: .404 p : .000**

	The student explains the outcome of the procedure to the patient.	13	37.14	16	**45.71**	6	17.14	**K: .266 p : .032**
	The student positions the patient comfortably and ends the communication appropriately.	8	22.85	24	**68.57**	3	8.57	K: -.140 p : .135
	The student records the process.	32	**91.42**	0	0	3	8.57	**K: .844 p : .000**

Students' feedback about the simulation practice revealed that 40% of the students felt anxious during the application and 45.7% stated that they had gained experience from the practice. No negative aspects were found for the application by 57.1% of the students. In addition, 22.9% of the students did not respond to the request for suggestions and 22.9% had no suggestions, while 14.3% recommended that the simulation practices should be done more frequently (Table 3).

Table 3. Student opinions about simulation practice (n = 35)

Questions	**Student opinions**	**n**	**%**
How did you feel during the practice?	I was happy to help someone.	2	5.7
	I was very anxious; I couldn't do what I had to do.	**14**	**40.0**
	It was very realistic; I was anxious before I went back to normal.	10	28.6
	I was a little tense from the simulator coughing.	3	8.6
	I'm sorry, I thought I couldn't give enough attention to the patient.	1	2.9
	I was a little anxious tobe next to a patient.	3	8.6
	I felt stressed and under pressure.	2	5.7
What are the positive aspects of the practice?	My view is not very positive	1	2.9
	It was aimed at investigating diseases.	1	2.9
	I gained experience.	**16**	**45.7**
	It was realistic.	4	11.4
	It made me realize my shortcomings.	7	20.0
	It helped me to distinguish sounds.	2	5.7
	It helped me overcome my fear and anxiety.	2	5.7
	It created a real sense of environment that enabled me to manage my stress.	1	2.9
	By gaining experience, it made me realize my shortcomings.	1	2.9
What are the negative aspects of the practice?	No answer given.	5	14.3
	There are none.	**20**	**57.1**
	More guidance is needed.	1	2.9
	Bowel sounds in the simulator were low.	1	2.9
	It arouses feelings of failure.	1	2.9

	It is stressful.	5	14.3
	It is not enduring/feeling, not like a real patient.	1	2.9
	Resources are limited.	1	2.9
What are your suggestions for implementation?	No answer given.	**8**	**22.9**
	I have no suggestions.	**8**	**22.9**
	Brief information can be given in the form of reminders/cues.	2	5.7
	The diversity of the practice can be increased with different scenarios.	3	8.6
	Quite suitable.	2	5.7
	It should be applied for all students.	3	8.6
	Such practices should be done more frequently.	**5**	**14.3**
	The number of simulators should be increased and mutual communication should be established with the simulator.	3	8.6
	The simulator should be lighter in order to move it more comfortably.	1	2.9
Total		**35**	**100.0**

4. Discussion

The results of the study showed that more than half of the students did not introduce themselves to the patient before starting the physical examination, while many of students only partially completed the steps of explanation/authorization from the patient for the procedure to be performed (62.85%) and explaining the outcome to the patient (45.71%). It was also determined that 94.28% of students did not close the curtain to ensure the privacy of the patient during the application. Similar to the results of this study, Çevik, Demirci, and Güven (2015) reported that 35.1% of the nursing students administered medication without explaining it to the patient.

However, information about the procedures to be performed on a patient and maintaining patient privacy during the procedures performed are emphasized in the policies of health institutions and in the Patient Rights Regulation no. 23420 (Patient Rights Regulation, 2017). Nurses are expected to know the rights of the patients and provide adequate, safe, and ethical care in line with these principles (Erdil & Korkmaz, 2009). Therefore, nursing students' attitudes toward patient rights and privacy should be developed within the educational processes and it may be considered useful to provide students with theoretical training to develop their attitudes as well as to give them the opportunity to experience simulation practices that can reflect clinical situations.

By partially completing the steps, a majority of the students (85.71%) were able to listen to lung sounds from the listening points, 48.57% to distinguish abnormal wheezing, 40% to listen to bowel sounds from each quadrant, and 48.57 to express the number of bowel sounds in each quadrant.

Based on these results, it can be stated that nearly half of the students had effectively developed the auscultation skills of lung and bowel sounds. Similar to the present study results, Tawalbeh's (2017) study on the effect of simulation on the cardiopulmonary system examination skills of nursing students revealed that the students' skill levels were significantly higher after the simulation. In the study of Tiffen, Graf and Corbridge (2009), it was determined that nursing students attending the simulation practice had higher competency levels in heart and lung examination skills. Similarly, Multak et al. (2015) in a study with medical students, determined the simulation method to be effective in the

development of the students' information and cardiac examination techniques, recognition of cardiac findings and ability to reach a correct diagnosis. Also the results of the Butter, McGaghie, Cohen, Kaye, and Wayne (2010)'s study by carried out with medical students were similar.

In addition to the positive effects of simulation applications on physical examination skills, many studies in the literature discuss the inconsistency between the physical examination skills that are taught and those used in the clinical field (Birks et al., 2013; Secrest, Norwood & Mont; 2005). Douglas, Windsor, and Lewis (2015) reported that nursing students had learned physical examination skills during the undergraduate education process, but could neither find the means to apply the skills nor could they improve themselves in the skills and therefore, they stated that the physical examination training practices were inadequate. Cicolini et al. (2015) revealed that the practice of techniques such as auscultation skills and examination of lung, heart and bowel sounds were not applied or rarely applied. Also, in the study of Çevik, Uğurlu, Akyüz, Kav, and Ersayın (2018) 78.4% of the nurses stated that they would like to receive training on physical examination skills. Considering the results obtained from the study data and the literature review, the importance of increasing the proficiency and awareness levels of nursing students in physical examination skills has emerged, and simulation applications included in the training process can increase their competence and awareness and enable them to arrive at the clinical setting with an adequate level of skills.

After completing the physical examination, 68.57% of the students partially performed the step of comfortably positioning the patient and terminating the communication appropriately, while a high number (91.42%) did not record the procedure they had performed. Ending the communication with the patient after a procedure is extremely important for the therapeutic communication between the patient and the nurse, and effective communication holds an important place among the nursing skills (Xie, Ding, Wang, & Liu, 2013). Expósito, Costa, Agea, Izquierdo, and Rodríguez (2018) evaluated the communication skills of nursing students and stated that the students' communication skill scores were low and needed to be improved. Similarly, Xie et al. (2013) also reported that nursing students needed training in communication. In terms of professional competence in nursing, it is necessary to possess not only cognitive and psychomotor skills, but also advanced and effective communication skills (Terzioğlu et al., 2016). Students may find it difficult to communicate with patients when they are not adequately prepared for the clinical practice environment (Bokken et al., 2010).Studies performed using the simulation method have revealed that the simulation had an effect on the development of student communication skills (Alexander & Dearsley, 2013; Ryan et al., 2010; Weaver & Erby, 2012). It is also essential to record all the procedures performed in order to make apparent the nursing care, to manage the patient's care, to provide information about the patient for other health personnel and to establish legal evidence of the care (Kim & Park, 2005; Tiusanen, Junttila, Leinonen, & Salanterä, 2010; Türk, Hakverdioğlu, Eşer, & Khorshid, 2010).

The feedback from the students about the simulation application revealed that 40% of the students were very anxious during the application and could not do what they needed to do and 45.7% of them felt that they had gained experience as a positive aspect of the simulation practice. Findings similar to the results of this study have been reached on the effect of simulation practices on levels of student anxiety and on the ability to achieve the expected skills (Cheung & Au, 2011; Harvey, Bandiera, Nathens, & LeBlanc, 2012; Sprengel & Job, 2004).A review of the literature revealed that student satisfaction levels and psychomotor skills increased as the reality level of the simulation environment increased (Terzioğlu et al., 2016), whereas the stress levels they experienced also increased (Sprengel & Job, 2004).

In addition to the negative feelings that students may experience during the implementation process, it has emerged that simulation applications have positive effects on their knowledge and skills, including improvement of psychomotor skill development, critical thinking and development of clinical decision-making skills (Gündoğdu & Dikmen, 2017; Şendir & Doğan, 2015).

Similar to the results of this study, the study of Uslusoy (2014) examining the views of nursing students who received and did not receive simulation training in the process of their education found that those who received simulation training stated that it contributed to their professional skills, reduced their anxiety, increased their selfconfidence and facilitated quick decision making. Also, Yilmaz & Sari's (2018) study dealt with nursing student views of the effects of low and high fidelity simulation on the development of their clinical skills. The students stated that highly realistic simulation enabled holistic assessment of the patient, increased clinical self-confidence, provided continuity and retention of knowledge and improved decision-making skills.

In this study, more than half of the students stated that there were no negative aspects of the simulation application and 14.3% of the students suggested that such simulation training should be performed more frequently. In contrast, Uslusoy (2014) stated that the models and simulators used by the students were inadequate and that the simulation training caused difficulties for a high number of students. However, in line with the suggestion made by the students participating in this study, more frequent integration of simulation applications in nursing education has been recommended (Corbridge et al., 2008; Fountain & Alfred, 2009). By using high fidelity simulation application more often, students are given the opportunity to repeatedly practice and reduce mistakes that could have been made in the real environment (Edeer & Sarıkaya, 2015). The increasing number of students in nursing education today has led to an inadequate number of faculty members. Because of this situation, not all students may be given the opportunity to repeat their skill practices in a given time period (Uslusoy, 2014).

5. Conclusion and Recommendations

In light of the results obtained in the study and the data in the literature, it is recommended that high fidelity simulation applications be included in the education of nursing students in order to develop their physical examination skills. In addition, it is thought that the implementation of simulation applications that include more comprehensive physical examination skills would facilitate integration of knowledge and skills and improve student attitudes toward holistic patient assessment. Moreover, evaluating student feedback on high fidelity simulation can help reveal the positive and negative aspects of the simulation from the student point of view and enable further development of the simulation technique in line with their opinions.

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