Original Article

Simulation-Based Teaching is Effective in Developing Peripheral Intravenous Catheterization Skills

Hatice Erdem Onder, MSc, RN
Research Assistant Ege University Faculty of Nursing, Fundamental of Nursing Department, Izmir, Turkey

Dilek Sari, PhD, RN
Associate Professor, Ege University Faculty of Nursing, Fundamental of Nursing Department, Izmir, Turkey

Correspondene: Hatice Erdem Onder, Research Assistant Ege University Faculty of Nursing, Fundamental of Nursing Department, 35100, Izmir,Turkey E-mail:haticerdem20@gmail.com

Abstract

Background: One of the most common basic nursing skills is peripheral intravenous catheterization. Although peripheral intravenous catheterization is one of the most common and important skills performed in the clinical setting, it is also one of the most difficult skills to teach in nursing education.
Aims: The research has been conducted in randomized controlled trial design in order to examine the effect of simulation-based learning in development of peripheral intravenous catheter insertion skill of nursing students.
Methodology: the study was designed as a randomized controlled experimental study. Stratified sampling method was used; A total of 72 students (36 in experimental group, 36 in control group), participated in the study. After all students were provided with theoretical background, peripheral intravenous catheterization skills training was given in the laboratory. Following the trainings, students in the experimental group were provided with simulation training. Data were collected by using an individual identification form, peripheral intravenous catheterization information test and skill checklist, the student satisfaction and self-confidence scale in learning.
Results: There was no statistically significant difference between the pre-test and post-test mean scores of the peripheral intravenous catheterization knowledge of the students in both group ($p>0.05$). The skill performance scores of the students in the experimental group, were found significantly higher (44.47±3.72) than those of the students in the control group (32.47±5.55) ($p<0.001$). The mean satisfaction and self-confidence scores of the students in the experimental group were found to be 4.33±0.42.
Conclusions: It was determined that simulation-based training was effective in improving students' peripheral intravenous catheterization skills and increased students' self-confidence.

Key Words: Peripheral Intravenous Catheterization, Nursing Education, Simulation

Introduction

Clinical practice, as an integral part of nursing education, enables students to integrate knowledge and skills into practice and adopt professional values (Sarmasoglu, Dinc & Elcin, 2016a). Although clinical practice is an integral part of nursing education, some students experience unequal learning opportunities within the clinical environment due to the difficulties in clinical settings, as early discharge periods and some patients' reluctance to take part in the clinical learning process (McGraw & O'connor, 1999; Sarmasoglu, Dinc & Elcin, 2016a). In addition, fear of making mistakes might cause performance anxiety among students while they practice their skills with real patients and it may prevent them from transferring their knowledge and skills to clinical practice, and pose significant risks to patient safety and privacy (Feng, Bobay & Weiss, 2008; Houghton et al., 2013; Ozturk & Dinc, 2014; Ross, 2012; Sarmasoglu, Dinc & Elcin, 2016a). In this respect, vocational education, which requires integration of knowledge and practice, is of great importance to ensure patient safety and reduce the rate of mistakes (Robinson & Dearmon, 2013). In addition, ethically, students must carry out these procedures before performing them onto patients

(Strand, Nåden & Slettebø, 2009). The different teaching environments used in nursing education have an important role in developing students' psychomotor skills. Among the most commonly used educational environments in transferring knowledge into practice are nursing skills laboratories, standard patient laboratories and clinical settings (Baxter et al., 2009; Morgan, 2006; Richardson et al., 2009; Terzioglu et al., 2016). In nursing education, developing skills in the laboratory setting forms the basis of safe patient care (Castanelli, 2009). This is because skill laboratories provide students with a safe and controlled learning environment where they can observe and practice clinical skills without harming real patients (Houghton et al., 2012; Morgan, 2006; Wilford & Doyle, 2006). However, in order to ensure effective learning, laboratory environment should be as realistic as possible (Alinier, 2003; Houghton et al., 2012). When appropriate laboratory conditions cannot be provided, students' learning is prevented and/or cannot occur at the desired level, problems are experienced in transferring their knowledge and skills to the clinical environment, and they feel insecure about the adequacy of their professional knowledge and skills. For this reason, it is thought that it is necessary to strengthen the infrastructures of the skill laboratory where practices are carried out and it is emphasized that the new opportunities provided by contemporary teaching methods and technologies should also be benefited in these strengthening practices. Therefore, it is necessary to establish laboratory environments with necessary technical equipments, where simulation training is provided, and which will provide nursing students with opportunity to experience patient care before they meet with real patients and to practice until they feel competent. Following the twentieth century, along with the increase in the factors that make learning conditions difficult in the hospital environment and due to the impact of technological developments, simulation provides an interactive teaching and learning environment for the education of health workers. In this respect, the use of simulation in nursing education has become increasingly important all over the World (Bradley, 2006; Nehring & Lashley, 2009; Ross, 2012; Sarmasoglu, Dinc & Elcin, 2016b; Silverman & Wood, 2004; Terzioglu et al., 2012). Simulation training; It aims to provide artificial or virtual experience to the students by providing a safe environment where real life conditions are created but the risk of a real situation is not taken. In addition, simulation training provides students with the opportunity to work in a safe environment by improving their knowledge and skills and reducing anxiety levels (Alinier, 2007; McAllister et al., 2013; Rhodes & Curran, 2005; Terzioglu et al., 2012). With the help of the education received in such an environment, the effects of education are maximized because students learn by experiencing their knowledge, skills and mistakes during their performances during the simulation training (Ahn & Kim, 2015). In some studies, it was reported that the newly graduated nurses are inadequate in performing basic nursing duties due to lack of skills and one of the practices in which they experience the most anxiety is peripheral intarvenous catheterization (PIVC) (Bayar, Cadir & Bayar, 2009; Hiton & Pollard, 2004; Khorshid et al., 2002; Salyers, 2007). In order to enable them to acquire PIVC skills, it is essential to provide an interactive learning environment where students can experience real-life situations, experience patient care before interacting with real patients, and gain subjective or virtual experiences without risk (Cant & Cooper, 2010; Terzioglu & Boztepe, 2013; Wilfong et al., 2011). In this context, it is estimated that the integration of simulation-based instruction, as one of the interactive and current education approaches, into nursing education will contribute to the knowledge levels and psychomotor learning processes of nursing students.

This study was conducted to investigate the effect of simulation based teaching on the development of PIVC skills of nursing students.

Methodology: This is a randomized controlled experimental study conducted to investigate the effect of simulation based teaching on the development of peripheral intravenous catheterization skills of nursing students. The study was carried out in a nursing faculty in Izmir between February and June, 2018. The population of the study consisted of 288 second year students in the Faculty of Nursing, who studied and took basic nursing skills courses in the academic year of 2017-2018. The sample group of the study consisted a total of 72 students, 36 students in the experimental group and 36 students in the control group, who did not have any clinical experience and accepted to participate in the study. The research sampling and application scheme is shown in Figure 1. The students in the sample group were divided into three groups according to their academic success by using stratified sampling method. 24 students from each group were included in the research sample by using simple random sampling method and these students were divided into experimental and control groups by using research randomization program.

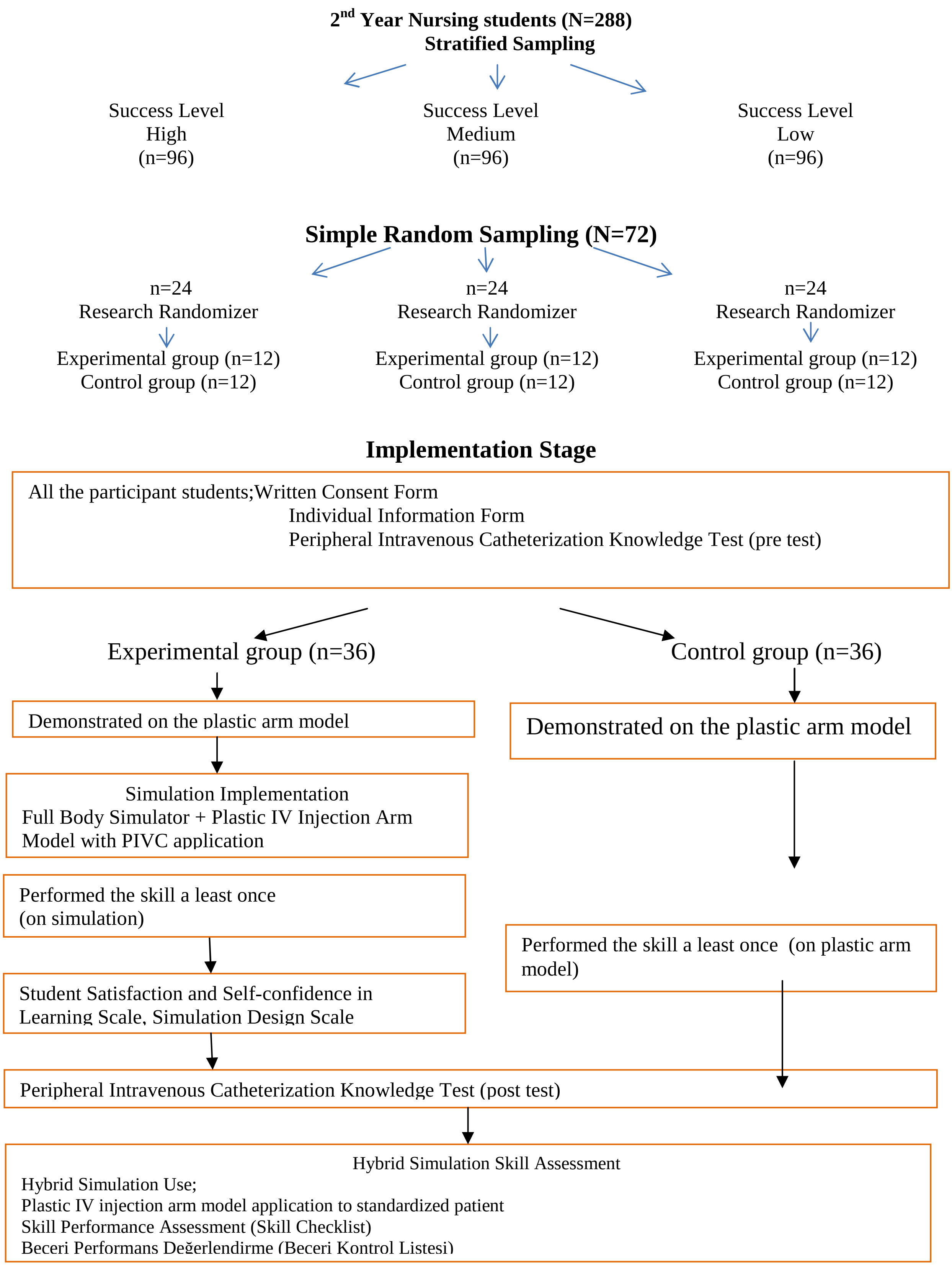

Figure 1. Research sampling and application scheme

All the participant students in the study were given PIVC training with the traditional education method. In traditional education, the students were first given theoretical education about PIVC. After the theoretical training, PIVC skills training was provided by plastic arm model in skill laboratory and practice was made. The students performed their PIVC skills with The Life/form Adult Venipuncture and Injection Training Arm model. This is an adult sized plastic arm simulator with multivascular system designed for PIVC and intravenous (IV) injection training. This plastic arm model includes visible, palpable venous veins. Thus, students can perform PIVC, IV injection and drug applications. In addition, all applications can be repeated (Nasco).

After the traditional training, a patient room was created in the demonstration laboratory and simulation based instruction was performed with full body mannequin and plastic IV injection arm simulator with the students in the experimental group.

During the prebriefing stage of the simulation, the objective of the simulation was explained to the students, the equipment to be used was introduced and questions of the students were answered. The scenario for the simulation implementation was shared with the students. In accordance with the scenario, the students were asked to perform the PIVC application skill within 10 minutes according to the skill checklist and the students' performances were videotaped. After the simulation implementation, video recordings were watched, analyzed and discussed together with the students.

Collection and Analysis of Data: Data were collected by using individual identification form, peripheral intravenous catheterization skill checklist, peripheral intravenous catheterization knowledge test, and by student satisfaction and self-confidence in learning scale and simulation design scale after the simulation implementation.

The individual information form consists of 3 questions about the descriptive characteristics of students such as age, gender and the state of considering themselves suitable for nursing profession.

The peripheral intravenous catheterization knowledge test prepared by the researcher in accordance with the literature, in order to determine the knowledge level of the students about PIVC application; consists of 10 questions (Akca Ay, 2016; Potter et al., 2013; Uzun, 2013). The lowest score of the test is 0 and the highest score is 100.

In order to evaluate the PIVC skills of the students, 25-step skills checklist (Akca Ay, 2016; Potter et al., 2013; Tuzer, Dinc & Elcin, 2017), developed by the researcher based on the literature, was used. In the skills assessment forms, each item was scored as "Not observed=0", "Insufficient=1" or "Correct/Complete=2". The maximum score from the checklist was 50 points. The increase in the total score indicates that PIVC skill levels of the students are high.

Student satisfaction and self-confidence in learning scale was developed by Jeffries and Rizzolo, and adapted to Turkish by Unver et al. (Jeffries & Rizzolo, 2006; Unver et al., 2017). This scale, which measures students' satisfaction and their self-confidence in learning in a simulation implementation, consists of two parts and 12 items. Student responses for each item were recorded on a five-point Likert-type scale; Strongly Disagree, Disagree, Neutral, Agree and Strongly Agree. It was found that the Cronbach's Alpha value for "Satisfaction with current learning" was 0.85 and Cronbach's Alpha value for "Self-confidence in Learning" was 0.77. Scores range from 1 to 5; 1 is the lowest score and 5 points is the highest and as the total score increases, students' satisfaction and self-confidence in learning increase, as well (Unver et al., 2017).

Simulation design scale in learning was developed by Jeffries and Rizzolo, and adapted to Turkish by Unver et al. (Jeffries & Rizzolo, 2006; Unver et al., 2017). The scale consists of 2 parts. Cronbach Alpha values for the sub-headings ranges from 0.73 to 0.86. Scores range was determined as follows; 1 is the lowest score and 5 point is the highest, and the increase in the total score obtained in the first part indicates that the best simulation design elements are applied in the simulation implementation, while the increase in the total score obtained from the second part shows that the importance that was placed the simulation experience by the students to is high (Unver et al., 2017).

The research was carried out in 3 stages; preparation, implementation and evaluation.

Research design and implementation scheme is shown in Figure 1.

All the students in the second year of the Faculty of Nursing are given the theoretical education about the application of PIC within the Spring Semester syllabus of 2017-2018 academic year by the instructor of the course. Following the theoretical education, the students were provided with demonstration training on PIVC skills.

In the preparation stage of this study, scenarios and information guides for the students and standardized patients were developed and shared.

Two different scenarios were prepared for the simulation implementation and skill performance assessment. In the first scenario, students are required to perform PIVC to 'treat' an adult patient who is admitted to the clinic for treatment, and in the second scenario, students are required to perform PIVC to 'examine' the patient. Standardized patients were taken from the Standardized Patient Program of the Department of Medical Education. Four standardized patients were trained in a 2-hour training session for PIVC application. In this session, the role/responsibilities of standardized patients in the simulation, and the feedback that they are expected to give the students after the practice were clearly explained and necessary information about the scenario was given to the patients.

In the application stage of the research, all of the students included in the research sample filled out the individual information form and the PIVC knowledge pre-test before the training.

After students completed the forms, the research was carried out in 2 stages. In the first stage, all the students in the experimental and control groups were given PIVC training by the researcher, with plastic IV injection arm model, which is a traditional method in skill laboratory. After the training, each student applied the procedures under the supervision of the researcher. After the training, the students were divided into experimental and control groups.

In the second stage of the study, simulation based teaching was performed with full-body mannequin simulator and plastic IV injection arm model. During the prebriefing of the simulation implementation, the purpose of the simulation was explained to the students, the equipment to be used was introduced and the students' questions were answered. The scenario developed for the simulation implementation was shared with the students. In accordance with the scenario, the students were asked to perform the PIVC practice skill within 10 minutes according to the skill checklist and their performance was videotaped. Following the simulation implementation, video recordings were watched and debriefing stage together with the students. The students in the experimental group filled out the Student Satisfaction and Self-confidence in Learning Scale and Simulation Design Scale about the completed simulation experience.

As the last stage of the research, in the assessment stage; skill performances of students were evaluated. Just before the skill assessment, all of the students in the experimental and control group completed the PIVC knowledge posttest. The skill performances of the students in the experimental and control groups were evaluated by hybrid simulation method in Simulated Patient Laboratory. In order to increase the reality of the simulation implementation and reduce the risk of injury, the plastic IV injection arm was fixed to the left arm of the standardized patient. The scenario prepared for the simulation implementation was shared with the students. The students were asked to perform the PIVC procedures within 10 minutes to the plastic IV injection arm simulator, fixed to the left arm of the standardized patient.

Simultaneously, the performances of the students were evaluated by the researcher, using the "Peripheral Intravenous Catheterization Skill Checklist". After the simulation application in which the skill performance evaluations of the students in the experimental and control group were made, video recordings were watched and debriefing stage together with the students.

The data were analyzed by using Statistical Package For Social Science (SPSS) 22.0 software program. In the analysis of the data; in order to analyze students' descriptive characteristics and their levels of satisfaction and self-confidence, numbers, percentages and arithmetic means were used.

In order to evaluate the difference between PIVC knowledge pretest scores of the students in the experimental and control groups, Independent groups t test was used and to evaluate the difference between the PIVC posttest scores and

PIVC skill performance scores Mann-Whitney U test was used.

To conduct the study, written permission was obtained from the institutional ethics committee (reference no. 453-2018) and the faculty where the study was carried out. Verbal and written informed consent were obtained from standardized patients and the students who participated in the study. Permission to use the Turkish version of Student Satisfaction and Self-Confidence in Learning Scale and Simulation Design Scale was obtained from Vesile Unver.

Results

It was found that the majority of the students in the experimental and control groups were female (83.3%) and the mean age of the students in the experimental group was 20.56±0.65 years, control group, it was 20.86±0.72 years.

Table 1. Distribution of PIVC knowledge pre test and posttest scores of experimental and control group students.

	Experimental Group		Control Group		Statistical analysis
	Mean(SD)	Min-Max	Mean(SD)	Min-Max	
PIVC Knowledge Pre test Scores	58.89±14.60	35-85	54.86±14.90	20-80	t= 1.159 p= .251
PIVC Knowledge Post test Scores	78.19±15.68	30-100	71.11±16.13	40-90	Z= -1.771 p= .076
Hybrit Simulation PIVC skill Scores	44.47±3.72	35-50	32.47±5.55	20-44	Z= -6.799 p< .001

t=Independent Groups t test, Z= Mann-Whitney U test

Table 2. Distribution of in-group PIVC knowledge pre test and post test scores of experimental and control group students.

	PIVC Knowledge Pre test Scores		PIVC Knowledge Post test Scores		Statistical Analysis
	Mean(SD)	Min-Max	Mean(SD)	Min-Max	
Experimental Group	58.89±14.60	35-85	78.19±15.68	30-100	Z*= -4.280 p< .001
Control Group	54.86±14.90	20-80	71.11±16.13	40-90	Z*= -4.303 p< .001

Z*= Wilcoxon Signed Ranks Test

Table 3. Simulation design scale of the students in the experimental group, distribution of mean scores of student satisfaction and self-confidence scale in learning.

	Mean(SD)	Min-Max
Simulation Design Scale		
Best Design Elements	4.39±0.33	3-5
-Objectives and information	4.51±0.40	3-5
-Support	4.48±0.43	3-5
-Problem - Solving	4.13±0.58	2-5
-Feedback/Guided Reflection	4.60±0.38	3-5
- Fidelity (realism)	4.15±0.70	2-5
Importance for the student	4.56±0.31	3-5
-Objectives and information	4.57±0.34	4-5
-Support	4.62±0.34	3-5
-Problem - Solving	4.44±0.39	3-5

-Feedback/Guided Reflection	4.69±0.41	3-5
- Fidelity (realism)	4.46±0.59	3-5
Student Satisfaction and Self-confidence in Learning Scale	4.33±0.42	3-5
Student satisfaction	4.49±0.49	3-5
Self-Confidence	4.22±0.44	3-5

No statistically significant difference was found between the pre-test and post-test knowledge scores of the students in the experimental and control groups (p> .05) (Table 1). However, the PIVC post-test knowledge scores of the students in the experimental and of those in the control group were found to be significantly higher than the pre-test knowledge scores (p <.001) (Table 2).

The skill performances of both groups were evaluated by using hybrid simulation application. It was found that there was a significant difference between the PIVC skill performance scores of the students in the experimental and control groups (p <0.001) (Table 1).

“Simulation Design Scale” mean scores of the students in the experimental group are given in Table 4. The average score of the section of the scale on “The Best Design Elements” was found 4.39±0.33 and the average score of the section on “Its Importance for Student” was found 4.56±0.31. “Student Satisfaction and Self-Confidence in Learning Scale” total item score average was founded 4.33±0.42 in the simulation implementation.

Discussion

In this current study, no statistically significant difference was found between the pretest and posttest scores of the PIVC knowledge of the experimental and control group students. On the other hand, the mean posttest knowledge scores of the students in both experimental and control group were found to be significantly higher than their pretest knowledge scores (p <0.001) (Table 2). Similarly, although Gunay and Zaybak (2018), in their study, reported that there was no statistically significant difference between pretest and posttest knowledge scores of the participants, the posttest scores were found high, and in another study carried out by Garner et al. (2018), it was found that simulation training increased the PIVC knowledge score. Therefore, both traditional and simulation based education in developing their PIVC skills increases the PIVC knowledge scores of the students. Significant increase in PİK knowledge levels of both experimental and control groups after the trainings, it is thought that the students' skills training on theoretical knowledge reinforces the subject and provides a better understanding of the subject.

As a result of the research, it was found that there was a significant difference between the PIVC skill performance scores of the experimental group and those of the control group (p <0.001) (Table 1). When the literature is reviewed, it is seen that there are similar studies comparing traditional education and simulation method in developing PIVC skill. In some studies, it was reported that the participants who received simulation training had higher PIVC skill performance scores than those who received traditional training (Gunay & Zaybak, 2018; Wilfong et al., 2011). Simulation method has also been used in psychomotor skill trainings of nursing students in addition to PIVC training. As a result of studies on improving skills of nursing students in urinary catheterization, taking a blood sample, subcutaneous injection application and arterial blood pressure measurement, skill performance scores of the experimental group receiving simulation training were found to be higher than those of the control group receiving traditional method (Sarmasoglu, Dinc & Elcin, 2016a; Vidal et al., 2013; Yoo, Yoo & Son, 2002). The debriefing stage of the simulation implementation is an activity in which participants' skill performances are discussed and reflective thoughts are encouraged. Learning can be achieved during simulation training, but it is reported that an efficient learning is achieved through feedbacks provided in the debriefing stage (Fanning & Gaba, 2007; Tuzer, Dinc & Elcin, 2017). Therefore, in our study, providing each student with feedback about the procedures that they did well and need to develop, in the debriefing stage of the video recordings of the simulation practice, which they perfomed independently, is considered to be effective in the development of PIVC skills of the students.

In a study carried out by Levett-Jones and Lapkin (2014), it is reported that video assisted feedback improves knowledge and skill performance, and considered that providing video assisted feedback is the gold standard in the debriefing stage, which is a significant component of simulation.

The results of the study shows that the simulation design scale scores of the students that receive simulation training are quite high and the highest mean score belongs to the feedback subscale (Table 3). This suggests that it is important for the students to analyze the video recordings of the practices with the researcher in the debriefing stage and to receive feedback about their performances. As a result of the research, the satisfaction and self-confidence scores of the students in the experimental group were found to be high. In the literature, there are several studies indicating that such similar simulation training methods increase the self-confidence and satisfaction levels of nursing students (Bambini, Washburn & Perkins, 2009; Bearnson & Wiker, 2005; Goldenberg, Andrusyszyn & Iwasiw, 2005; Karaoz, 2003; Lubbers & Rossman, 2016; Schoening, Sittner & Todd 2006). In the study carried out by Bremner et al. (2006), it was found that 61% of the students who received simulation training increased their self-confidence in their physical examination skills. In another study investigating the self-confidence levels of the students who received simulation training and traditional education, self-confidence levels of the students in the experimental group who received simulation education were found to be significantly higher (Thomas & Mackey, 2012). In this respect, it is suggested that simulation education will be effective in preparing nursing students for the clinic and will develop their self-confidence by improving their nursing practice skills.

Conclusions: As a result of this study, it was found that simulation based teaching was effective in developing peripheral intravenous catheterization skills of students. In addition, it was also found that the simulation method not only improves the psychomotor skills of the students but also increases their knowledge and self-confidence levels.

Acknowledgments: The authors would like to thank all nursing students who participated in this study.

The name and the postal address of the place where the work was carried out: Ege University Faculty of Nursing, Bornova, Izmir zip code: 35100

References

Ahn, H., & Kim, H.Y. (2015). Implementation and outcome evaluation of high-fidelity simulation scenarios to integrate cognitive and psychomotor skills for Korean nursing students. Nurse Educ Today, 35(5): 706-11.

Akca Ay, F. (2016).Medication applications. In: Akca Ay, F. (Editor) Basic Nursing Frames, Principles, Applications.Medical Publishing, Istanbul, Turkey, 485-545.

Alinier, G. (2003). Nursing students' and lecturers' perspectives of objective structured clinical examination incorporating simulation. Nurse Educ Today, 23: 419-26.

Alinier, G.A. (2007). A typology of educationally focused medical simulation tools. Medical Teacher, 29(8): 243-50.

Bambini, D., Washburn, J. & Perkins, R. (2009). Outcomes of clinical simulation for novice nursing students: Communication, confidence, clinical judgment. Nursing Education Research, 30(2): 79-82.

Baxter, P., Akhtar-Danesh, N., Valaitis, R., Stanyon, W. & Sproul, S. (2009). Simulated experiences: Nursing students share their perspectives. Nurse Educ Today, 29(8): 859-66.

Bayar, K., Cadir, G. & Bayar, B. (2009).Nurses at the age of clinical practice will not be able to think and think about clinical patterns. TAF Preventive Medicine Bulletin, 8 (1): 38-42.

Bearnson, C.S. & Wiker, K.M. (2005). Human patient simulators: A new face in baccalaureate nursing education at brigham young university. Journal Nurs Educ., 44(9): 421-5.

Bradley, P. (2006). The history of simulation in medical education and possible future directions. Med Educ., 40(3): 254-62.

Bremner, M.N., Aduddell, K., Bennett, D.N. & VanGeest, J.B. (2006). The use of human patient simulator: Best practices with novice nursing students. Nurse Educator, 31(4): 170-4.

Cant, R.P. & Cooper, S.J. (2010). Simulation-based learning in nurse education: systematic review. Journal of Advanced Nursing, 66(1): 3–15.

Castanelli, D.J. (2009). The rise of simulation in technical skills teaching and the implications for training novices in anaesthesia. Anaesthesia and Intensive Care, 37(6): 903–10.

Fanning, R.M. & Gaba, D.M. (2007). The role of debriefing in simulation-based learning. Simulation Healthcare, 2(2): 115-25.

Feng, X., Bobay, K. & Weiss, M. (2008). Patient safety culture in nursing: A dimensional concept analysis. Journal of Advanced Nursing, 63(3): 310-9.

Garner, S.L., Prater, L.S., Raj, L., Leena, G.V. & Anitha, A.J.J. (2018). Effectiveness of peripheral ıntravenous skill continuing education using low-fidelity simulation among nurses in ındia. J Contin Educ Nurs., 49(6): 255-61.

Goldenberg, D., Andrusyszyn, M.A. & Iwasiw, C. (2005). The effect of classroom simulation on nursing students'selfefficacy related to health teaching. Journal Nurs Educ., 44(7): 310-4.

Gunay, İ.E. & Zaybak, A. (2018). Comparison of the effectiveness of a virtual simulator with a plastic arm model in teaching ıntravenous catheter ınsertion skills. Comput Inform Nurs., 36(2): 98-105.

Hiton, P. & Pollard, C. (2004). Supporting clinical skills developments. Nursing Standard, 18(25): 31-6.

Houghton, C.E., Casey, D., Shaw, D. & Murphy, K. (2013). Students' experiences of implementing clinical skills in the real world of practice. J Clin Nurs., 22(13-14): 1961-9.

Houghton, C.E., Casey, D., Shaw, D. & Murphy, K. (2012). Staff and students' perceptions and experiences of teaching and assessment in Clinical Skills Laboratories: interview findings from a multiple case study. Nurse Educ Today, 32(6): 29-34.

Jeffries, P.R., Rizzolo, M.A. (2006). Designing and ımplementing models for the ınnovative use of simulation to teach nursing care of ıll adults and children: a national, multi-site, multi-method study.

Karaoz, S. (2003). An overview of clinical teaching in nursing and recommendations for effective clinical teaching. HEMAR-G, 1: 15-21.

Khorshid, L., Eşer, İ., Sarı, D., Zaybak, A., Yapucu, U. & Gurol, G. (2002). Examination of fear symptoms and signs related to performing invasive and non-invasive procedures in nursing students. Journal of Anatolia Nursing and Health Sciences, 5 (2): 1-10.

Levett-Jones, T. & Lapkin, S.A. (2014). A systematic review of the effectiveness of simulation debriefing in health professional education. Nurse Education Today, 34(6): 58-63.

Lubbers, J. & Rossman, C. (2016). The effects of pediatric community simulation experience on the self-confidence and satisfaction of baccalaureate nursing students: A quasi-experimental study. Nurse Educ Today, 39: 93-8.

McAllister, M., Levett-Jones, T., Downer, T., Harrison, P., Harvey, T., Reid-Searl, K., Lynch, K., Arthur, C., Layh, J. & Calleja, P. (2013). Snapshots of simulation: creative strategies used by Australian educators to enhance simulation learning experiences for nursing students. Nurse Education in Practice, 13(6): 567-72.

McGraw, R.C. & O'connor, H.M. (1999). Standardized patients in the early acquisition of clinical skills. Medical Education, 33(8): 572-8.

Morgan, R. (2006). Using clinical skills laboratories to promote theory-practice integration during first practice placement: an Irish perspective. J Clin Nurs., 15(2): 155-61.

Nasco Medikal. Adult venipuncture and injection training arm model. https://www.enasco.com/p/LF00698 Erisim Tarihi: 10.02.2019

Nehring, W.M. & Lashley, F.R. (2009). Nursing simulation: A review of the past 40 years. Simulation & Gaming, 40(4): 528-52.

Ozturk, D. & Dinc, L. (2014). Effect of web-based education on nursing students' urinary catheterization knowledge and skills. Nurse Educ Today, 34(5): 802-8.

Potter, A., Perry, G., Stockert, A., Hall, M. (2013). Fundamentals of nursing. 8nd Ed. Canada: Mosby, an Imprint of Elsevier Inc.

Rhodes, L.M. & Curran, C. (2005). Use of the human patient simulator to teach clinical judgment skills in a baccalaureate nursing program. Computer Informatics Nursing, 23(5): 256-62.

Richardson, L., Resick, L., Leonardo, M. & Pearsall, C. (2009). Undergraduate students as standardized patients to assess advanced practice nursing student competencies. Nurse Educator, 34(1): 12-6.

Robinson, B.K. & Dearmon, V. (2013). Evidence-based nursing education: effective use of instructional design and simulated learning environments to enhance knowledge transfer in undergraduate nursing students. J Prof Nurs., 29(4): 203-9.

Ross, J.G. (2012). Simulation and psychomotor skill acquisition: A review of the literature. Clinical Simulation in Nursing, 8(9): 429-35.

Salyers, V.L. (2007). Teaching psychomotor skills to beginning nursing students using a web-enhanced approach: a quasi-experimental study. International Journal of Nursing Education Scholarship, 4(1): 23-9.

Sarmasoglu, S., Dinc, L. & Elcin, M. (2016a). Using standardized patients in nursing education: Effects on students' psychomotor skill development. Nurse Educator, 41(2): 1-5.

Sarmasoglu, S., Dinc, L. & Elcin, M. (2016b). Nursing students' views on standard patients and models used in clinical skills training. HEAD, 13 (2): 107-15.

Schoening, A.M., Sittner, A.J. & Todd, M.J. (2006). Simulated clinical experience; nursing students' perceptions and educators' role. Nurse Educator, 31(6): 253-8.

Silverman, J. & Wood, D.F. (2004). New approaches to learning clinical skills. Med Educ., 38(10): 1021-23.

Strand, I., Nåden, D. & Slettebø, Å. (2009). Students learning in a skills laboratory. Vård i Norden, 29(3): 18-22.

Terzioglu, F. & Boztepe, H. (2013). Hemşirelik egitiminde beceri degerlendirme. Journal of Anatolia Nursing and Health Sciences, 16(1): 57–64.

Terzioglu, F., Kapucu, S., Ozdemir, L., Boztepe, H., Duygulu, S., Tuna, Z. & Akdemir, N. (2012). Views of nursing students about the simulation method. Hacettepe University Faculty of Nursing Journal, 19 (1): 16-23.

Terzioglu, F., Yucel, C., Koc, G., Simsek, S., Yasar, B.N., Sahan, F.U., Akin, R., Ocal, S.E., Akdag, C., Elcin, M., Mert, M. & Yildirim, S. (2016). A new strategy in nursing education: From hybrid simulation to clinical practice. Nurse Education Today, 39: 104-8.

Thomas, C. & Mackey, E. (2012). Influence of a clinical simulation elective on baccalaureate nursing student clinical confidence. J Nurs Educ, 51(4): 236-9.

Tuzer, H., Dinc, L. & Elcin, M. (2017). Importance of analysis process in nursing undergraduate education simulation applications. Turkey Clinical J Pediatr Nurs-Special Topics, 3 (1): 23-7.

Unver, V., Basak, T., Watts, P., Gaioso, V., Moss, J., Tastan, S., Iyigun, E. & Tosun, N. (2017). The reliability and validity of three questionnaires: the student satisfaction and self-confidence in learning scale, simulation design scale, and educational practices questionnaire. Contemp Nurse, 53(1): 60-74.

Uzun, S. (2013). Intravenous fluid therapy. In: Aştı, A. & Karadag, A. (Editors) Nursing Principles Nursing Science and Art. Akademi Basim, Istanbul, Turkey, 818-51.

Vidal, V.L., Ohaeri, B.M., John, P. & Helen, D. (2013). Virtual reality and the traditional method for phlebotomy training among college of nursing students in Kuwait: Implications for nursing education and practice. J Infus Nurs., 36(5): 349-55.

Wilfong, D.N., Falsetti, D.J., McKinnon, J.L., Daniel, L.H. & Wan, Q.C. (2011). The effects of virtual intravenous and patient simulator training compared to the traditional approach of teaching nurses: a research project on peripheral IV catheter insertion. Journal of Infusion Nursing, 34(1): 55-62.

Wilford, A. & Doyle, T.J. (2006). Integrating simulation training into the nursing curriculum. British J Nurs., 15(17): 926-30.

Yoo, M.S., Yoo, I.Y. & Son, Y.J. (2002). The effectiveness of standardized patient managed instruction in teaching foley catheterization skills, communication skills and learning motivation. Journal of Korean Academy of Fundamentals of Nursing, 9(1): 66-75.