Safe Drug Administration in Pediatric Nursing Education: A Quasi-Experimental Design Study

Pediatri Hemşireliği Eğitiminde Güvenli İlaç Uygulaması: Yarı-Deneysel Tasarım Bir Çalışma

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ABSTRACT

Objective: This study was carried out to determine the correlation between the performance of students who received simulation-based pediatric nursing education and their self-confidence regarding safe drug administrations during simulation.

Methods: The study was conducted in pretest and posttest quasi-experimental design and carried out on a sample group (n = 39) based on criteria established at the Nursing Department of a foundation university. Students were subjected to a simulation of "Drug Management in Children" within the scope of the pediatric nursing course. The researchers collected data through a checklist, a self-confidence scale, and tests (pretest and posttest) used in the simulation application on "Drug Management in Children."

Results: The students obtained a mean score of 129.00 ± 14.36 on the self-confidence scale. The posttest scores of the students were statistically significantly higher than the pretest scores (P = .011). The performance mean score of the students from the simulation checklist for safe drug administrations was 36.28 ± 6.65. There was no statistically significant correlation between the scores from the self-confidence scale, the pretest, the posttest, and the checklist scores (P > .05).

Conclusion: This study underlines the importance of having a suitable level of self-confidence for students' educational gains and also indicated that there was no correlation between self-confidence and performance.

Keywords: Safe drug, self-confidence, pediatric nursing, simulation

ÖZ

Amaç: Bu çalışma simülasyon temelli pediatri hemşireliği eğitimi alan öğrencilerin; simülasyon sırasındaki güvenli ilaç uygulamalarına ilişkin performansları ile özgüvenleri arasındaki ilişkinin saptanması amacıyla yapıldı.

Yöntemler: Araştırma yarı deneysel ön test ve son test tasarımda bir vakıf üniversitesinin Hemşirelik Bölümü'nde kriterleri belirlenen örneklem grubunda (n = 39) yapıldı. Öğrencilere pediatri hemşireliği dersi kapsamında bir "Çocuklarda İlaç Yönetimi" konulu simülasyon uygulandı. Veriler, "Çocuklarda İlaç Yönetimi" konulu simülasyon uygulamasında kullanılan kontrol listesi, özgüven ölçeği ve testler (ön test, son test) kullanılarak toplandı.

Bulgular: Öğrencilerin özgüven ölçeği puan ortalaması 129,00 ± 14,36'dır. Öğrencilerin son test puanları, ön test puanlarından istatistiksel olarak anlamlı düzeyde yüksek saptandı (P = .011). Öğrencilerin güvenli ilaç uygulamalarına ilişkin simülasyon uygulaması kontrol listesinden aldıkları performans puan ortalaması 36,28 ± 6,65'dir. Özgüven ölçeği, ön-test, son-test ve kontrol listesi puanları arasında istatistiksel olarak anlamlı bir ilişki saptanmadı (P > ,05).

Sonuç: Bu çalışma öğrencilerin eğitim kazanımları için uygun düzey özgüvenin önemli olduğunu vurgulamaktadır. Ayrıca özgüven ve performans arasında bir ilişki olmadığını göstermektedir.

Anahtar Kelimeler: Güvenli ilaç, özgüven, pediatri hemşireliği, simülasyon

INTRODUCTION

Self-confidence is a crucial factor of the learning process since students learn when they feel safe.[1,2] Self-confidence is a subjective concept that arises through self-assessment.[3] There are several definitions of this concept in the literature. Feltz[4] defined self-confidence as an "individual's belief that he can successfully execute a specific activity rather than a global trait, and individual's trust to his own judgment, ability, strength and decisions." Bandura,[5] a prominent theoretician, states that self-confidence is an individual's judgment of feeling himself valuable. In general, self-confidence may be described by an individual's awareness of his own competences and feelings of self-satisfaction.[6]

A nursing student's self-confidence in developing their skills is influenced by the learning environment, teaching method, and ability for self-reflection.[7] Therefore, it is crucial for students to learn critical patient safety issues primarily in a safe care setting. Simulation, an effective teaching technique, provides realistic clinical circumstances that allow learners to learn and practice in a safe setting.[8] Many studies have reported that when simulations are run according to standards, they contribute to learning and raise self-confidence.[9-13] Self-confidence is a significant concept in both the educational and professional lives of healthcare professionals.[6,14] The literature indicated that self-confidence is the determining factor that affects students' low or high academic motivation.[15] Studies have also indicated that self-confidence has a positive effect on many variables related to education, such as healthy behavior change, academic achievement, and self-regulation.[16-20] Most of these studies suggest that self-confidence is a significant predictor of learning and success.[15] It is very important that a student sees herself as sufficient in order to overcome her deficiencies in a subject, whether she is aware of her needs and her self-confidence during this application. In a study, it was emphasized that self-confidence is closely associated with one's feeling of agency, and when confidence and competence are incoherent, problems may arise.[21] When this is exemplified, it is reported that a healthcare professional lacking self-confidence may hesitate to make a decision when necessary, while an overconfident healthcare professional may be insensitive or blind to the consequences of his actions, both of which may harm the patient.[21]

This study, which was planned based on the importance of this concept, was grounded on safe drug administration, a critical implementation of health care practices in pediatric nursing. It was aimed to identify the self-confidence of the students during their pediatric nursing education and to determine the correlation between their self-confidence and their performance about safe drug administrations during the simulation.

Research Questions

1. What is the students' level of self-confidence before the application?
2. What is the students' level of knowledge on pediatric safe drug administrations?
3. How are the students' performances during the simulation of pediatric safe drug administrations?
4. Is there a correlation between self-confidence, knowledge of pediatric safe drug administration, and practice performance during the simulation?

METHODS

Research Design
The study was planned with pretest and posttest quasi-experimental design.

Setting
The study was conducted in the Nursing Department of a foundation university. The university has a simulation center that has NASCE, SSIH accreditation, as well as the designation of "Center of Excellence" awarded by CAE. Simulation is included at various rates in all of the practices of courses of nursing departments in the 4-year curriculum of nursing education. The study was conducted during the spring semester of the second year of the Pediatric Nursing course.

Sample
The students, who were second year of bachelor nursing students at the time of the study, took the Pediatric Nursing course in the curriculum, attended the theoretical course and laboratory practice on "safe drug administrations" under the course before simulation, and then became actively involved in the simulation application on "Drug Management in Children," were included in the study. Pediatric drug applications are risky and critical applications for both the patient and the student. For this reason, it is essential to experience a safe care environment during training. Since the simulation is also included in the literature where it prepares a safe care environment for the participants,[22-24] it is ensured that all students get this experience with the simulation. For this reason, all participants in the study were included in a single experimental group without the control group.

The number of 2nd-year nursing students was 67 and 39 of them who met these criteria were included in the study.

Data Collection
The researchers collected data through a checklist, a self-confidence scale, and tests (pretest and posttest) used in the simulation on "Drug Management in Children." The data collection process is shown in the study flow diagram (Figure 1).

Simulation Application on "Drug Management in Children"
First and foremost, the instructor of the Department of Pediatric Nursing designed the scenario for the simulation practice. Following expert feedback on the designed scenario and the evaluation tools (prepost test and checklist) to be used with the scenario, a pilot study was conducted on a similar group suitable for the designated level. After necessary revisions were made, it was included in the curriculum. Effective communication with team members, children, and family, evaluating the treatment plan and administering drugs safely, material and waste management, and recording the practices are the learning outcomes of the scenario. The literature on the scenario was shared with the students prior to the scenario to allow them to make their cognitive preparations, and the lecture notes were delivered to them for review. The students were informed on the day of the scenario that their practices would be recorded, the records would be utilized scientifically, and their verbal and written consent would be acquired. All students were subjected to a pretest consisting of 10 questions regarding drug management in children and the "Self-Confidence Scale" before the simulation practice. Following that, the students were divided into groups of 2, and each group
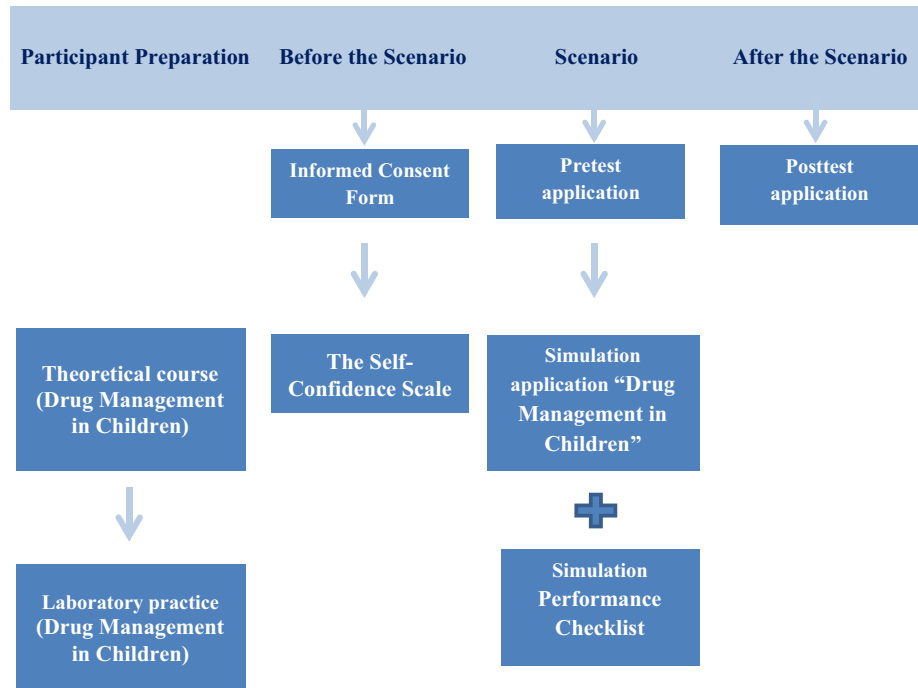
Figure 1. Study flow.

was allowed a short free time to orient themselves following the preliminary briefing. The reason why each group consisted of 2 students was because there was a learning outcome of effective communication with team members, in pediatric safe drug administration in the simulation. The groups were then entered into the simulation practice in order. Two intermediate simulators, an infant and a child, a professional actor playing a clinical nurse as a facilitator, and a moderator to chair the scenario were included in the scenario. The instructor, who also acted as moderator, evaluated the performances of the students during the implementation of the scenario in accordance with the checklist for the learning outcomes of the scenario. The other instructor who served in the course, regardless of the moderator, watched the videos of simulation practices at different times and evaluated the performance of the students using the checklist. Statistically significant and high levels of agreement were found among the observers in terms of checklist total and subdimension proficiency percentages ($P < .01$). Since there was a high level of agreement among the observers, the following analyzes were continued with the results of the first observer who observed the students during the simulation.

After the scenario, the students were taken to the debriefing session under the guidance of the moderator. In the simulation practices, the scenario took 10 minutes, and the debriefing took 30 minutes for each group. After the debriefing session, the students were asked to answer the posttest and the practice ended.

Self-Confidence Scale
The self-confidence scale was developed by Akın.[15] The total number of items on the scale is 33. The scale consists of 2 subscales. The "inner self-confidence," which evaluates traits such as self-love, self-acquaintance, setting clear goals, possessing positive thinking skills, and knowing one's strengths and weaknesses, and the "outer self-confidence" subscale includes traits, such as the ability to communicate easily, express himself in a healthy way,

control emotions, and take risks. The scale is a Likert type, scored ranging from 1 to 5 ("1" never, "2" rarely, "3" frequently, "4" generally, and "5" always). The highest and lowest scores of the scale are 165 and 33, respectively. Higher scores signify a high level of self-confidence. The internal consistency coefficients of the self-confidence scale were 0.83 for the overall scale, and 0.83 and 0.85 for inner and outer self-confidence subscales, respectively. In this study, Cronbach's alpha value was 0.94 for the overall scale and 0.89 and 0.88, respectively, for inner and outer self-confidence subscales.[15]

Tests
The pretest and posttest both included the same questions. It comprises a total of 12 questions, 3 of which are multiple-choice, one of which is open-ended, and 8 of which are true-false questions based on 8 correct principles in drug administration. It took 10 minutes for students to respond to answers. Students were asked to respond to the pretest before beginning the simulation application and the posttest following the debriefing session.

Checklist
The checklist consists of a total of 17 items based on 8 correct principles in drug administrations, including the objectives of the simulation scenario. The students' performances during the simulation were monitored, and the items were rated and marked as "1. needs improvement, 2. Sufficient, 3. Mastered, and 4. Not Observed." Maximum total score of this checklist is 51 points. The distribution of the percentages of proficiency in the subdimension and the total of the checklist was calculated and included in the analysis. The Cronbach's alpha internal consistency coefficient obtained in the study for the checklist was determined as 0.845.

Statistical Analysis
While assessing the findings of the study, the IBM Statistical Package for the Social Sciences Statistics 22 (IBM SPSS Corp.,

Armonk, NY, USA) software was used for statistical analysis. Descriptive statistical methods (mean, SD, frequency, and percentage) were used to analyze the data, and the Wilcoxon signed-rank test was used to assess quantitative data that did not exhibit a normal distribution in the pretest and posttest. Results were accepted at 95% CI, significance level of $P < .05$, and advanced significance level of $P < .01$ and $P < .001$.

Ethical Considerations

The study was started after obtaining the Acıbadem University Ethics Committee approval from the scientific research evaluation committee (decision no. ATADEK-2018/19, dated December 6, 2018) and institutional permission. At the beginning of the study, the "Informed Consent Form" was used to obtain consent from the students included in the sample. Permission to use the scale was obtained from the authors who conducted the Turkish validity and reliability of the scale.

RESULTS

The study was conducted with a total of 39 students; 84.6% (n = 33) of the participants were females and 15.4 % (n = 6) were males. The students' ages ranged from 19 to 33 years, and they had a mean age of 20.59 ± 2.28 years.

The mean score of the students in the inner self-confidence subscale was 66.49 ± 7.50, and their mean score in outer self-confidence subscale was 62.51 ± 7.89. The total scores of the students on the self-confidence scale ranged from 98 to 157 and had a mean age of 129.00 ± 14.36. The Cronbach's alpha internal consistency coefficient was 0.901 for the overall scale (Table 1).

The pretest mean scores of the students were 76.77 ± 13.66, and their posttest mean score was 83.41 ± 10.36. The posttest scores of the students were statistically significantly higher than their pretest scores ($P = .011$; $P < .05$) (Table 2).

Table 3 shows the distribution of students' checklist performance scores.

Accordingly, it was found that the total mean scores of the students in communicating effectively with team members, children,

and family were 48.72 ± 26.87 and 87.2% of them (n = 24) needed to be improved in the practice of "explaining the procedure and providing information to the child and his family based on the child's developmental period."

When examining the students' goal of evaluating the treatment plan and performing safe drug administrations, their mean score was 72.37 ± 26.72. Within the scope of this goal, it was found that for the majority of students, the practices to need improvement were "calculating the administration dosage based on the request" and "preparing the medicine in the correct dosage" at the rate of 59% (n = 23). However, 56.4 % (n = 22) of them needed to improve their practices in the step of "assessing the effect of the drug."

When examining the students' goal of realizing material and waste management and taking infection control measures, their mean score was found to be 62.31 ± 23.11. It was found that 87.2% of them (n = 34) needed to be improved in the practice of "selecting and writing the appropriate drug label." When examining the students' goal of registering the practices realized, their mean score was found to be 10.26 ± 30.74, and 89.7% of them (n = 35) needed to be improved in the practice of "recording the practices realized." The mean score for the overall checklist was 62.97 ± 19.46, and Cronbach's alpha internal consistency coefficient was 0.845 (Table 3). The checklist total and subscale competency percentages had statistically significant and high levels of coherence among the observers (Intraclass correlation coefficient (ICC): 0.571-0.974; $P < .05$).

There was no statistically significant correlation between the self-confidence scale, pretest, posttest, and checklist scores ($P > .05$) (Table 4).

DISCUSSION

The study was conducted to identify the self-confidence of the students, as well as to determine the correlation between their self-confidence and their performance about safe drug administrations during the simulation. In the study it was determined that the students' mean scores of inner and outer self-confidence subscales and total mean scores were high, but there was no overconfidence. Self-confidence is an important trait that can affect the activities and learning of the individual, as well as many factors in the life of the individual.[21] Overconfidence can result in missed learning opportunities and lower sensitivity to feedback, while a lack of self-confidence can lead to spend excessive time on already-known information. For safe clinical practice, an appropriate level of self-confidence is essential.[21] Hoops et al[25] emphasize that one's level of self-confidence might affect the willingness to undertake a task or seek help. From this standpoint, it can be asserted that students have the self-confidence to positively promote their learning. Results of the present study determined that the posttest mean scores of the students were higher than the pretest mean scores, and the posttest scores were statistically significantly higher than the pretest scores ($P = .011$; $P < .05$) (Table 2).

When the student is more self-confident, the simulation teaching setting can be successful.[26] Bandura[5] indicates that one of the psychological structures that affect students' academic performance is self-confidence. Arkes and Garske[27] stated that self-confidence was the determining factor that influences students'

Table 1. Distribution of Subscale and Total Scores (n = 39) from Self-Confidence Scale

Self-Confidence Scale	Minimum–Maximum	Mean ± SD (Median)	Cronbach's Alpha
Inner self-confidence	52-81	66.49 ± 7.50 (67)	0.818
Outer self-confidence	43-76	62.51 ± 7.89 (65)	0.843
Total	98-157	129.00 ± 14.36 (131)	0.901

Table 2. Evaluation of the Students' Pretest and Posttest Results (n = 39)

	Pretest	Posttest	Z	P
Minimum–maximum	40-100	59-100	−2.585	.011*
Mean ± SD (median)	76.77 ± 13.66 (77)	83.41 ± 10.36 (85)		

*$P < .05$.
Z, Wilcoxon signed-rank test.

Table 3. Distribution of Students' Checklist Performance Scores (n = 39)

Scenario Learning Outputs and Practices	Needs improvement n (%)	Sufficient n (%)	Mastered n (%)	Not Observed n (%)	Min-Max	Mean±SD
Communicates effectively with team members, child and family.					0.00-100.00	48.72 ± 26.87
Establishing an effective communication with the team	6 (15.4)	22 (56.4)	11 (28.2)	-		
Explaining the procedure and providing information to the child and his family based on the child's developmental period	34 (87.2)	4 (10.3)	1 (2.6)	-		
Evaluates the treatment plan and performs safe drug administrations.					11.11-100.00	72.37 ± 26.72
Checking the medication request	4 (10.3)	-	35 (89.7)	-		
Comparing the safe dosage range of the drug with the medication request, deciding whether or not it is a safe dosage	8 (20.5)	-	31 (79.5)	-		
Comparing the drug form with the medication request	3 (7.7)	-	36 (92.3)	-		
Calculating the administration dosage based on the request	23 (59)	-	16 (41)	-		
Preparing the medicine in the correct dosage	23 (59)	-	16 (41)	-		
Verifying the child's identity	6 (15.4)	-	33 (84.6)	-		
Administering the drug at the correct time	-	-	38 (97.4)	1 (2.6)		
Administering the drug in the proper method	7 (17.9)	1 (2.6)	30 (76.9)	1 (2.6)		
Assessing the effect of the drug	22 (56.4)	1 (2.6)	15 (38.5)	1 (2.6)		
Realizes material and waste management and takes infection control measures.					20.00-100.00	62.31 ± 23.11
Following aseptic procedures and managing waste while preparing drugs	5 (12.8)	10 (25.6)	24 (61.5)	-		
Preparing adequate and appropriate materials for drug administration	14 (35.9)	9 (23.1)	16 (41)	-		
Selecting and writing the appropriate drug label	34 (87.2)	1 (2.6)	4 (10.3)	-		
Following aseptic procedures in drug administration	7 (17.9)	17 (43.6)	14 (35.9)	1 (2.6)		
Washing hands and managing waste	13 (33.3)	15 (38.5)	11 (28.2)	-		
Records the practices followed					0.00-100.00	10.26 ± 30.74
Registers the practice realized	35 (89.7)	-	4 (10.3)	-		
Checklist Total					23.53-94.12	62.97 ± 19.46

academic motivation, regardless of being high or low. Successful students are those who have a high level of self-confidence and anticipate accomplishing academically successful outcomes. Also, most of these studies have suggested that self-confidence is a significant predictor of learning and success.[15] The studies have proven that assessment of self-confidence has a positive effect on many variables related to education, such as healthy behavioral change, academic achievement, and self-regulation.[28-30]

A study that examined how self-confidence was associated with performance reported that trust and doubt were at 2 ends of the scale and both were needed, and self-confidence was closely associated with one's sense of agency.[31] Another study states how self-confidence affects speech, which may then direct the action.[21] Self-confidence is also necessary for establishing therapeutic relationships.[32] When looking at the students' performances during the simulation from this perspective, it was observed that they have critical performances that need to be improved in all 4 goals of the scenario. These were determined as *"explaining the procedure and providing information to the child and his family based on the child's developmental period,"*

"calculating the administration dosage based on the request," "preparing the medicine in the correct dosage," "assessing the effect of the drug," "selecting and writing the appropriate drug label," and *"registering the practice realized"* (Table 3). When the literature is reviewed for these critical performances, it is seen that there are similar mistakes.[33-35]

Wolf et al[36] reported that 17.1% of student nurses made a mistake in dosage/quantity. In their study, Ayık et al[37] reported that the majority of the students administered drugs that were prepared by someone else to the patient at least once or more. In their study, Aştı and Kıvanç[38] questioned the problems frequently encountered in the oral administration of drugs and concluded that these problems were the failure of administration at the right time, in the correct dosage, and to the correct patient. Ayık et al[37] indicated that nearly half of the nursing students who participated in the study administered drugs to the patient without any explanation at least once or more. According to a study conducted by Marvanova and Henkel[39] for the teaching of preventable medication errors in undergraduate nursing education, the most common mistake made by students was incorrect drug administration due to failure to

Table 4. Correlation Assessment of Self-Confidence Scale, Pre-and Post-Test and Checklist Scores

Checklist	Pre-test		Post-test		Inner self-confidence		Outer self-confidence		Total Self-Confidence	
	r	P	r	P	r	P	r	P	r	P
Subscale 1 (Effective Communication)	0.178	.278	-0.259	.111	-0.155	.345	-0.135	.413	-0.155	.347
Subscale 2 (Safe Drug Administrations)	0.134	.415	-0.066	.689	0.171	.298	0.038	.816	0.076	.644
Subscale 3 (Material, waste management, infection control)	-0.085	.606	-0.144	.381	0.062	.708	0.132	.423	0.092	.577
Subscale 4 (Registration)	-0.158	.337	-0.113	.493	-0.267	.101	-0.214	.190	-0.289	.074
Total control	0.055	.741	-0.113	.492	0.139	.397	0.043	.793	0.065	.694
Pre-test					0.267	.100	0.221	.175	0.239	.144
Post-test					0.312	.052	0.304	.060	0.306	.058

r, Spearman's Rho Correlation Analysis

appraise the interaction and an incorrect abbreviation in the patient chart. In a study, it was reported that a common source of medication error for pediatric patients was especially from mathematical calculations,[40] and it was stated that students often had difficulty in applying appropriate formulas to calculate correct dosages.[41]

Calculation errors in drug doses in nursing students are generally associated with low self-confidence and high anxiety.[42,43] The study by Mackie and Bruce[44] reported the reasons for the main difficulties in dose calculations as conceptual deficiencies, low self-confidence, and anxiety. In this study, there was no statistically significant correlation between the self-confidence scale, pretest, posttest, and checklist scores ($P > .05$) (Table 4). Brinkman et al[45] investigated the correlation between medical students' self-confidence and their competency in prescribing and found a weak positive correlation ($r = 0.2$, $P < .01$, 95% CI 0.1-0.3) between self-confidence and true competence. Other studies on pediatric assistants' performance of resuscitation skills and procedures have also found that self-confidence is incoherent with performance. The majority of assistants in these studies reported comfort with the procedural skills included, but only a minority displayed the skills correctly when assessed by direct observation.[46,47] Extreme belief in one's potential to succeed may promote task motivation and commitment,[48] but it may also cause participants to be less eager to assume tasks for which they are not well-prepared and less open to seeking help.[49] More significantly, low self-confidence can also have undesirable consequences, including underestimating preparedness to duties, which leads to avoidance of activities that may be within a provider's capabilities.[48]

It is important for students to be aware of their strengths and abilities during their education, to acknowledge their shortcomings, to avoid repeating their mistakes, and to develop a behavioral change against the learned subject. Simulation applications are educational methods that will allow students to make mistakes and try again and thus will contribute to their self-confidence. The present study revealed no correlation between students' self-confidence and their performance. However, as a consequence of this study, it is recommended to monitor the same student groups for their self-confidence development and performance longitudinally with repetitive simulation applications during the education process. The findings of the present study on safe drug administrations have indicated that in-depth studies are required on multidimensional issues that require cognitive, psychomotor, and behavioral competencies such as drug administrations in nursing education. It is thought that such studies would contribute positively to the patient safety culture when examined together with the self-confidence of the students.

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