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Evaluation of the Effectiveness of Patient Safety Training in Nurses: A Quasi-Experimental Study

Hemşirelerde Hasta Güvenliği Eğitiminin Etkinliğinin Değerlendirilmesi: Yarı Deneysel Bir Çalışma

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This study was presented as an oral presentation at the 6th Global Public Health Conference (GLOBEHEAL 2023), February 23-24, 2023, Colombo, Sri Lanka.

ABSTRACT Objective: The knowledge and competence levels of nurses regarding patient safety play a large role in decreasing the potential risks that patients can face. This study was conducted to evaluate the effectiveness of the training given to nurses about patient safety. **Material and Methods:** This study is a quasi-experimental study with a one-group pretest-posttest design. The study sample comprised 258 nurses employed in a training and research hospital in Ankara. Data were collected through an eight-question demographic characteristics and 23-question patient safety survey form administered between October 4-28, 2022. Descriptive statistics, t-tests and one-way analysis of variance test were used to analyze the data. **Results:** In the study, nurses' post-test mean score (96.59±5.492) was found to be higher than their pre-test mean score (85.59±13.182, p<0.001). In the pre-test, the highest correct answer rate was in "verbal communication", (92.2%) and the lowest correct answer rate was in "medication administration" (30.2%) areas. In the post-test, the highest correct answer rate was in "patient falls" (%99.6) and the lowest correct answer rate was in "medication administration" (%65.1) areas. Additionally, the nurses' mean scores varied according to age, gender, education level, and previous patient safety training. **Conclusion:** Nurses' knowledge and awareness of patient safety play an important role in providing safe and quality service. This study shows that nurses' knowledge levels regarding patient safety were significantly increased through education. For this reason, it is recommended that institutions support nurses with continuous in-service training programs for patient safety.

Keywords: Continuing training programs; competency; nurse education; patient safety; medical error

ÖZET Amaç: Hemşirelerin hasta güvenliğine ilişkin bilgi ve yeterlilik düzeyleri hastaların karşılaşabileceği potansiyel risklerin azaltılmasında büyük rol oynamaktadır. Bu çalışma, hemşirelere yönelik uygulanan hasta güvenliği eğitiminin etkinliğini değerlendirmek amacıyla yürütülmüştür. **Gereç ve Yöntemler:** Bu çalışma, tek gruplu ön test-son test desenli yarı deneysel bir çalışmadır. Çalışmanın örneklemini Ankara'daki bir eğitim ve araştırma hastanesinde çalışan 258 hemşire oluşturmuştur. Veriler, 4-28 Ekim 2022 tarihleri arasında uygulanan 8 soruluk demografik özellikler ve 23 soruluk hasta güvenliği anket formu aracılığıyla toplanmıştır. Verilerin analizinde tanımlayıcı istatistikler, t-testleri ve tek yönlü varyans analizi testi kullanılmıştır. **Bulgular:** Araştırmada hemşirelerin son test puan ortalamalarının (96,59±5,492), ön test puan ortalamalarından (85,59±13,182, p<0,001) yüksek olduğu belirlendi. Ön testte en yüksek doğru cevap oranı "sözlü iletişim" (%92,2), en düşük doğru cevap oranı ise "ilaç uygulaması" (%30,2) alanlarındaydı. Son testte ise en yüksek doğru cevap oranı "hasta düşmeleri" (%99,6), en düşük doğru cevap oranı "ilaç uygulaması" (%65,1) alanlarındaydı. Ayrıca hemşirelerin puan ortalamaları yaşa, cinsiyete, eğitim düzeyine ve daha önce hasta güvenliği eğitimi alıp almadıklarına göre farklılık göstermiştir. **Sonuç:** Hemşirelerin hasta güvenliği konusundaki bilgi ve farkındalıkları, güvenli ve kaliteli hizmet sunmada önemli rol oynamaktadır. Bu çalışma, hemşirelerin hasta güvenliği konusundaki bilgi düzeylerinin eğitim yoluyla anlamlı düzeyde arttığını göstermektedir. Bu nedenle kurumların hemşireleri hasta güvenliğine yönelik sürekli hizmet içi eğitim programları ile desteklemeleri önerilmektedir.

Anahtar Kelimeler: Sürekli eğitim programları; yeterlilik; hemşire eğitimi; hasta güvenliği; tıbbi hata

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Patient safety is the most basic principle of healthcare and is the prevention of avertable harm to the patient and the reduction of the risk of unnecessary harm associated with health care to an acceptable minimum level.[1] The high incidence of errors causes great harm to patients and places a heavy financial burden on the healthcare system.[2] Studies reveal that a significant number of patients are harmed during health care, with preventable errors leading to permanent injuries, prolonged hospital stays, and even death.[2,3] It is also stated that approximately half of fatal events are preventable.[4,5] Therefore, the high mortality and morbidity associated with preventable errors demonstrate the importance of improving patient safety.

Ensuring patient safety and preventing patient harm are key elements of quality healthcare.[2,6] Patient safety competence refers to the knowledge, skills, and attitudes regarding patient safety that are essential for safe healthcare delivery.[6] In this context, safe nursing care includes interventions that will prevent injuries that may arise from errors and maximize the possibility of early detection of errors. Nurses need to know the components of safe care, develop skills, and use them in order to provide safe care.[6]

Education plays an important role in improving safety and quality in healthcare and preventing patient harm.[6,7] Continuous nurse trainings are necessary and effective in improving the knowledge base of nurses and therefore patient outcomes and quality of care.[8] Leading healthcare organizations report that the lack of knowledge and skills of healthcare professionals is one of the causes of preventable errors and that patient safety education is an important tool to ensure safe and quality patient care.[2,9]

Patient safety training is an important part of nursing education in hospitals and educational institutions. Patient safety should be included in the undergraduate education curriculum at an early stage and should be supported by in-service training in institutions after graduation. Nurses' awareness can be increased, they can gain positive behaviors related to patient safety, and preventable errors can be reduced by the trainings.[10,11] Vaismoradi et al. stated that regular training programs in hospitals positively affect nurses' adherence and compliance with patient safety principles and increase their awareness.[10] In addition, there are studies in the literature revealing that there is a relationship between nurses' participation in patient safety education and patient safety competencies and attitudes.[12-14]

Nurses' knowledge and competence levels about patient safety play an important role in reducing preventable patient harm. Continuous in-service training programs should be implemented to ensure that nurses provide quality and safe care and the effectiveness of these programs should be assessed.[13] In this context, this study was carried out to evaluate the effectiveness of patient safety training given to nurses in a hospital.

Research Questions

1. Is there a difference between nurses' patient safety scores before and after training?

2. What are the factors associated with nurses' scores on patient safety?

MATERIAL AND METHODS

RESEARCH DESIGN

This study is a quasi-experimental study with a one-group pretest-posttest design.

PLACE AND TIME OF THE RESEARCH

This study was conducted in a training and research hospital in Ankara between October 4-28, 2022. The hospital has 110 beds. The hospital serves adult and pediatric patients in inpatient floors/clinics (except oncology), outpatient clinics (except oncology) and tertiary care cardiovascular surgery, cardiology, neonatal intensive care and general intensive care areas.

POPULATION AND SAMPLE

The population of the study consisted of 258 nurses working in the hospital between the specified dates and the entire population was included. Joint Commission International (JCI) quality standards and Health Quality Standards (HQS) of the Ministry require patient safety trainings to be given regularly every year and their effectiveness to be evaluated. Within the hospital quality and training processes, patient safety training is given to new nurses during ori-

entation training/first employment. In addition, other working nurses are regularly provided with patient safety training every year. Therefore, all nurses working in the hospital between the specified dates were included in the study. Nurses working in other hospitals were excluded from the study. Health personnel with non-nurse titles (doctors, technicians, secretaries, patient counselors, administrative staff, etc.) were excluded from the study. Nurses work in outpatient clinics, inpatient floors/clinics and intensive care units. Every nurse receives the same training. Nurses can temporarily work in other clinics in cases of annual leaves, seasonal transitions, clinic density, etc.

DATA COLLECTION TOOLS

Two forms developed by the researchers were used. The first is the demographic data form; It consisted of 8 questions: gender, age, education level, clinic settings, professional experience, duty period in the institution, patient safety training during the education program (high school or undergraduate level) and in the hospital. The second is the patient safety knowledge level form, which is a pre-test-post-test questionnaire developed to determine the knowledge levels of nurses. This form was created by the researchers in line with the quality standards of the JCI, which supervises the quality processes of hospitals, and the patient safety goals in the HQS of the Ministry.[15,16] This form contained a total of 23 questions, including 22 tests and one open-ended question, designed to assess the participants' level of knowledge based on the training content. The test questions were multiple-choice questions with 5 options. This form, along with the training content, was presented to the experts for evaluation of their adequacy. The open-ended question was worth "8" points, while the test questions were worth "2", "2.5" or "5" points according to their importance. Participants who answered the questions correctly received the corresponding points, while those who answered incorrectly received no points. The total score for the whole form was given out of 100 points.

PATIENT SAFETY TRAINING

The content of this training was developed in accordance with JCI and HQS implementation guidelines and the standards reviewed during hospital audits, within the framework of relevant literature. The training consisted of a total of 9 main topics: patient safety goals (1 question), verbal communication (1 question), patient identification (8 questions), blood transfusion (3 questions), medication administrations (4 questions), patient falls (2 questions), patient safety reporting (2 questions), adverse events (1 question), and patient transfer (1 question). Training content was reviewed by 2 nursing management lecturers, one JCI and HQS auditors, one nurse managers and one quality manager. The experts evaluated the adequacy and quality of the training content by answering questions such as, "Is this training content reliable?", "Is the content relevant to the topic?" and "Is additional information needed on the topic?". The training groups were planned according to the nurses' work schedules. The nurses were divided into 5 groups, 4 groups of 50 people and one group of 58 people. The training sessions planned for each group lasted four hours and were held on separate days. Teaching methods and techniques like face-to-face lecture with power point, demonstration of visual materials, video examples and question-answer were used in training.

DATA COLLECTION

The data were collected face-to-face by demographic data form and patient safety knowledge level form before training, and by the patient safety information level form after training (Figure 1). Pre-test and post-test results were evaluated by the researchers. Each training was given by the training nurse of the hospital. The in-service training nurse provided one-on-one training to all groups. A pre-test was applied before each training. A post-test was administered after the training. The data was collected by the in-service training nurse. The answers given by the nurses were checked with the question and answer form.

DATA ANALYSIS

The data were analyzed by a statistician using the SPSS 24.0 (IBM corp., Chicago, USA) statistical software suite. Numbers, percentages, and averages were calculated for descriptive data. Independent Sample t-test and one-way analysis of variance test were used to compare pre-test and post-test scores ac-

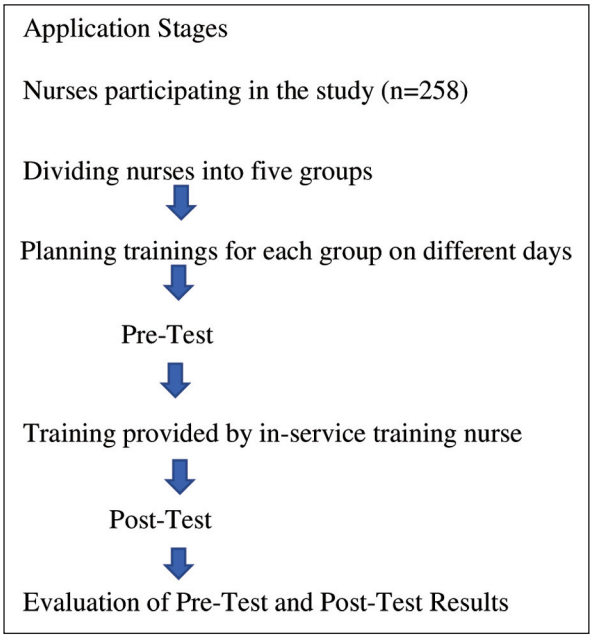

FIGURE 1: Application stages of the study.

cording to the demographic characteristics of nurses. The results of the pre-test and post-test scores were compared using Paired-Sample t-test. Cohen (d) and eta squared (η^2) coefficients were used to calculate the effect size. Effect size indicates whether the difference between groups is large enough to be considered significant. The effect size of Cohen (d)=0.2, 0.5, 0.8 and Eta squared (η^2)=0.01, 0.06, 0.14 were considered small, medium, and large, respectively.[17] The data were evaluated at 95% confidence interval and significance was evaluated at $p<0.05$.

ETHICAL STATEMENTS

The study was approved by the Ardahan University Scientific Research and Publication Ethics Committee (date: September 3, 2022, no:E-67796128-000-2200032550) the permission of the institution was obtained from the managers of the hospital. This study was conducted according to the guidelines of the Declaration of Helsinki (as revised in Brazil 2013). Nurses were informed before the pre-test was distributed and they were assured that the test results would not be disclosed to anyone, but that the results would be given to them one-on-one via e-mail, if requested. Nurses were informed about the results of the training. A check box was added to the pre-test and post-test question page and consent was obtained to be used in the study.

RESULTS

In this study it was determined that 81.8% (n=211) of the nurses were female, 30.2% (n=78) were between the ages of 26-33, 50% (n=129) had an undergraduate degree, 32.9% (n=85) had 5-9 years of professional experience and 43.7% (n=113) have worked in the institution between 1-4 years. The majority of the nurses (95%, n=245) did not receive patient safety training as a separate course during the education period, and 88.4% (n=228) of them received patient safety training at the hospital where they worked (Table 1).

According to the pre-test-post-test results, the pre-test correct response ratios of the nurses on the

TABLE 1: Sociodemographic characteristics of the participants (n=258).

Variable	n (%)
Gender	
Male	47 (18.2)
Female	211(81.8)
Received patient safety training during the education program	
Yes	13 (5)
No	245 (95)
Received patient safety training at the hospital	
Yes	228 (88.4)
No	30 (11.6)
Age	
18-25	43 (16.7)
26-33	78 (30.2)
34-41	74 (28.7)
42 and above	63 (24.4)
Education program	
High school	122 (47.3)
Undergraduate	129 (50)
Postgraduate	7 (2.7)
Duty period in the institution	
<12 months	43 (16.7)
1- 4 years	113 (43.7)
5-9 years	66 (25.6)
10 years and above	36 (14)
Total duty period	
<12 months	27 (10.5)
1- 4 years	78 (30.2)
5-9 years	85 (32.9)
10 years and above	68 (26.4)

patient safety knowledge level ranged from 30.2% (n=78) to 92.2% (n=238). In the pre-test, the highest correct response ratio was found to be in the topic of "verbal communication" (92.2%), and the lowest correct response ratio were in the topics of "medication administration" (30.2%), "adverse event" (37.6%) and "patient safety goals" (46.1%). The post-test correct response rates of the nurses were determined to range from 65.1% (n=168) to 99.6% (n=257). In the posttest, the highest correct response ratio was in the "patient fall" (99.6%) and the lowest correct response ratio was in the "medication administrations" (65.1%) and "adverse event" (70.5%) areas (Table 2).

When the pre-test and post-test scores were compared according to the demographic characteristics of the nurses, statistically significant differences were found in the pre-test-post-test scores according to gender, age, education level, and patient safety training in the educational program and/or at the hospital. Female nurses (pre-test $p<0.05$, $d=0.4$; post-test $p<0.05$, $d=0.4$), those between the ages of 26 and 33 (pre-test $p<0.001$, $\eta^2=0.08$; post-test $p<0.05$, $\eta^2=0.05$), those that had undergraduate and postgraduate edu-

TABLE 2: Pre-test-post-test response distributions according to nurses' patient safety training sub-topics.

		Pre-test		Post-test	
Topics		**n**	**%**	**n**	**%**
Patient safety goals	True	119	46.1	247	95.7
	False	139	53.9	11	4.3
	Sum	258	100	258	100
Authentication	True	217	84.1	249	96.5
	False	41	15.9	9	3.5
	Sum	258	100	258	100
Verbal communication	True	238	92.2	255	98.8
	False	20	7.8	3	1.2
	Sum	258	100	258	100
Blood transfusion	True	223	86.4	248	96.1
	False	35	13.6	10	3.9
	Sum	258	100	258	100
Reporting	True	192	74.4	237	91.9
	False	66	25.6	21	8.1
	Sum	258	100	258	100
Medication administration	True	78	30.2	168	65.1
	False	180	69.8	90	34.9
	Sum	258	100	258	100
Patient fall	True	223	86.4	257	99.6
	False	35	13.6	1	0.4
	Sum	258	100	258	100
SBAR technique	True	154	59.7	238	92.2
	False	104	40.4	20	7.8
	Sum	258	100	258	100
Adverse event	True	97	37.6	182	70.5
	False	161	62.4	76	29.5
	Sum	258	100	258	100

TABLE 3: Comparison of nurses' pre-test and post-test scores according to demographic variable.

Variable	Pre-test $\bar{X}$±SD	Post-test $\bar{X}$±SD
Gender		
Male	81.28±14.503	94.65±6.402
Female	86.55±12.708	97.03±5.186
t-test	t=-2.50, p=0.013*	t=-2.380, p=0.020*
Received patient safety training during the education program		
Yes	94.69±1.109	99.62±1.387
No	85.11±13.354	96.43±5.582
t-test	t=10.570, p=0.000*	t=6.064, p=0.000*
Received patient safety training at the hospital		
Yes	88.50±10.427	97.08±5.068
No	63.47±10.776	92.93±7.110
t-test	t=12.315, p=0.000*	t=3.090, p=0.004*
Age		
18-25	83.40±12.576	96.16±3.722
26-33	91.10±8.971	98.24±3.626
34-41	83.22±15.105	95.24±7.247
42 and above	83.05±13.774	96.44±5.631
"Post hoc" Tukey HSD	F=6.980, p=0.000*	F=4.086, p=0.007*
Education		
High school	82.39±15.004	95.84±6.771
Undergraduate	88.42±10.745	97.14±2.673
Postgraduate	89.29± 6.726	97.28±3.982
"Post hoc Tukey" HSD	F=7.179, p=0.001*	F=2.184, p=0.115
Duty period in the institution		
<12 months	85.49±11.115	95.37±3.539
1- 4 years	86.44±13.256	97.54±5.352
5-9 years	84.12±14.956	96,54±4.754
10 years and above	85.72±11.985	95.19±8.127
"Post hoc" Tukey HSD	F=0.430, p=0.732	F=2.659, p=0.050
Total duty period		
<12 months	86.37±9.600	95.48±3.906
1- 4 years	85.09±13.616	97.14±4.826
5-9 years	87.38±12.157	97.39±5.022
10 years and above	83.62±14.964	95.42±6.952
"Post hoc" Tukey HSD	F=1.098, p=0.351	F=2.291, p=0.079
Pre-test/post-test score average	85.59±13.182	96.59± 5.492
Paired-sample t-test	(minimum 30, maximum 100) t=15.191 p=0.000*	(minimum 65, maximum 100)

*p<0.05; SD: Standard deviation.

cation (pre-test $p<0.05$, $\eta^2=0.05$), those who received patient safety training in the education program (pre-test $p<0.001$, $d=0.8$; post-test $p<0.001$, $d=0.7$) and those who received patient safety training in the institution where they worked (pre-test $p<0.001$, $d=2.4$; posttest $p<0.05$, $d=0.7$) was found to have a higher scores. The mean pre-test score of the nurses was 85.59±13.182 (minimum 30, maximum 100) and the mean post-test score was 96.59±5.492 (minimum 65, maximum 100). It was determined that the mean scores of the nurses after the training were higher than the mean scores before the training and that patient safety training had an effect on the scores of the nurses ($p<0.001$, $d=1.1$) (Table 3).

DISCUSSION

In this study, the effectiveness of patient safety training given to nurses and demographic characteristics related to patient safety knowledge level were evaluated. Safe health care education is possible with adequate and competent health personnel. Nurses' lack of knowledge and skills leads to negative outcomes.[8] Training given to healthcare professionals have positive effects on patient care outcomes; its importance in promoting safe and quality care is clear.[11,18] Because, continuous training on patient safety increase the awareness of nurses as well as their level of knowledge. Raising awareness of safer care among healthcare professionals is one of the priority initiatives for the improvement of patient safety.[19] Healthcare professionals need to have a higher level of knowledge of patient safety so that they can better recognize medical errors and implement interventions to protect patients.[20] In this study, a significant increase was observed in the knowledge levels of nurses after patient safety training. Ghallab et al.'s study also reveal significant improvements in nurses's knowledge test scores, patient safety culture, and compliance with safety goals both immediately and three months after the implementation of the patient safety training program, compared to before.[21] In many similar studies, it was found that patient safety trainings were effective on the knowledge, attitude and awareness levels of healthcare workers.[22-24]

In this study, less than 1/3 of the nurses answered the questions about medication administrations correctly before the training, while this ratio increased to 2/3 after the training. Although the proportion of those who answered correctly increased after the training, correct response to medication administration questions was lowest among all topics, both before and after the training. It is thought that the most important result of the study is that the scores for medication administrations after training are lower compared to other areas. Ultimately, medication administration is primarily the responsibility of the nurse, and nurses devote 40% of their time to medication administration.[25] It has also been reported in the literature that medication administration errors are one of the most common errors and that wrong dose, wrong time, wrong medication, wrong way, wrong patient, lack of documentation and technical errors are among the medication errors.[26-29] Lack of training of nurses on safe medication administration is an important cause of medication preparation and administration errors.[26,28,29] It is an obvious requirement for a nurse to have sufficient knowledge in order to be competent in medication administration. In this context, the study by Han et al. revealed that increasing the patient safety competencies of nurses was associated with a decrease in medication error events.[30] Therefore, empowering nurses through continuing training programs is an important step to ensure patient safety.

It was found out that less than one-third of the nurses answered the question about the adverse event correctly before training. It is stated in the literature that nurses need improvement in knowledge, attitude, and practices related to adverse event reporting.[31] The institute of medicine has reported that preventable adverse events are due to the inadequate knowledge and skills of healthcare workers in ensuring patient safety, and healthcare providers should advance their training programs to include vital patient safety issues.[32]

In the study, it was observed that most of the nurses had previously received patient safety training in their institutions. However, it was found that less than half of the nurses could answer the questions about patient safety goals correctly before the training, and this rate increased after the training. These findings highlight the need to evaluate the content and effectiveness of the education programs pro-

vided to nurses, as well as the importance of ongoing education. To improve patient safety, health care professionals must have specific knowledge and skills.[33] Within the scope of JCI and HQS, it is important for all personnel to know the patient safety goals in order to raise awareness among nurses in ensuring patient safety. More generally, increasing the knowledge and skills of healthcare workers for patient safety plays an important role in reducing preventable errors in hospitals.

In this study, it was determined that the mean scores of the nurses before and after the training differed according to the variables of gender, age, education level and previous patient safety training. Nurses who were female, had patient safety training, had graduate education, and were between the ages of 26 and 33 had higher levels of knowledge about patient safety. In the literature, there are different results regarding nurses' patient safety competencies and attitudes according to age and gender variables.[12,22,24,34] These different results may have been due to different sample sizes and characteristics. There are studies supporting that nurses who have postgraduate education and have received previous patient safety training have a higher level of patient safety knowledge.[6,12-14,22,34] This situation might be explained by the increase in the level of knowledge and awareness of these participants.

In the pre-test of this study, the scores of nurses who had previously received education program and hospital-based patient safety training were found to be statistically higher compared to those who had not received such training. In addition, while the pre-test score of the group that had not received training was significantly lower than that of the group that had received training in the hospital (difference in scores=25.03), the statistical difference between the 2 groups remained at the post-test, but the difference in scores between them was significantly reduced (difference in scores=4.15). JCI and HQS recommend providing annual continuous training on patient safety to hospital staff. These trainings aim to reduce adverse events and ensure patient safety by improving the patient safety competences of nurses and creating a patient safety culture.[30] Also Biresaw et al. found that continuous training on patient safety positively increased nurses' patient safety attitudes.[23] Education is a prerequisite of knowledge.[35] Adequate knowledge encourages attitudes and beliefs and thus guides nurses' safe practices/behaviors.[35] Patient safety training given to nurses is also a prerequisite for improving their attitudes and behaviors towards patient safety.

LIMITATIONS

This study is a quasi-experimental study with a one-group pretest-posttest design and provides information about the current situation. The absence of a control group in the study and the inability to perform patient safety training and follow-up after the last test can be considered as limitations. In addition, since the research was carried out in nurses of only one hospital, the results are limited to this hospital only.

CONCLUSION

In the study, the post-test scores of the patient safety training given to the nurses were found to be higher than the pre-test scores and it was determined that the training significantly increased the knowledge and awareness levels of the nurses. In Türkiye, although patient safety training is provided to hospital staff, there are shortcomings in terms of the adequacy, delivery methods, and effectiveness of these trainings. This study has highlighted the importance of structured training programs and the evaluation of training effectiveness. The fact that nurses correctly answered most of the post-test questions and that the scores of nurses who had previously received patient safety training also improved compared to the pre-test demonstrates the effectiveness of patient safety training and underscores the importance of its repetition. In addition, since nurses were found to have lower correct response rates in both pre-test and post-test in terms of medication administrations and adverse events, more studies may need to be done on these issues and nurses may need to be supported especially in these areas.

It is essential to focus on patient safety in the education programs and/or hospitals to increase safe and quality care. Nurses' knowledge and awareness of patient safety play an important role in the provision of safe and quality service. For this reason, it is

recommended that institutions support nurses with continuous in-service training programs for patient safety.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

All authors contributed equally while this study preparing.

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