

Operating Room Nurses' Knowledge of and Attitudes About Pressure Injury Prevention: A Descriptive Cross-Sectional Study

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ABSTRACT

BACKGROUND: Understanding nurses' knowledge and attitudes might be important in influencing their behaviors of complying with pressure injury prevention measures in the operating room. **PURPOSE:** The aim of this descriptive and cross-sectional study was to determine operating room nurses' knowledge and attitudes about pressure injury prevention. **METHODS:** This study was performed with 174 nurses working in the operating rooms of 5 hospitals in Istanbul between July and October 2020. The data were collected with the Modified Pieper Pressure Ulcer Knowledge Test-MPPUKT and Attitude Towards Pressure Ulcer Prevention Instrument-APuP and analyzed with parametric and nonparametric tests using the SPSS 20.0 package program. The statistical significance level was accepted as $P < .05$. **RESULTS:** The total mean score of the MPPUKT of the operating room nurses was 32.72 ± 6.65 , and the knowledge level of only 57.5% of the nurses was considered sufficient (MPPUKT score $\geq 70\%$); the total mean score of the APuP was 44.67 ± 3.10 , and almost all (94.8%) had a satisfactory attitude ($\geq 75\%$). In addition, there was a significant positive correlation between the knowledge and attitudes of the operating room nurses about pressure injury prevention ($P = .000$). **CONCLUSION:** This study has shown that the knowledge level of the operating room nurses was weak and their attitudes were satisfactory. It is recommended to improve the knowledge and attitudes of operating room nurses to prevent pressure injuries through effective in-service training programs.

KEY WORDS: pressure ulcer/injury; knowledge; attitude; operating room nursing; cross-sectional study

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POTENTIAL CONFLICTS OF INTEREST: none disclosed

Pressure injury is defined as localized damage to the skin or deep tissues, usually on a bony prominence or in association with a medical or other devices.¹ Any pressure injury that develops within 48 to 72 hours intra-, inter-, or postoperatively in a patient undergoing surgical intervention is described as a perioperative pressure injury, and the anatomical position is associated with the operating position.²⁻⁴ The incidence of perioperative pressure injuries ranges from 1.3% to 51%, and this rate constitutes 45% of all hospital-acquired pressure injuries.^{3,5,6}

Pressure injury is an important indicator of international health care quality.^{1,3,7} These injuries are usually difficult to heal, painful, negatively affect the health-related quality of life of the individual,⁷⁻⁹ and increase length of hospital stay and health care costs.^{7,10} Thus, the ideal is to prevent the development of pressure injury⁴; diagnosis at its earliest stage is essential to allow planning for cost-effective care.⁹

Although a multidisciplinary team approach plays a key role in preventing pressure injury, nurses are at the forefront of

this effort in most healthcare settings.^{9,11} Monitoring and maintaining skin integrity and preventing skin damage is the primary responsibility of the nurse.^{7,8,10} In this context, to provide safe and quality nursing care, nurses should routinely evaluate the surgical patient's skin for the presence of pressure injury during the perioperative period.⁴ However, pressure injury prevention requires risk assessment that involves a complex interaction of care planning, implementation, and evaluation. To be successful, nurses must be aware of the risk factors associated

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with the development of pressure injury. In addition, the relevant elements of pressure injury prevention guidelines should be followed after the individual has been evaluated.^{8,9,12}

In the literature, it is recommended to regularly evaluate the knowledge and attitudes of healthcare professionals regarding pressure injury prevention and management to facilitate compliance with clinical guidelines and to identify potential barriers and facilitators when initiating quality improvement initiatives.¹³ Evaluation of nurses' knowledge and attitudes about pressure injury prevention contributes to the identification of training needs, opportunities to improve practice and priorities, and helps develop organization-specific interventions.^{10,13}

The relationship between knowledge, attitude, and practice is both complex and not fully understood. In addition, the literature states that there is a gap between nurses' knowledge and evidence-based practices in pressure injury prevention.¹⁰ Understanding nurses' knowledge and attitudes may be important in influencing the behavior of complying with pressure injury prevention measures that directly lead to pressure injury preventative practices in the operating room.⁴ However, although there are a few studies^{2,14,15} on surgical nurses in the literature, there is only one study⁴ examining the knowledge and attitudes of operating room nurses about pressure injury prevention. Thus, the aim of this study is to determine operating room nurses' knowledge and attitudes about pressure injury prevention.

Research questions were as follows: 1) What is operating room nurses' knowledge level about pressure injury prevention? 2) What are operating room nurses' attitudes about pressure injury prevention? 3) Is there a relationship between knowledge and attitudes about pressure injury prevention?

METHODS

This descriptive and cross-sectional study was conducted between July and October 2020 in the operating rooms of 5 hospitals in Istanbul; 4 are public

institutions providing tertiary health services with 385 to 568 beds, and 1 is a private institution with 200 beds. The population of this study consisted of 206 nurses working in the operating rooms of these hospitals. In this study, no sample selection was made, and it was aimed to include as many nurses as possible. A total of 174 nurses who were aged 18 years and over, actively working in the operating rooms of these hospitals during the data collection process, and willing to participate in the study were included in the sample. Thirty-two nurses who did not accept to participate in the study, were on leave, or were on a report were excluded. Thus, 84.5% of the population has been reached.

Data were collected with the Individual Characteristics Form, which was developed by the researchers in light of the literature,^{2,11,15} assessing the sociodemographic characteristics of nurses and their training for the prevention of pressure injuries, the Modified Pieper Pressure Ulcer Knowledge Test (MPPUKT), and the Attitude Towards Pressure Ulcer Prevention Instrument (APuP).

The Individual Characteristics Form consisted of 9 questions such as age, sex, education level, the working year, pressure injury training, when and what kind of training the nurses last received, etc.

The MPPUKT developed by Pieper and Mott¹⁶ consists of 47 questions in total, including prevention and risk, staging, and wound description. Each correct answer is scored as "1" and incorrect and I don't know answers as "0". Lawrence et al¹⁷ revised the scale; it consists of 49 items, including 25 true and 24 false questions. Correct answers are evaluated as "1" and incorrect answers as "0", and the total score is calculated in the range of 0 to 49. Its Turkish validity and reliability were performed by Gul et al.¹⁸ The Cronbach's alpha value of the scale was found to be 0.814.

The APuP developed by Beeckman et al¹⁹ consists of 13 items for 5 subscale domains: personal competency to prevent pressure ulcers (items 1-3), priority of pressure ulcer prevention (items 4-6), impact of pressure ulcers (items 7-9),

responsibility in pressure ulcer prevention (item 10-11), and confidence in the effectiveness of prevention (items 12-13). A 4-point Likert-type scale was designed to collect the data (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree). Items 3, 5, 7-10, and 13 of the scale contain negative statements and are reversed in scoring. The minimum score is 13 and the maximum score is 52. A higher score on the scale indicates a more positive attitude. The Turkish validity and reliability of the scale were performed by Üstün,²⁰ and its Cronbach's alpha value was found to be 0.714.

In this study, as in other studies,^{7,17} the MPPUKT mean score of $\geq 70\%$ was designated as satisfactory knowledge level, $\geq 80\%$ good knowledge level, and $\geq 90\%$ very good knowledge level. An average score of 75% or more on the APuP was considered a satisfactory attitude.^{4,19,21} In this study, the Cronbach's alpha value of the MPPUKT was 0.846 and the Cronbach's alpha value of the APuP was 0.700. Accordingly, the internal consistency and reliability of MPPUKT were at a good level and APuP were at a fair level.

The most substantial reason for utilizing the MPPUKT and APuP in this study is that these are valid and reliable tools that are widely used in Turkey. In addition, in many international studies^{4,12,15,17,21} nurses' knowledge and attitudes towards pressure injury prevention were evaluated with these instruments.

Study procedures. Data were collected by the second and third authors of the study between July 2020 and October 2020 on the working days of the operating room nurses who met the research criteria and at time intervals that did not interfere with the workflow order. The operating room nurses were informed about the purpose and scope of the research, and those nurses who were willing to participate in the study were asked to fill in data collection forms. Additionally, they were informed not to use resources such as phones, the internet, and peers during the data collections process. It took an average of 10 to 15 minutes for the nurses to answer the data collection form, and the forms

were handed over to the researchers after these forms were filled.

Statistical analysis. The data were analyzed using the SPSS 20.0 (IBM Corp) package program. Descriptive statistics (frequency, percentage, mean, standard deviation, median, and range) were performed in the analysis of descriptive data. Kolmogorov-Smirnov test was used to assess the normality of the data. Nonparametric tests were performed for the variables for which this test was significant, and parametric tests were used when it was not significant. The t test, Mann-Whitney U test, and Kruskal-Wallis test (advanced analysis Mann-Whitney U test with Bonferroni correction) were performed in independent groups to determine the effect of descriptive features on the total scores of MPPUKT and APuP. The relationship between the scale total scores was evaluated using Spearman correlation analysis. The significance level was accepted as $P < .05$.

Ethical considerations. Study procedures were reviewed and approved by the Maltepe University Ethics Committee, approval number 2020/08-10. Written and verbal permissions of the nurses who met the research criteria were obtained prior to initiating the data collection process because the use of human beings in the study requires protection of an individual rights.

RESULTS

The demographic characteristics of the operating room nurses were tabulated in Table 1. In this study, 51.1% of the nurses were under the age of 30, 78.2% were women, 62.6% had a bachelor's degree, 32.2% had received pressure injury training within the past year, and 82.2% needed training for the prevention of pressure injuries (Table 1). In addition, the mean knowledge scores were significantly higher among nurses who received pressure injury training within the past year ($P = .012$) and who were able to reflect on training they received to the care they provided ($P = .000$). The mean attitude score of the nurses who worked as a nurse for <1 , 2-5, and ≥ 10 years ($P = .000$) and who worked as an operating

Table 1. Comparison of the Mean Scores of the MPPUKT and APuP According to Nurses' Descriptive Characteristics

Descriptive characteristics	No. (%)	MPPUKT	APuP
Age, y*			
< 30	89 (51.1)	33.21 $\pm$ 6.57	45.74 $\pm$ 3.00
≥ 30	85 (48.9)	32.21 $\pm$ 6.73 $P = .322$	46.07 $\pm$ 2.89 $P = .463$
Sex***			
Female	136 (78.2)	32.84 $\pm$ 6.20	45.80 $\pm$ 3.11
Male	38 (21.8)	32.28 $\pm$ 8.12 $P = .872$	46.26 $\pm$ 2.21 $P = .520$
Education level**			
Health vocational high school-	18 (10.3)	34.16 $\pm$ 8.23	45.61 $\pm$ 2.27
Associate degree	109 (62.6)	32.88 $\pm$ 6.37	46.06 $\pm$ 2.77
Undergraduate	47 (27.1)	31.78 $\pm$ 6.64 $P = .171$	45.63 $\pm$ 3.52 $P = .739$
Postgraduate			
Time working as a nurse, years**			
< 1 ^a	10 (5.7)	29.80 $\pm$ 8.50	46.26 $\pm$ 2.98
2-5 ^b	58 (33.3)	33.63 $\pm$ 7.01	46.43 $\pm$ 2.72
6-9 ^c	39 (22.4)	31.94 $\pm$ 5.45	44.20 $\pm$ 2.69
$\geq 10^d$	67 (38.5)	32.82 $\pm$ 6.63 $P = .252$	47.00 $\pm$ 2.70 $P = .000$ a, b, d > c
Time working as an operating room nurse, years**			
< 1 ^a	16 (9.2)	32.93 $\pm$ 7.92	45.64 $\pm$ 3.46
2-5 ^b	94 (54.0)	32.47 $\pm$ 6.57	45.67 $\pm$ 2.73
6-9 ^c	25 (14.4)	33.16 $\pm$ 6.14	45.92 $\pm$ 2.81
$\geq 10^d$	39 (22.4)	32.94 $\pm$ 6.82 $P = .609$	47.87 $\pm$ 2.44 $P = .028$ d > a, b
Time since last training on pressure injury, years**			
< 1yil ^a	56 (32.2)	35.32 $\pm$ 4.96	46.10 $\pm$ 2.37
1-2yil ^b	42 (24.1)	31.85 $\pm$ 7.31	46.38 $\pm$ 3.48
2-5yil ^c	46 (26.4)	31.58 $\pm$ 6.51	45.80 $\pm$ 3.13
$\geq 5yil^d$	19 (10.9)	32.00 $\pm$ 4.53	46.00 $\pm$ 1.67
None ^e	11 (6.3)	28.81 $\pm$ 10.85 $P = .012$ a > c	44.42 $\pm$ 3.06 $P = .235$
Do you need training in pressure injury?***			
Yes	143 (82.2)	32.49 $\pm$ 6.90	45.75 $\pm$ 2.92
No	31 (17.8)	33.77 $\pm$ 5.28 $P = .316$	46.58 $\pm$ 3.00 $P = .051$
Can you reflect on training you have received to the care?***			
Yes	125 (71.8)	33.76 $\pm$ 6.25	46.30 $\pm$ 2.59
No	49 (28.2)	30.08 $\pm$ 6.96 $P = .000$	45.74 $\pm$ 3.06 $P = .383$

Abbreviations: MPPUKT, Modified Pieper Pressure Ulcer Knowledge Test; APuP, Attitude Towards Pressure Ulcer Prevention Instrument.

*t test for independent groups; **Kruskal-Wallis test; ***Mann-Whitney U test

room nurse for ≥ 10 years ($P = .028$) were also significantly higher (Table 1).

Table 2 showed that the total mean score of the MPPUKT was 32.72 ± 6.65 and that the mean score of 57.5% of the nurses was $\geq 70\%$. The highest gap in knowledge scores was in the prevention and risk subscale, and 53.4% of the nurses scored $<70\%$. The total mean score of the APuP was 44.67 ± 3.10 , and the mean score of 94.8% of the nurses was $\geq 75\%$. The vast majority ($>95\%$) of the nurses had "Personal competency," "Priority," "Impact," "Responsibility," and "Confidence in the effectiveness of prevention" subscale mean scores of $\geq 75\%$. There was a statistically significant positive correlation between the MPPUKT and the APuP ($r = .320$; $P = .000$) (Table 2).

The 3 most difficult questions for the operating room nurses to answer were item Q12 "Bunny boots and gel pads relieve pressure on the heels" (2.3%), item Q14 "Ring cushions do not help to prevent pressure ulcers" (9.8%), and item Q49 "Reactive hyperemia disappears within 45 minutes" (17.2%). The easiest questions were item Q2 "Some risk factors for development of pressure ulcers include immobility, incontinence, impaired nutrition, and altered level of consciousness," item Q5 "Stage 1 pressure ulcers are described as intact skin with nonblanchable redness of a localized area usually over a bony prominence," and Q13 "It is necessary to assess the patient and a turning regime should be determined and noted at the bedside" with 98.3%, 95.4%, and 94.8% selecting the correct answer, respectively. There was a significant correlation between $\geq 75\%$ positive attitude scores and correct answers of the operating room nurses to items 4, 8, 9, 11, 13, 15, 16, 19, 21, 23, 28, 40, and 43 in the MPPUKT ($P < .05$) (Table 3).

According to survey responses, the most common obstacles faced by nurses in applying nursing interventions for the pressure injury prevention were heavy workload (63.8%), an insufficient number of nurses (61.5%), presence of other priorities (51.1%), lack of time (51.1%), and inadequacy of products/devices/

Table 2. Mean Scores of the MPPUKT and the APuP

MPPUKT	No. (%)	Mean $\pm$ SD	Median (min-max)
Prevention and risk, %			
<70	93 (53.4)		
≥ 70	81 (46.6)	21.22 ± 4.07	22 (5-28)
Staging			
<70	39 (22.4)		
≥ 70	135 (77.6)	6.55 ± 1.96	7 (0-9)
Wound description			
<70	48 (27.6)	4.94 ± 1.42	5 (0-7)
≥ 70	126 (72.4)		
Total score			
<70	74 (42.5)	32.72 ± 6.65	34 (5-44)
≥ 70	100 (57.5)		
APuP	No. (%)	Mean $\pm$ SD	Median (min-max)
Personal competency, %			
<75	7 (4.0)	9.78 ± 1.04	9 (7-12)
≥ 75	167 (96.0)		
Priority			
<75	0 (0)	11.12 ± 1.19	12 (9-12)
≥ 75	174 (100.0)		
Impact			
<75	0 (0)	11.12 ± 1.18	12 (9-12)
≥ 75	174 (100.0)		
Responsibility			
<75	1 (0.6)	7.01 ± 0.73	7 (5-8)
≥ 75	173 (99.4)		
Confidence in the effectiveness of prevention			
<75	1 (0.6)	7.05 ± 0.74	7 (4-8)
≥ 75	173 (99.4)		
Total score			
<75	9 (5.2)	44.67 ± 3.10	46 (38-51)
≥ 75	165 (94.8)		
MPPUKT and APuP total score	$r = .320$ $P = .000$		

Abbreviations: MPPUKT, Modified Pieper Pressure Ulcer Knowledge Test; APuP, Attitude Towards Pressure Ulcer Prevention Instrument
r, Spearman's correlation analysis

resources that distribute pressure in the operating room (50.6%) (Figure 1).

DISCUSSION

This study was carried out to determine operating room nurses' knowledge and attitudes about pressure injury

prevention. According to this study, the total mean score of the MPPUKT of the operating room nurses was 32.72 ± 6.65 and the knowledge level of only 57.5% was sufficient; the total mean score of the APuP was 44.67 ± 3.10 , and almost all (94.8%) had a satisfactory attitude.

Table 3. Distribution of Nurses' Responses to the MPPUKT

Questions	Correct answer No. (%)	APuP i value
Prevention and Risk		
Q1. It is important to massage bony prominences.	37 (21.3)	.500
Q2. Some risk factors for development of pressure ulcers are immobility, incontinence, impaired nutrition, and altered level of consciousness.	171 (98.3)	.077
Q3. All hospitalized individuals at risk for pressure ulcers should have a systematic skin inspection at least daily and those in long-term care at least once a week.	136 (78.2)	.303
Q4. Hot water and soap may dry the skin but does not increase the risk of developing pressure ulcers.	104 (59.8)	.000
Q5. Stage 1 pressure ulcers are described as intact skin with nonblanchable redness of a localized area usually over a bony prominence.	166 (95.4)	.073
Q6. A stage 3 pressure ulcer is a partial-thickness skin loss involving the epidermis and/or dermis.	33 (19.0)	.117
Q7. Transparent dressings (eg, Tegaderm, Opsite) and hydrocolloid dressings (eg, Duo-derm, Restore) do not protect against the effects of friction.	93 (53.4)	.617*
Q8. All individuals should be assessed on admission to a hospital for risk of pressure ulcer development.	153 (87.9)	.001
Q9. A stage 4 pressure ulcer is a full-thickness tissue loss with exposed bone, muscle, or tendon.	159 (91.4)	.005
Q10. Patients with reduced dietary intake of protein and calories are not at a greater risk for pressure ulcers.	157 (90.2)	.866
Q11. Persons confined to bed should be repositioned every 3 hours.	131 (78.2)	.000
Q12. Bunny boots and gel pads relieve pressure on the heels.	4 (2.3)	.112
Q13. It is necessary to assess the patient and a turning regime should be determined and noted at the bedside.	165 (94.8)	.015
Q14. Ring cushions do not help to prevent pressure ulcers.	17 (9.8)	.198
Q15. In a side-lying position, a person should be at a 30-degree lateral tilt unless inconsistent with the patient's condition and other care needs that take priority.	106 (60.9)	.012
Q16. Chairbound persons should not be fitted for a chair cushion.	143 (82.2)	.003
Q17. The head of the bed should be maintained at the lowest degree of elevation (ideally no higher than a 30-degree angle) consistent with conditions.	117 (67.2)	.481
Q18. Persons who can be taught should shift their weight every 60 minutes while sitting in a chair.	60 (34.5)	.691
Q19. A person who cannot move himself or herself should not be seated in a chair for more than 2 hours.	106 (60.9)	.000
Q20. Stage 2 pressure ulcers are a partial-thickness skin loss or blister.	146 (83.9)	.503

(continued)

Table 3. Distribution of Nurses' Responses to the MPPUKT

Q21. It is not necessary for the epidermis to be kept clean and dry at all times.	127 (73.0)	.015
Q22. A low-humidity environment does not predispose a person to pressure ulcers.	95 (54.6)	.207*
Q23. The incidence of pressure ulcers is so high that the government has appointed a panel to study risk, prevention, and treatment.	153 (87.9)	.008
Q24. To minimize the skin's exposure to moisture from incontinence, skin and continence products should be correctly applied.	164 (94.3)	.899
Q25. Rehabilitation should be instituted if consistent with the patient's overall goals of therapy.	156 (89.7)	.165
Q26. Slough is yellow or creamy necrotic tissue on a wound bed.	119 (68.4)	.104
Q27. The presence of an eschar is good for wound healing.	35 (20.1)	.119
Q28. Bony prominences should not have direct contact with one another.	149 (85.6)	.015
Q29. Every person assessed to be at risk for developing pressure ulcers should be placed on a pressure-redistribution bed surface.	158 (90.8)	.396
Q30. Undermining is the destruction that occurs under the skin.	141 (81.0)	.662
Q31. Eschar is healthy tissue.	44 (25.3)	.000
Q32. Skin macerated from moisture does not tear more easily.	102 (58.6)	.094*
Q33. A pressure-redistribution surface reduces the tissue interface pressure below capillary closing pressure.	123 (70.7)	.983
Staging		
Q34. Blanching refers to whiteness when pressure is applied to a reddened area.	123 (70.7)	.259
Q35. Pressure ulcers are sterile wounds.	120 (69.0)	.184
Q36. A pressure ulcer scar breaks down faster than unwounded skin.	157 (90.2)	.211
Q37. A blister on the heel is nothing to worry about.	149 (85.6)	.774
Q38. Devices that suspend the heels do not protect the heels from pressure.	105 (60.3)	.254
Q39. Educational programs do not reduce the incidence of pressure ulcers.	128 (73.6)	.861
Q40. The good way to decrease pressure on the heels is to elevate them off the bed with slight knee flexion.	125 (71.8)	.007
Q41. A patient who is determined to be "not at risk" will never develop a pressure ulcer.	148 (85.1)	.787
Q42. Slough or eschar is never present on a stage 4 pressure ulcer.	85 (48.9)	.203*
Wound Description		
Q43. Shear is the force that occurs when the skin sticks to a surface and the body slides.	152 (87.4)	.032
Q44. The skin is not the largest organ of the body.	134 (77.0)	.754

(continued)

Table 3. Distribution of Nurses' Responses to the MPPUKT		
Q45. Stage 2 pressure ulcers are not painful because the nerve endings are not exposed.	105 (60.3)	.077
Q46. For persons who have incontinence, skin cleansing is not necessary at the time of soiling or at routine intervals.	138 (79.3)	.355
Q47. All care given to prevent and treat pressure ulcers should be documented.	161 (92.5)	.695
Q48. Friction occurs when moving a person up in bed.	140 (80.5)	.280
Q49. Reactive hyperemia disappears within 45 minutes.	30 (17.2)	.711

Abbreviations: MPPUKT, Modified Pieper Pressure Ulcer Knowledge Test; APuP, Attitude Towards Pressure Ulcer Prevention Instrument.
*t-test on independent groups; non-signal items Mann Whitney-U test

Moreover, there was a significant positive correlation between the knowledge and attitudes of the operating room nurses about pressure injury prevention. It should be kept in mind that the steps to be taken to improve the knowledge and attitudes of operating room nurses towards the prevention of pressure injury may reduce the incidence of operating room-acquired pressure injury, improve patient outcomes, and reduce hospital costs. This study shows the need for regular in-service training programs to improve the knowledge and attitudes of operating room nurses in the prevention of pressure injury.

Many studies^{8,15,22} in the literature have indicated that the effect of nurses' individual characteristics on their knowledge and attitudes towards the prevention of pressure injuries is controversial. This study revealed that nurses who received pressure injury training within the past year and were able to reflect on training to the care had a higher knowledge level, and nurses who worked as an operating room nurses for ≥ 10 years had a more positive attitude ($P < .05$).

Beeckman et al²¹ reported that the knowledge scores of the nurses increased significantly with pressure injury training and that the nurses who participated in the additional education displayed higher knowledge scores than the nurses who did not participate in any additional education. Nuru et al²³ stated that nurses with a bachelor's degree were 2.4 times more likely to have a better knowledge

of pressure injury prevention than diploma-prepared nurses. In the study of De Meyer et al,¹³ the total knowledge scores of the nurses with a higher education level and who participated in additional training for the prevention of pressure injuries or wound care were significantly higher; in the study of Ebi et al,⁸ nurses who read articles related to pressure injury and participated in training had higher knowledge scores. In the study of Gul et al,¹⁸ the level of knowledge of nurses who read articles/books and attended lectures/conferences/courses related to pressure injury in Turkey was higher. This finding, which is consistent with the literature, highlights the importance of continuing education in the prevention of pressure injury. Therefore, continuing in-service training programs for the prevention of pressure injuries should be considered as a part of the training of operating room nurses.

According to Moore and Price,²² education level and clinical work experience do not have a significant effect on the attitudes of nurses; on the other hand, Tubaishat et al²⁴ stated that the only factor that had an effect on positive attitudes was the experience of nurses, and as the years of experience increased, nurses showed a more positive attitude. In the study of Barakat-Johnson et al,¹⁰ having more experience as a nurse was associated with a more positive attitude towards pressure injury prevention. Moreover, a significant positive relationship has been reported between years of

experience and attitudes.¹⁰ In this study, considering the finding that nurses with more clinical experience have a higher attitude towards the pressure injury prevention, it can be suggested that the evaluation of pressure injury risk factors and implementation of prevention strategies in surgical patients in the operating room environment should be carried out under the supervision of senior nurses.

Many studies have confirmed that nurses' attitudes affect their adherence to pressure injury prevention strategies and that nurses' knowledge changes their perceptions of the necessity and importance of pressure injury prevention.⁴ In the literature, it is stated that understanding nurses' knowledge and attitudes towards pressure injury prevention is of critical importance for identifying opportunities to improve education and practice.¹⁰ In this study, 57.5% of the operating room nurses had sufficient knowledge of pressure injury; 53.4% of them did not have a sufficient level of knowledge in the subscale of prevention and risk assessment. On the other hand, almost all (94.8%) nurses had a satisfactory attitude towards pressure injury prevention.

Beeckman et al²¹ stated that nurses in Belgium had a lack of knowledge about pressure injury, especially risk assessment, classification, and prevention strategies. Dilie and Mengistu²⁵ reported that most of the nurses in Ethiopia (68.4%) had a positive attitude, especially in the implementation of pressure



Figure 1. Barriers encountered by operating room nurses in preventing pressure injury.

injury prevention strategies, and that approximately 40% of the nurses had insufficient knowledge of pressure injury. However, it should be noted that in this study, the knowledge score was determined to be 80% or more (10% higher than the studies in the literature) to show sufficient knowledge and that the nurses who scored above the median score in the APuP were considered to have a positive attitude. In the study of De Meyer et al,¹³ it was reported that the knowledge level of nurses and nursing assistants was weak (50.7%), and the lowest scores were in the knowledge themes of prevention (42.7%), etiology (45.6%), and prevention for specific patient groups (46.6%). Unlike these studies, Kallman and Suserud²⁶ stated that nurses in Sweden have a good level of knowledge and have a positive attitude. Lawrence¹⁷ reported an overall score of 79%, indicating that nurses in Australia had adequate knowledge of pressure injury prevention and management. Barakat-Johnson et al¹⁰ showed that nurses have a good level of knowledge and exhibit a positive attitude. These findings, which show that operating room nurses have a low level of knowledge about pressure injury prevention^{13,21,25,27} and have a positive attitude, are consistent with the findings of many studies.^{10,22,24-26} As a matter of fact,

when evaluating these results, it should be considered that these studies constitute the international literature and that health care systems may have various resources and/or different care routines. In addition, it is thought that the lack of widespread use of surgical patient-specific pressure injury risk assessment instruments in operating rooms may also affect these results.

This study showed that operating room nurses still do not have enough knowledge about pressure injury prevention. A pressure injury, although theoretically preventable, is a multifactorial problem that can occur in the highest-quality care settings. Appropriate nursing care is an important component of pressure injury prevention.²⁷ Therefore, the knowledge of operating room nurses on this subject should be updated with regular in-service training. In addition, the inclusion of an operating room-specific standard assessment instrument in the current assessment list may encourage pressure injury risk assessment in surgical patients, given that 53.4% of operating room nurses have insufficient knowledge on prevention and risk assessment.

The relationship between knowledge, attitude, and practice is both complex and not fully understood. However, researchers show that a positive attitude

towards the prevention of pressure injury is associated with good nursing practices and should ultimately result in the prevention of hospital-acquired pressure injury.¹⁰ In this study, there was a significant positive correlation between the knowledge and attitudes of operating room nurses on pressure injury prevention ($P = .000$).

The literature has reported various opinions about the knowledge and attitudes of nurses that affect the implementation of pressure injury prevention strategies. Whereas some studies^{10,25} report strong direct relationships between knowledge and attitudes on pressure injury prevention, others^{4,21} contradict this relationship. Beeckman et al²¹ explained that knowledge alone does not affect an individual's probability of implementing pressure injury prevention strategies. A systematic review noted that some nurses rely solely on their knowledge and personal experience to decide whether patients need pressure injury prevention.²⁸ In the study of Khong et al,⁴ however, it was reported that the positive attitude of the operating room nurses had no relationship with their general knowledge scores. It has been stated that other factors such as time constraints and human resources may also affect nurses' attitudes about providing preventive care for pressure injury and prioritizing

skincare.⁴ In this study, similar with the study findings of Dilie and Mengistu,²⁵ it was found that nurses' knowledge had an effect on their attitudes towards the pressure injury prevention. In the literature, it is reported that attitudes are of vital importance in nursing, as they help to understand how individuals perceive problems and processes in care and how they determine what is important, good, relevant, and appropriate. Therefore, attitude may be important in influencing behavior, given that pressure injury prevention is a multifaceted issue.⁹ As a result, we believe that increasing the level of knowledge and improving the attitudes of operating room nurses on preventing pressure injury with various training programs are important steps that should be addressed in the prevention of pressure injury in the operating room environment.

Successful knowledge transfer is based on a process that takes into account the clinical context and methods necessary to change and maintain practice.¹⁰ Implementation of effective pressure injury prevention strategies is not limited to insufficient knowledge¹¹ but is affected by many factors such as time management and staff shortages.⁴ In this study, although 94.8% of the operating room nurses had a positive attitude, the most common barriers they encountered in implementing the interventions for the prevention of pressure injury were heavy workload (63.8%), an insufficient number of nurses (61.5%), presence of other priorities (51.1%), lack of time (51.1%), and inadequacy of products/devices/resources that distribute pressure in the operating room (50.6%). Similarly, Kallman and Suserud²⁶ reported that although nurses have good knowledge and a positive attitude towards the prevention of pressure injury, the implementation of preventive interventions in daily practice was incomplete and coupled with time constraints. In the study of Mwebaza et al,²⁹ the main barriers to implementing pressure injury prevention strategies were staff shortages associated with heavy workload (94.6%), lack of pressure

relief devices in the non-cooperated patient (62.5%), insufficient access to pressure injury literature (37.5%), and insufficient coverage (23.2%) about pressure injury during training. In the study of Qaddumi and Khawaldeh,³⁰ the main barriers nurses faced in preventing pressure injury were lack of time (34.1%), lack of personnel (24.4%), patient condition (17.8%), and lack of resources or equipment (19.3%). In the study of Ebi et al,⁸ the primary barriers reported were heavy workload/insufficient staff or lack of time (83.3%), insufficient equipment/resources (67.6%), insufficient training coverage (63%), and the absence of universal guidelines to prevent injuries (59.9%).

Given the nature of the demands in the operating room environment, it is not surprising that nurses' top barriers to pressure injury prevention are heavy workload, inadequate staffing, the presence of other priorities, and lack of time and resources. In the literature, it is stated that creating a positive working environment should start with finding solutions to eliminate the barriers faced by nurses in the implementation of pressure injury prevention strategies, and if these barriers are not managed correctly, nurses will continue to grapple with the attitude-behavior gap.⁹ In this context, it can be recommended that a wound care nurse be included in the operating room team in order to assist in the implementation of pressure injury prevention strategies and to eliminate barriers such as workload and lack of time as well as to plan human, time, and material resources in a timely manner to encourage active practice. While making this planning, managers should consider the high treatment and care costs of pressure injuries and keep in mind that the prevention of pressure injury is much less costly.

LIMITATIONS

There are some limitations to this study. First, the findings cannot be generalized to other cities and to all healthcare professionals, as this study was conducted in operating room nurses of

only 5 hospitals in 1 metropolitan city in Turkey. Second, randomly selected participants may be less motivated to fill out the information questionnaire and the findings may be very poor. Third, although nurses were informed not to use resources such as phones, the internet, and peers during the data collection process, this cannot be guaranteed in this study. There are also various problems with indirect measurement methods, such as social desirability, that affect the validity of attitude instruments. In other words, to maintain a positive self-image, nurses may have answered the questions in a way they thought was socially acceptable. Finally, the fact that this study was conducted during the COVID-19 pandemic period may have negatively affected the knowledge and attitudes of operating room nurses about pressure injury prevention.

CONCLUSION

In this descriptive and cross-sectional study, the level of knowledge for preventing pressure injuries among operating room nurses was weak and their attitudes were satisfactory. There was a positive correlation between nurses' knowledge and attitudes about the pressure injury prevention. Moreover, the nurses faced many obstacles such as heavy workload, low number of nurses, the existence of other priorities, lack of time, and insufficient resources. It is recommended to improve the knowledge and attitudes of operating room nurses to prevent pressure injury through effective in-service training programs and to plan resources such as people, time, and materials in a timely and effective manner to encourage active implementation. ■

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