

# Surgical team's knowledge levels about pre-operative hair removal: a cross-sectional study

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## Abstract

**Aim:** This study aimed to assess the surgical team's knowledge of hair removal practices to prevent surgical site infections.

**Methods:** A descriptive, cross-sectional design was used, involving 145 surgical clinic employees from a university and public hospital between February and August 2023. Data were collected using a 26-question (15 true 11 false statements) survey about hair removal knowledge.

**Results:** The participants' mean age was  $34.77 \pm 7.35$ , with 69.7% female, and 78.6% had received training on surgical site infections. The mean knowledge score for hair removal was  $15.68 \pm 2.29$ , indicating insufficient knowledge. Only 11 of the 26 suggestions regarding hair removal had a correct answer rate above 80%. The highest correct response was that using an electric shaver prevents damage to skin integrity, while the least correct response was that hair should be cut to prevent infection during head and neck surgery. No significant differences in knowledge scores were found based on age, gender, profession, education level, institution, unit, length of service, or training in surgical site infections and hair removal ( $p > 0.05$ ).

**Conclusions:** As a result, it was determined that the knowledge level of the surgical team's knowledge of hair removal practices to prevent surgical site infections was not at the desired level.

**Keywords:** Surgical site infection; perioperative care; nursing care; surgical nursing; hair removal

## 1. Introduction

Surgical site infections (SSI) are defined as incision, organ cavity, or organ infections. These infections can develop in the context of various pathogenesis agents within 30–90 days following a surgical intervention. The morbidity and mortality rates associated with SSI are very high. SSI has been identified as the primary nosocomial infection affecting surgical patients<sup>1-3</sup>. The frequency of SSI is contingent upon various factors, including work style, surgical approach, patient characteristics, and the categorization of infections. The World Health Organization (WHO) reports that the incidence of SSI ranges from 1.2% to 23.6%<sup>3</sup>. It has been estimated that approximately half of SSIs are capable of being prevented through the implementation of evidence-based strategies<sup>1,4</sup>. It has been reported that patients with SSI are twice as likely to die, 60% more likely to stay in the intensive care unit and 5 times more likely to be readmitted to hospital compared to other patients undergoing surgery<sup>5</sup>. With increased morbidity and mortality, SSI leads to increased workload and costs due to increased hospitalizations and readmissions, additional diagnostic tests, and reoperations. SSIs can also lead to increased antibiotic resistance, public mistrust of healthcare services, and legal problems<sup>6,7</sup>.

Hair removal is a simple and effective step in preoperative skin preparation to prevent SSI. In the literature, it is frequently shown that removal of hair in the surgical field increases the risk of developing SSI<sup>1,3,4,7-10</sup>. The Association of Operating Room Nurses (AORN) recommends that hair not be removed in the surgical area as part of skin preparation<sup>11</sup>. In this context, healthcare professionals should be familiar with evidence-based practices for surgical hair removal and implement guideline recommendations to reduce the risk of SSIs<sup>1,7,11</sup>.

It is important to raise the awareness of the surgical team regarding evidence-based knowledge and practices related to hair removal, which is only one of the steps in SSI prevention. However, it is critical to determine the surgical team's level of knowledge and skill in this area in order to provide the necessary education and planning to raise awareness<sup>8,12,13</sup>. In the literature, no study has been conducted to create a knowledge score specific to hair removal. The purpose of this study was to determine the level of knowledge of the surgical team regarding hair removal to prevent SSI. Determining the level of knowledge of the surgical team regarding hair removal will set an example for interventions to correct incorrect practices and take necessary precautions.

## 2. Materials and Methods

### 2.1. Study design, participants, and data collection

A descriptive and cross-sectional study design was adopted. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist was used in the study process<sup>14</sup>. The study was conducted in surgical clinics and operating rooms of a university and state hospital. The population of the study consisted of 220 nurses and physicians working in the surgical clinics and operating rooms of the same hospitals between the dates the study was conducted. The study was completed with 145 healthcare professionals, excluding those who were on vacation (n=25), on medical report (n=26), and those who refused to participate (n=24) in the study. According to the post hoc power analysis using the G\*power 3.0.10 program, the sample size of 145 participants was found to be adequate with an effect size of 0.5, a margin of error of 0.05, and a power of 91%. Surgical and operating room nurses and surgeons were included in the study on a voluntary basis.

The research data were collected by the researchers between February and August 2023. Participants who met the research criteria were interviewed in person, and their verbal and written consent was obtained. The data were collected from 145 participants using a data collection form based on the literature. The research data were collected by the researcher using face-to-face interview technique.

The data were collected in approximately 10-15 minutes. Data were collected using a literature-based information form<sup>1,3,7,8,11</sup>. The information form has two parts. The first part consists of 13 questions assessing the descriptive characteristics of the surgical team and their training in SSI and hair removal. In the study, the level of knowledge of the surgical team's about preoperative hair removal was evaluated with an 26-item form consisting of 15 true and 11 false propositions prepared based on the literature<sup>1,3,8,11</sup>. The information form was evaluated by five experts in terms of language/expression appropriateness and content validity using the Davis technique. Five experts in the field of surgical diseases nursing evaluated the questionnaire forms for content validity. The questionnaire form was reorganized in accordance with the expert recommendations<sup>8</sup>. Then, a total score was obtained for the hair removal information form by giving '1' point for correct answers and '0' point for incorrect answers. The highest possible score is 26, while the lowest possible score is 0.

### 2.2. Ethical Considerations

Permission was obtained from the non-interventional clinical research ethics committee (Date/no 22.07.2022/62), the head physician of the university hospital (Date/no E-18649120-622.03-628926-31.01.2023), state hospital (Date/no E-66442466-604.01.01-215653867-11.05.2023/31), and the participants to conduct the study. In addition, the study was conducted in accordance with the principles of the Declaration of Helsinki 2008.

### 2.3. Data Analysis

The data obtained from the study were analyzed using the SPSS (Statistical Package for Social Sciences) for Windows 27.0 program. Descriptive statistics were employed to calculate the number, percentage, mean, standard deviation, and median values. Due to the data not meeting the criteria for normal distribution, as determined by the Kolmogorov-Smirnov test, nonparametric tests were utilized. Non-parametric methods included Mann-Whitney U test (Z-table value) and Kruskal-Wallis H test ( $\chi^2$ -table value). The statistical significance threshold was set at  $p < 0.05$ , with a 95% confidence interval.

## 3. Results

The mean age of the surgical team was  $34.77 \pm 7.35$  years, 69.7% were female, 84.1% were nurses, and 71% had a university education. It was found that 64.8% of the participants worked in a university hospital and 43.4% in general surgery, with a total working time of  $12.13 \pm 7.84$  years and  $6.54 \pm 6.03$  years in the surgical clinic. Of the surgical team, 78.6% received training on SSI and 51.7% did not receive training on hair removal. There is no statistically significant difference in knowledge scores according to age group, gender, occupation, education level, institution, work unit, work hours, clinic hours, surgical field training, and hair removal training ( $p > 0.05$ ) (Table 1).

The mean knowledge score of the surgical team regarding hair removal is " $15.68 \pm 2.29$  (min=10 max=22)". Only 11 of the 26 items measuring knowledge of preoperative hair removal were answered correctly by 80% of the participants. The highest percentage (97.2%) correctly answered that the purpose of shaving with an electric razor is to prevent disruption of skin integrity, and the lowest percentage (15.9%) correctly answered that hair should be cut during head and neck surgery because it causes infection (Table 2).

## 4. Discussion

SSI is a form of healthcare-associated infection that occurs after surgery<sup>10</sup>. SSI can be caused by the patient's own flora, and the correct application of hair removal as part of skin preparation is important in its prevention<sup>1,15</sup>. Preparing patients for surgery has traditionally involved routine removal of body hair from the surgical incision site. Routine hair removal is performed to improve the appearance of the incision site, to facilitate suturing of the incision, and to facilitate application of adhesive bandages or wound dressings.

Failure to clean hair may be interpreted as inadequate skin cleansing and may be interpreted as an increased risk of SSI<sup>15-17</sup>. Guidelines recommend that hair should not be routinely removed from the surgical site to reduce the risk of SSI<sup>1,3,7,11,15,18</sup>. If hair removal is desired, hair should be removed with a razor, electric shaver (clipper), and depilatory creams. Hair removal guidelines and meta-analyses do not recommend the use of razor blades because they cause visible/invisible cuts to the patient's skin, increasing the risk of SSIs<sup>1-3</sup>. On the day of surgery, hair should be removed using an electric shaver with a disposable head<sup>10,11,15</sup>.

In the study, although the majority of participants had received training in SSI, only eleven out of twenty-six items had a correct response rate above 80%. The rate of correct answers is low for the suggestions regarding the reasons for hair removal, the time and place of the procedure, and the use of depilatory cream.

In the study conducted by Yurtseven and Şişman to determine the level of knowledge about SSI among nurses working in surgical clinics, it was shown that the level of knowledge about preoperative hair removal was low<sup>13</sup>. Sahin's study, which examined nurses' knowledge of SSI in a public hospital, also found that knowledge of hair removal was low<sup>12</sup>. These findings suggest that the surgical team lacked knowledge about hair removal practices, one of the steps in preventing SSIs. Lack of clear information on appropriate preoperative preparation to prevent SSIs may lead to an increase in these infections<sup>19</sup>.

In the study, almost all participants correctly answered that preoperative hair removal with electric shavers prevents SSI. There were high rates of correct responses to the statements about not shaving unless necessary, not using razors to remove hair, using electric shavers to remove hair, and using disposable tools to remove hair.

**Table 1**

Comparison of participant variables and hair removal knowledge scores (n=145)

Variable (n=145)				
Age [ $\bar{X} \pm S.D. \rightarrow 34.77 \pm 7.35$ (year)]				
Total duration of employment [ $\bar{X} \pm S.D. \rightarrow 12.13 \pm 7.84$ (year)]				
Duration of employment in the surgicak clinic [ $\bar{X} \pm S.D. \rightarrow 6.54 \pm 6.03$ (year)]				
			<i>Scores of knowledge</i>	<i>Test statistics *</i>
	<i>n</i>	<i>%</i>	$\bar{X} \pm S.D.$	<i>p</i>
Age group				
<30	41	28.3	15.46±2.09	$\chi^2=0.501$ p=0.778
30-39	64	44.1	15.65±2.32	
≥40	40	27.6	15.95±2.45	
Gender				
Male	44	30.3	15.95±1.79	Z=-1.549 p=0.121
Female	101	69.7	15.56±2.47	
Occupation				
Nurse	122	84.1	15.63±2.33	Z=-1.096 p=0.273
Surgeon	23	15.9	15.96±2.03	
Education				
High school	12	8.3	14.50±1.67	$\chi^2=3.854$ p=0.278
Associate's degree	8	5.5	16.13±1.64	
University	103	71.0	15.79±2.37	
Master or doctorate	22	15.2	15.63±2.28	
Institution				
University hospital	94	64.8	15.61±2.31	Z=-0.479 p=0.632
State hospital	51	35.2	15.80±2.25	
Clinic				
General surgery	63	43.4	15.41±2.41	$\chi^2=4.665$ p=0.198
Urology	20	13.8	15.45±2.16	
Operating room	41	28.3	16.43±2.36	
Another	21	14.5	15.23±1.54	
Duration of employment (year)				
<5	23	15.9	15.34±1.94	$\chi^2=0.624$ p=0.732
5-14	73	50.3	15.69±2.11	
≥15	49	33.8	15.81±2.68	
Duration of employment in surgical clinic (year)				
≤1	22	15.2	15.95±2.12	$\chi^2=0.654$ p=0.721
2-5	55	37.9	15.56±2.04	
>5	68	46.9	15.69±2.53	
Training on SSI				
Yes	114	78.6	15.86±2.22	Z=-1.225 p=0.220
No	31	21.4	15.03±2.45	
Training on hair removal				
Yes	70	48.3	15.94±2.19	Z=0.911 p=0.362
No	75	51.7	15.44±2.36	

\*For non-normally distributed data, "Mann-Whitney U" test (Z-table value) was used to compare the measurement values of two independent groups; "Kruskal-Wallis H" test ( $\chi^2$ -table value) statistics were used to compare three or more independent groups.  $\bar{X}$ =Mean, SD=Standart deviation.

**Table 2**

Hair removal knowledge level of the surgical team

Mean knowledge score $X \pm SD \rightarrow 15.68 \pm 2.29$ min=10 max=22	True answer	
	n	%
The hair in the surgical area should not be shaved unless necessary (T)	66	45.5
The purpose of preoperative hair removal with electric shavers is to prevent skin integrity and surgical site infections (T)	141	97.2
The purpose of hair removal with electric shavers is to ensure that the surgical area is clean and visible (F)	15	20.3
No surgeon approval is required for hair removal (F)	53	36.6
Hair removal should be done in the patient's room (F)	64	44.1
Patient should be taught how to remove hair at home (F)	34	23.4
Hair removal should be done outside the operating room, in a waiting room of the operating room (T)	73	50.3
Hair removal should not be done immediately before surgery (F)	57	39.3
Hair removal should be done the night before surgery (F)	27	18.6
Hair removal should not be done using a razor (T)	116	80
Hair removal should be done using an electric shaver (T)	126	86.9
Hair removal can also be done using a depilatory cream (F)	84	57.9
If the hair removal will be done with a depilatory cream, it is sufficient to ask the patient whether there is an allergy (F)	49	33.8
Before hair removal, the patient's identity must be verified and the procedures to be performed must be explained to the patient (T)	125	86.2
There is no need to check the skin after hair removal (F)	98	67.6
Lighting should be sufficient and privacy should be taken into consideration when removal hair (T)	124	85.5
After hair removal, the patient's skin should be examined for any redness or irritation (T)	133	91.7
Patients should be warned not to use razors or depilatory creams before surgery (T)	124	85.5
Allergies, scars, moles and other skin problems that may affect hair removal should be determined (T)	134	92.4
The device, tool or material used for hair cleaning must be disposable or disinfected (T)	135	93.1
If hair removal is to be done with a depilatory cream, a small amount should be applied to the skin beforehand to check for an allergic reaction (T)	129	89
After the hairs are cut, the hairs that have fallen out should be cleaned from the surface with an adhesive tape (T)	121	83.4
It is sufficient to clean the device, tool or material used for hair cleaning with antiseptic solution (F)	50	34.5
After the hair is cut, the skin should not be washed with water (T)	72	49.7
In head and neck surgery, hair should be cut as it can cause infection (F)	23	15.9
In head and neck surgery, hair should be braided and covered with a non-flammable gel to keep it away from the incision area (T)	101	69.7

T: True information

F: False information

 $\bar{X}$ =Mean, SD=Standart deviation.

The results of the study are similar to the results of the study that examined the level of nurses' knowledge about preoperative hair removal and the level of knowledge about the necessity of hair removal and the necessary tool<sup>8</sup>. Similarly, in the studies, it was mostly assumed to be true that an electric shaver should be used for hair removal<sup>20,21</sup>. In our study results, the level of knowledge of the surgical team about the equipment used in hair removal was higher compared to the literature. As the information that the damage caused by razor blades increases the risk of SSI is frequently emphasized in the literature, its use in clinical practice has decreased. Therefore, the use of electric razors has become more accepted.

Time and place of hair removal is also a risk factor for SSI<sup>7,9,15</sup>. SSI prevention guidelines state that hair removal should be performed immediately prior to surgery and, if possible, in a separate area of the operating room. Hair removal in the operating room is not recommended as it threatens the sterile field. In addition, after hair removal, the shed hair is removed from the skin with tape<sup>7,10,11,15</sup>. In the study, participants had low levels of knowledge about when and where to clean their hair. In reviewing the literature for results related to the timing of hair cleansing, it was found that the level of knowledge was mostly low, similar to the

results of our study<sup>8,21-23</sup>. In a study investigating the level of knowledge of nurses working in surgical clinics about preoperative hair removal, it was reported that the level of knowledge about the place where hair removal should be performed was low, similar to our results<sup>8</sup>. Contrary to the results of the research, there are studies in the literature where the level of knowledge about the timing of hair removal is high<sup>12,20</sup>. In a study by Tank et al. that examined the knowledge of operating room nurses about evidence-based practices for preventing surgical site infections, the majority of participants gave the correct answer for the time of hair removal<sup>20</sup>. In the study by Şahin in which nurses' level of knowledge about surgical site infections was examined, the level of knowledge about the timing of hair removal was found to be high<sup>12</sup>. These results show that there are deficiencies in the translation of current knowledge about hair removal into practice and that the level of knowledge is mostly inadequate. For this reason, it is thought that the correct response rates of the propositions on place and time are at medium and low levels.

The strength of this study is that it is the first study to develop a knowledge score to measure the level of knowledge about hair removal. The relatively small sample size is a limitation of this study. Therefore, the results may not be generalizable. Additionally, collecting data face-to-face may cause bias among participants.

## 5. Conclusion

In conclusion, the findings of the study showed that the level of knowledge of the surgical team regarding preoperative hair removal in SSI prevention was not at the desired level. It is seen that the surgical team has compliance with evidence-based information about some practices in hair removal, but they have contradictory information in some practices. It is recommended that in-service trainings including evidence-based practices on hair removal in SSI prevention should be planned for all professionals in the surgical team and these should be repeated in line with the updates. In addition, it is recommended to conduct studies with a larger population on the use of evidence-based practices in order to raise awareness in the surgical team.

## Statement of ethics

The study was conducted with approval from the Non-Interventional Clinical Research Ethics Committee (Date/No. 22.07.2022/62), the University Hospital Director's Office (Date/No. E-18649120-622.03-628926-31.01.2023), State Hospital (Date/No. E-66442466-604.01.01-215653867-11.05.2023/31), and the participants. Furthermore, the study was conducted in accordance with the principles of the Helsinki Declaration 2008.

## genAI

No artificial intelligence-based tools or generative AI technologies were used in this study. The entire content of the manuscript was originally prepared, reviewed, and approved by both authors.

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## Conflict of interest statement

The authors declare that they have no conflict of interest.

## Availability of data and materials

This Data and materials are available to the researchers.

## Author Contributions

Both authors contributed equally to the article. Both authors read and approved the final manuscript.

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