RESEARCH ARTICLE

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Awareness, Attitude, and Performance of Operating Room Technologists Toward the Prevention of Pressure Ulcers in Patients Candidate for Surgery

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Abstract

Background and purpose: Pressure ulcers are common postoperative complications that increase morbidity, mortality, and healthcare costs. Operating room (OR) technologists play a critical role in preventing pressure ulcers through proper skin care. This study aimed to assess the knowledge, attitude, and performance of OR technologists regarding skin care and pressure ulcer prevention.

Materials and methods: This descriptive-analytical, cross-sectional study was conducted from September to December 2022. Using a census sampling method, we included 58 operating room technologists from the educational hospitals affiliated with Zahedan University of Medical Sciences. Data were collected using a researcher-made questionnaire assessing knowledge, attitude, and performance. The data were analyzed using SPSS version 21, employing descriptive statistics, independent t-tests, and ANOVA.

Results: The mean and standard deviation of knowledge, attitude, and performance scores were 38.00 ± 15.00, 33.00 ± 6.00, and 23.00 ± 4.00, respectively. Most operating room technologists demonstrated a positive attitude, relatively good knowledge, and average performance toward pressure ulcer prevention. There was a significant relationship between knowledge scores and the age of operating room technologists ($p < 0.0001$).

Conclusion: The results of this study highlight the importance of knowledge, attitude, and performance among operating room professionals in reducing the risk of pressure ulcers in patients surgical candidates.. It can be suggested that in the field of skincare and prevention of pressure ulcers in the operating room, basic pressure ulcer training should be included at the beginning of the operating room courses and in the in-service training of operating room experts.

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Introduction

Pressure ulcers are among the most common and costly postoperative complications, recognized as a major care challenge worldwide (1, 2). A pressure ulcer is a localized injury to the skin or underlying tissues, usually occurring over bony prominences as a result of pressure or a combination of pressure and shear forces. Its size and severity vary, ranging from skin erythema to

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muscle and bone damage (3-5). Pressure ulcers are associated with serious complications, including prolonged hospitalization, increased patient mortality, high healthcare costs, reduced quality of life, heightened psychological stress, infections, and delayed recovery (6-10).

Surgical candidates are at high risk of developing pressure ulcers due to immobility caused by anesthesia and risk factors such as surgery duration, positioning, reduced perfusion, lack of protective pads, and improper use of positioning devices(11-13). Pressure ulcers that occur in the operating room increase the risks of sepsis, pneumonia, and postoperative mortality (14). These ulcers typically develop within 48–72 hours after surgery, and their anatomical location correlates with the surgical position. They may present as white erythema, purple discoloration, or blisters (Stage 1 pressure ulcers), or as deep tissue injuries (Stage 2 pressure ulcers)(15-18).

The risk factors for pressure ulcers in the operating room can be categorized into preoperative factors (e.g., fasting duration, patient weight, age, and comorbidities), intraoperative factors (e.g., body temperature, type of anesthesia, blood pressure, humidity, and surgical position), and postoperative factors (e.g., surgery duration and amount of blood loss) (19, 20). Common sites for pressure ulcers include the sacrum, greater trochanter, heels, knees, ankles, medial tibial prominences, fibular heads, scapulae, and elbows (4, 21-24). The most frequent locations for pressure ulcers, particularly in the supine position, are the sacrum and heels, with 60% of ulcers occurring in the pelvic region (25).

Although surgical patients are at risk of developing pressure ulcers during operations, most cases are preventable(26). Operating room technologists, as integral members of the surgical team with close and direct patient contact during surgery, play a crucial role in preventing pressure ulcers. Their responsibilities include correctly identifying at-risk patients, possessing adequate knowledge of preventive principles and methods, delivering appropriate care, and using suitable equipment. Proper evaluation, prevention, and treatment of pressure ulcers require necessary knowledge and skills.The knowledge and attitudes of operating room technologists significantly influence their preventive actions against pressure ulcers (27-29).

Although few studies have examined the knowledge and attitudes of operating room technologists regarding pressure ulcers, findings indicate a lack of sufficient knowledge in this area(15, 30-32). Accurate assessment and the prompt implementation of pressure ulcer prevention strategies rely on the knowledge and skills of operating room technologists. A positive attitude toward pressure ulcer prevention enhances supportive behaviors during surgery, whereas lack of knowledge can lead to misconceptions that negatively impact performance. Therefore, insufficient knowledge and improper practices in pressure ulcer prevention substantially contribute to the occurrence or worsening of pressure ulcers in the operating room (15, 33).

Given the importance of pressure ulcers and their prevention in the operating room, as well as the paucity of related studies in Iran, this study aimed to determine the knowledge, attitudes, and practices of operating room technologists regarding skin care and pressure ulcer prevention in surgical patients. This assessment underscores the necessity of educational interventions for operating room technologists in this regard.

Materials and methods

This research is a descriptive cross-sectional study conducted using a census sampling method, where all individuals within a specific population are examined. The study was carried out on 58 operating room technologists working in the teaching hospitals affiliated with Zahedan University of Medical Sciences during spring 2022 (Persian calendar year 1401).

To determine the required sample size with a 95% confidence level and a margin of error of 0.05, the following formula was used, considering the known population size. After substituting the values into the formula, the sample size was calculated to be 52 individuals. To compensate for a potential 10% dropout rate, the sample size was increased, resulting in a final sample size of 58 participants.

$$n = \frac{NZ^2pq}{Nd^2 + Z^2pq}$$

N: 58 1.96 : z p=q=0.5 d: 0.05

Research Characteristics

Participants in the study were required to have at least an associate's, bachelor's, or master's degree in operating room technology, a minimum of six months of work experience in the operating room, and to provide informed consent to participate in the study.

Data Collection Tool

The data collection tool consisted of four sections:

1. Demographic Information: This section gathered demographic details about participants, including age, gender, marital status, employment type, work experience, and education level.

2. Knowledge Questionnaire: This questionnaire assessed the operating room technologists' knowledge of skin care and pressure ulcer prevention. It consisted of 34 questions, each with three response options: "Yes," "No," and "I don't know." A score of 2 was assigned to "Yes," 1 to "No," and 0 to "I don't know." The total

possible score ranged from 0 to 68. Knowledge levels were classified as:

High: 45–68 Moderate: 23–44 Low: 0–22

3. Performance Questionnaire: This section measured the performance of operating room technologists and included 11 items. Responses were scored as follows: "Always" (3 points), "Sometimes" (2 points), and "Never" (1 point). The total possible score ranged from 11 to 33. Performance levels were categorized as:

High: 23–33 Moderate: 12–22 Low: 1–11

Participants were also asked to describe the procedures they commonly performed in the operating room to prevent pressure ulcers.

4. Attitude Questionnaire: This questionnaire evaluated the technologists' attitudes toward the prevention and management of pressure ulcers, consisting of 9 items based on a Likert scale: "Strongly Agree" (5 points), "Agree" (4 points), "Neutral" (3 points), "Disagree" (2 points), and "Strongly Disagree" (1 point). Total scores ranged from 9 to 45, with attitude levels classified as:

Positive: >30 Neutral: 16–30 Negative: <15

Validity and Reliability

The content validity of the questionnaires was assessed and confirmed by a panel of 10 faculty members who reviewed and revised the tools. The reliability of the tools was established through a pilot study using the test-retest method with 10 operating room technologists. The questionnaires were re-administered two weeks later, and Cronbach's alpha coefficients were calculated as follows:

Knowledge questionnaire: 0.715

Performance questionnaire: 0.720

Attitude questionnaire: 0.710

Ethical Considerations

The study was approved by the ethics committee (IR.ZAUMS.REC.1401.043). The researcher obtained an introduction letter from the research deputy and the necessary permissions to access operating rooms. After explaining the study's objectives to operating room technologists at Ali Ibn Abi Talib, Khatam Al-Anbiya, and Al-Zahra Ophthalmology Hospitals in Zahedan, the researcher invited eligible participants to join the study and complete the informed consent form.

Data Collection Procedure

Eligible participants were selected using census sampling based on the study's inclusion criteria. After explaining the study and assuring participants of the confidentiality of their information, anonymized questionnaires were distributed. Completion of the questionnaires was voluntary, and participants could withdraw at any stage. The technologists completed the questionnaires within 30 minutes, and the responses were collected and coded for analysis.

Data Analysis

Data were analyzed using SPSS software version 21. Descriptive statistics (frequency, percentage, mean, and standard deviation) and inferential statistics (Pearson's correlation, ANOVA, and independent t-tests) were used. A significance level of less than 0.05 was considered statistically significant.

Results

Out of a total of 60 participants, two were excluded due to incomplete questionnaires, resulting in 58 operating room technologists from Zahedan University of Medical Sciences included in the study. The participants' ages ranged from 20 to 60 years.

General Characteristics

- **Gender:** The majority were female (58%).
- **Education Level:** Most participants held a bachelor's degree (98%).
- **Marital Status:** 63% were married.
- **Work Experience:** 60% had less than 10 years of experience.

Table 1. Mean Scores of attitude, performance, and knowledge regarding pressure ulcers

Variable	Mean ± SD
Attitude	33.00 ± 6.00
Performance	23.00 ± 4.00
Knowledge	38.00 ± 15.00

The results indicate that most operating room technologists have:

- **Positive attitudes** toward pressure ulcer prevention.
- **Moderately satisfactory knowledge** regarding pressure ulcers.
- **Average performance** in preventing pressure ulcers.

The mean scores for gender, marital status, and education showed that:

- Knowledge scores were significantly different between single and married participants, as well as between those with a diploma/associate degree and those with a bachelor's degree ($p < 0.05$).
- Single participants and those with a diploma/associate degree had higher knowledge scores about pressure ulcer care.
- Differences in attitude and practice based on these factors were not statistically significant.

The findings reveal:

Technologists employed under temporary contracts demonstrated significantly higher knowledge of

pressure ulcer care compared to other employment types ($p < 0.0001$).

There were no significant differences in attitude or performance based on employment type.

Technologists with less than 10 years of experience had significantly higher knowledge regarding pressure ulcer care ($p < 0.0001$). Differences in attitude and performance were not statistically significant.

Table 2. Mean scores based on employment type

Variable	Official Employment	Contractual Employment	Temporary Employment	P-Value
Attitude	33.00 ± 6.00	31.00 ± 8.00	34.00 ± 4.00	0.084
Performance	23.00 ± 4.00	22.00 ± 3.00	24.00 ± 4.00	0.066
Knowledge	35.00 ± 14.00	37.00 ± 19.00	48.00 ± 13.00	0.0001

Table 3. Mean scores based on work experience

Variable	<10 Years	10–20 Years	20–30 Years	P-Value
Attitude	33.00 ± 7.00	34.05 ± 5.00	30.00 ± 5.00	0.060
Performance	23.00 ± 4.00	23.00 ± 3.00	21.00 ± 2.00	0.074
Knowledge	39.00 ± 15.00	37.00 ± 13.00	22.00 ± 16.00	0.0001

Table 4. Mean scores based on age

Variable	20–30 Years	31–40 Years	41–50 Years	51–60 Years	P-Value
Attitude	35.00 ± 4.00	32.00 ± 7.00	25.00 ± 4.00	30.00 ± 5.00	0.082
Performance	24.00 ± 4.00	23.00 ± 4.00	20.00 ± 2.00	21.00 ± 3.00	0.070
Knowledge	44.00 ± 12.00	37.00 ± 15.00	22.00 ± 4.00	22.00 ± 13.00	0.0001

Younger technologists (20–30 years) showed significantly higher knowledge of pressure ulcer care compared to older age groups ($p < 0.0001$). No significant differences were observed in attitude or performance based on age.

Discussion

The present study aimed to assess the knowledge, attitudes, and practices of operating room technologists regarding skin care and pressure ulcer prevention in patients undergoing surgery. The results revealed that operating room technologists possessed a relatively good level of awareness. However, given the high incidence of pressure ulcers in operating rooms, it is expected that operating room technologists should have more knowledge on the subject, as the current level of awareness is not optimal. This is consistent with the findings of Keser et al. (2020), and Khong et al. (2020) (15, 34). This result may indicate a lack of emphasis on pressure ulcer prevention in educational programs for operating room technologists and in ongoing professional development. Since operating room technologists play a key role in ensuring patient safety, including pressure ulcer prevention during surgery, it is essential for them to have adequate knowledge of the principles and methods for preventing pressure ulcers. Therefore, education on pressure ulcer prevention and management should be integrated into routine training for operating room technologists during their studies and in subsequent in-service training programs.

The results also indicated that operating room technologists with less work experience had more knowledge than those with more experience. This may be related to the larger sample size of technologists with fewer than ten years of experience. Additionally, newly graduated technologists tend to have more up-to-date knowledge and awareness. Furthermore, the results showed that the majority of operating room technologists had a positive attitude towards pressure ulcers. In the study by Falk et al. (2022), although operating room technologists had a positive attitude, those with less experience demonstrated a more positive outlook than those with more experience. This finding contradicts the results of the present study (35). One possible explanation for this discrepancy is that more experienced participants may have provided socially acceptable responses regarding their attitudes. On the other hand, the attitudes of newly graduated technologists could be influenced by their recent education on pressure ulcer prevention. Attitude encompasses feelings and beliefs that influence decision-making and guide behavior. Therefore, understanding the attitudes of operating room technologists towards pressure ulcer care could provide insight into their beliefs and behaviors regarding pressure ulcer prevention and risk assessment, which in turn affects their adherence to preventive strategies.

The findings also revealed that operating room technologists exhibited an average performance in pressure ulcer prevention, and preventing pressure ulcers was not a top priority in their daily tasks. This is in line with the results of Fraser et al. (2012), which indicated that the low performance of nurses in the operating room regarding pressure ulcer prevention

was due to insufficient knowledge, and that educational interventions could improve certain aspects of nurses' knowledge and performance in the operating room (7). In contrast, the study by Cebeci et al. (2022) evaluated operating room nurses' performance as unsatisfactory, which contrasts with the findings of the present study (36). The differences in performance levels between the two studies may be attributed to the larger sample size in Cebeci's study (234 participants) and the use of an observational method to assess performance. There is a need to address current gaps in improving the performance of operating room technologists in pressure ulcer prevention, such as updating organizational guidelines, promoting the use of appropriate scales or organizational assessment forms to evaluate pressure ulcer risk in the operating room, and implementing a documentation system to support preventive actions. Additionally, pressure ulcer risk assessment and prevention should be included in hospital operating room policies and procedures, and education on pressure ulcer risks, preventive strategies, and risk screening using the AORN Monroe tool should be incorporated into operating room nursing education programs and continuous training.

Limitations of this study include the small sample size and the use of self-reporting methods for data collection, which may have led participants to provide socially desirable responses. Furthermore, this study is the first of its kind in Iran to assess the knowledge, attitudes, and practices of operating room technologists regarding pressure ulcers, and as such, there are no comparable studies, with very few international studies available on this topic.

Conclusion

Overall, the results of this study indicate that the knowledge and performance of operating room technologists in pressure ulcer prevention are not optimal. Based on these findings, it is recommended that staff be encouraged to enhance their knowledge, with ongoing supervision from managers to improve their performance and, ultimately, patient safety. Furthermore, it is suggested that basic pressure ulcer education be included in the curriculum for operating room technologist programs and in in-service training. Since the operating room environment is a team-based setting, effective educational interventions targeting all surgical team members' knowledge and performance are needed. Therefore, future research should examine and educate all members of the surgical team involved in patient positioning and transfer (particularly operating room technologists and anesthesiologists), as well as nurses in surgical wards who receive patients postoperatively.

Authors' Contribution

All authors discussed the results and contributed to drafting the final manuscript.

Conflict of Interests

The authors declared no conflict of interest.

Ethical Approval

The protocol of this study was approved under the code of ethics IR.ZAUMS.REC.1401.043 by Zahedan University of Medical Sciences.

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Informed Consent

All primary caregivers of the patients signed an informed consent form.

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