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Knowledge and Implementation of Perioperative Safety Standards Among Perioperative Nurses in a Nigerian Teaching Hospital: An Observational Study

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ABSTRACT

Introduction: Surgical safety remains a critical concern globally due to the significant risk of adverse events during operative procedures and perioperative nurses play an important role in ensuring safe surgical care through adherence to these established safety standards.

Objective: The study assessed knowledge, and level of implementation of perioperative safety standards in the operating theatre of UNIOSUN Teaching Hospital, Osogbo, Osun State.

Method: An observational study design using a quantitative research method was used. Data was collected using a self-designed questionnaire developed by the World Health Organization (WHO) safety checklist and Association of Perioperative Nurses (AORN) guidelines. Data was collected from 14 participants that represented both the sample size and target population. Data was analyzed using descriptive statistics. Results were presented in frequency tables, percentages and charts.

Results: Findings revealed that all participants (14, 100%) had good knowledge of perioperative safety standards. 12(85.7%) participants demonstrated a high level of implementation while 2(14.3%) demonstrated low level. Although high implementation was reported for several safety practices, the WHO surgical safety checklist and surgical smoke evacuation showed areas requiring improvement.

Conclusion: This study suggests that perioperative nurses had high formal exposure, strong knowledge of perioperative safety standards, and high self-reported implementation, indicating a favorable foundation for safe surgical nursing practice. However, published literature consistently shows that knowledge alone does not guarantee sustained compliance, and that stronger outcomes usually require continuing education, supportive leadership, teamwork, adequate resources, and audit-based monitoring.

Keywords: Perioperative Nurses, Perioperative Safety Standards, Knowledge, Implementation.

INTRODUCTION

Surgical safety remains a critical concern globally due to the significant risk of adverse events during operative procedures. The World Health Organization (WHO) reports that surgical complications contribute substantially to morbidity and mortality worldwide, particularly in low- and middle-income countries where healthcare resources are limited [1]. Despite the availability of internationally recognized perioperative safety guidelines such as the WHO Surgical Safety Checklist, implementation remains inconsistent, especially in resource-limited settings [2]. Perioperative nurses, who are central to patient preparation, intraoperative monitoring, infection prevention, and postoperative handover, play a pivotal role in the successful implementation of these standards.

Evidence suggests that major surgeries in developing countries are associated with mortality rates ranging from 5–10%, with approximately seven million patients experiencing major postoperative complications annually, resulting in about one million deaths during or immediately following surgery, many of which are preventable [3,4]. A significant proportion of these adverse events occur within the operating theatre, highlighting the need for strict adherence to perioperative safety standards [3].

The operating theatre is a highly complex and dynamic environment where patient safety and quality nursing care are of utmost priority. Nearly all surgical procedures are carried out in this setting, making it a focal point for patient safety interventions [3].

The rationale for this study is based on the growing global emphasis on patient safety and the central role of perioperative nurses in ensuring safe surgical outcomes. As frontline providers in the operating theatre, perioperative nurses are key implementers of perioperative safety standards, including the WHO Surgical Safety Checklist and AORN guidelines [5,1].

In Nigeria and other African countries, studies assessing perioperative safety practices are scarce, and available data remain limited in scope [6]. In Osun State specifically, there is limited empirical evidence on the extent to which perioperative nurses in tertiary hospitals adhere to established safety standards. This lack of data hampers efforts to improve surgical outcomes and strengthen patient safety initiatives.

This study therefore assessed perioperative safety standards implemented in the operating theatre of UNIOSUN Teaching Hospital, Osogbo, Osun State. The study addressed the following objectives: a) To assess the knowledge of perioperative nurses in UNIOSUN Teaching Hospital, Osogbo, Osun State, and b) to assess the level of implementation of perioperative safety standards among perioperative nurses in the operating theatre of UNIOSUN Teaching Hospital, Osogbo, Osun State.

METHODS

Study Design

An observational study design using a quantitative research method was used for this study using a self-designed questionnaire developed from the World Health Organization (WHO) safety checklist and Association of Perioperative Nurses (AORN).

Setting and Participants

The study was conducted in UNIOSUN Teaching Hospital (UTH), Osogbo. It has an operating room department, and surgical procedures are actively carried out. All perioperative nurses who met the eligibility criteria were recruited from the operating theatre of the selected hospital. The researcher introduced the study and provided adequate information about the study after approval from the relevant hospital authority. Participation was entirely voluntary. Eligible participants who met the inclusion criteria were identified. Due to the relatively small and manageable number of eligible perioperative nurses in the hospital, the entire accessible population was included in the study so, a census (total population) sampling approach was adopted. Thus, the sample size was 14, representing the entire accessible population.

Data Collection Instrument

A self-designed questionnaire was used for quantitative data collection. The questionnaire contained three sections; Socio-demographic characteristics of the respondents, which comprised of eleven (11) variables with the scale of ticking the appropriate option as listed in the questionnaire; Level of knowledge of perioperative nurses on safety standards in the operating room was adopted from the World Health Organization (WHO) safety checklist and Association of Perioperative Registered Nurses (AORN) guidelines, which comprised of twenty-four (24) question items, with Likert scale in ascending order: Strongly agree to strongly disagree (1-5), and the level of implementation of these safety standards by perioperative nurses in the tertiary hospitals, which comprised of fifteen (15) question items with Likert scale in descending order: Always to Never (5-1). Data was collected for a period of three weeks to ensure maximum representation, freedom to participate in the study and a comprehensive data collection.

The World Health Organization (WHO) safety checklist is a standardized checklist which is an evidence-based instrument developed through expert consensus and international testing. The presence of face, content, construct, criterion and external validity have been well established with extensive evidence demonstrating its effectiveness in improving teamwork, reducing surgical complications and lowering perioperative mortality across diverse healthcare settings.(WHO, 2009). It has also demonstrated high reliability particularly in terms of consistency of use across settings.[7]. The AORN safety guidelines formally published by the Association of perioperative Registered Nurses (AORN), a professional organization founded in 1949 was similarly developed through a rigorous evidence-based and expert consensus process and a periodic revision and updating reveals the validity and reliability it demonstrates. [5,1,8]. The questionnaire was reviewed by the researcher's mentor/supervisor for clarity and relevance and was pretested with one perioperative nurse at State Specialist Hospital, Asubiaro, Osogbo, who was not included in the main study.

Variables

Participant-profile variables included age, sex, highest professional qualification, years of perioperative nursing experience, professional rank/cadre, type of operating theatre mostly assigned to, training type received, presence of perioperative safety guidelines. Knowledge level variables covered checklist usage, AORN guidelines, sterile techniques, informed consent, effective communication, patient verification, fire safety precautions, documentation, proper positioning, availability of essential imaging, use of personal protective equipment (PPE), surgical smoke evacuation, and safe handling and disposal of sharps. Implementation Variables assessed the consistency of adherence to these safety standards, including the availability of equipment and supplies.

Data Management and Statistical Analysis

All data were handled with strict confidentiality, kept secure and private and in compliance with ethical research standards. Completed questionnaires were coded and did not contain any identifying information. Only the researcher and, where necessary, the research supervisor had access to the data. Electronic data was password-protected and backed up on an encrypted storage device. Data was processed and analyzed using IBM Statistical Product and Service Solutions (SPSS) software version 27.

For the assessment of knowledge, it was assessed using 24 statements on perioperative safety standards, scored on a five-point Likert scale. The possible total score ranged from 24 to 120. Scores of 61-120 were classified as high self-reported knowledge while scores of 24-60 were classified as low self-reported knowledge. Self-reported implementation was assessed using 15 items scored from 5(Always) to 1(Never), giving a possible total score of 15-75. Scores of 45-75 were classified as good self-reported implementation, while scores of 15-44 were classified as poor self-reported implementation.

Findings were presented using descriptive method of frequency and percentage distribution for clarity. Results were presented in charts and tables.

Ethical Approval

Informed consent was obtained from all participants prior to data collection. They were provided with detailed information about the study. They were required to indicate their consent by selecting an agreement option before proceeding to complete the questionnaire. Ethical permission was obtained from the Ethics and Research Committee of UTH, Osogbo. The approval was issued with Ethical Approval Number UTH/REC/2026/08/1635. This ethical clearance was applied for after a letter of introduction had been obtained from The Operating Room Global Institutional Review Board (TORG-IRB). Then, after the local ethical approval was obtained from the Ethics and Research Committees of the hospitals, administrative permission was gotten from the nursing head of the theatre unit before data was collected.

RESULTS

Sociodemographic Characteristics

The analysed dataset contained 14 filled questionnaires from the participants. Out of 14 participants, 6 (42.9%) participants were within the age of 40-49 years. Almost all, 13 (92.9%) the participants were female. Majority, 8 (57.1%) of the participants highest qualification, was BNSc. Half of the participants 7(50.0%) had less than 5 years of perioperative nursing experience. All the participants had formal training on perioperative safety standards, in which formal perioperative nursing course was the highest type of training received 12 (85.7%). Most of the participants were familiar with the WHO surgical safety checklist 12 (85.7%). (Table 1, Figures 1,2 , 3, 4, 5,6,7,8).

Table 1: Socio-demographic characteristics of participants (N=14)

Variables	Frequency (n)	Percentage (%)
Health institution		
UNIOSUN Teaching Hospital	14	100.0
Formal training on perioperative safety standards		
Yes	14	100.0
Operative theatre has safety guidelines		
Yes	11	78.6
No	3	21.4
Familiar with the WHO surgical safety checklist		
Yes	12	85.7
No	2	14.3

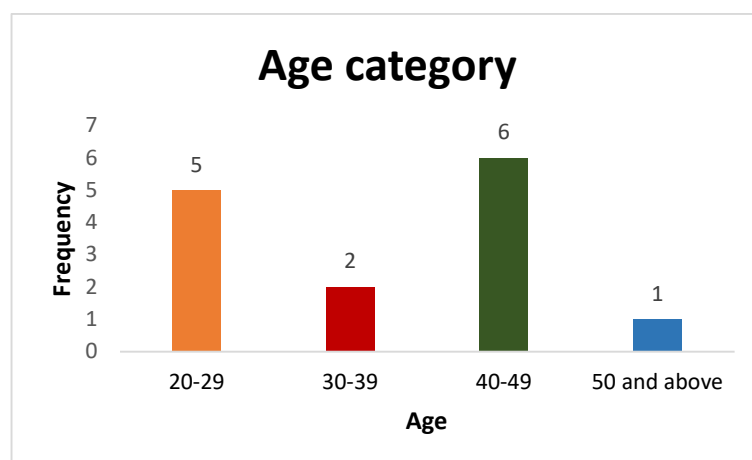


Figure 1 Age of respondents

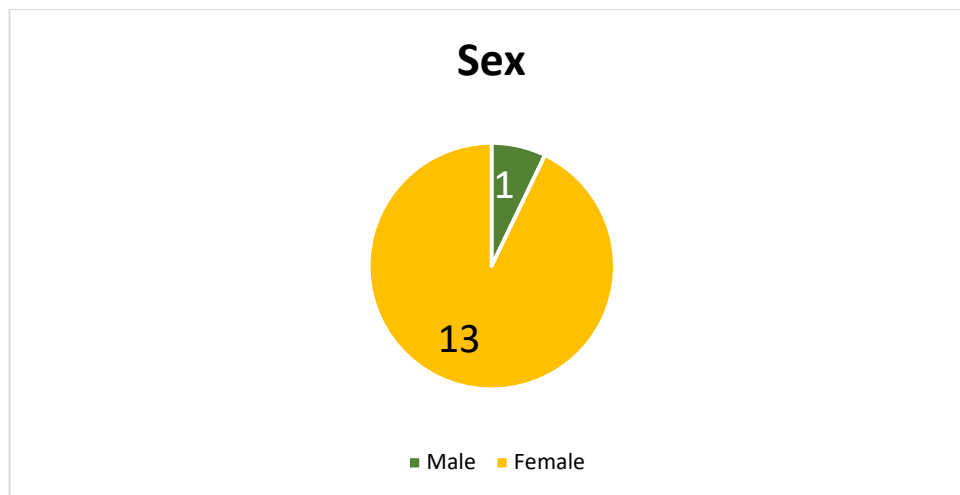


Figure 2: Sex of respondents

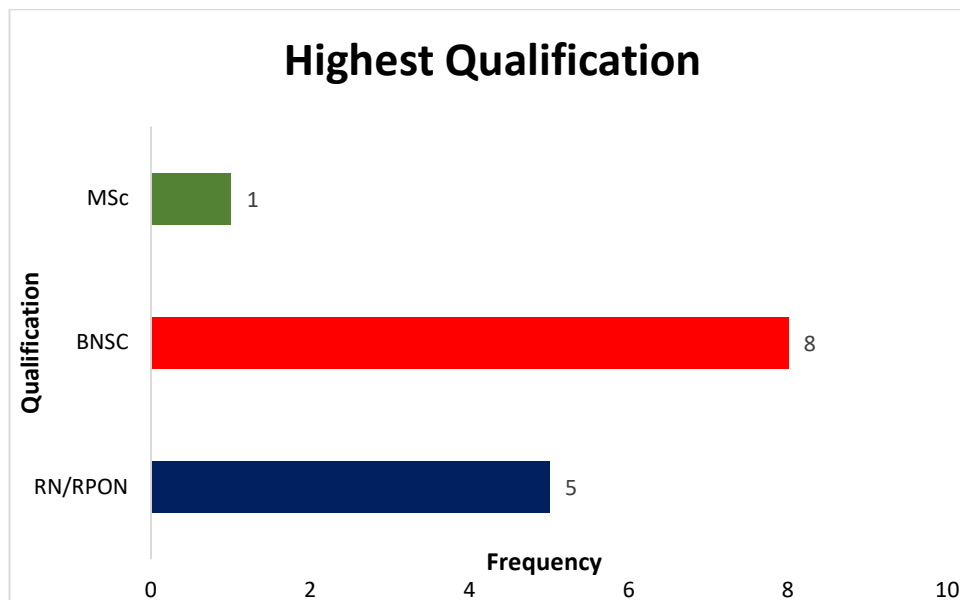


Figure 3 Highest qualification of respondents

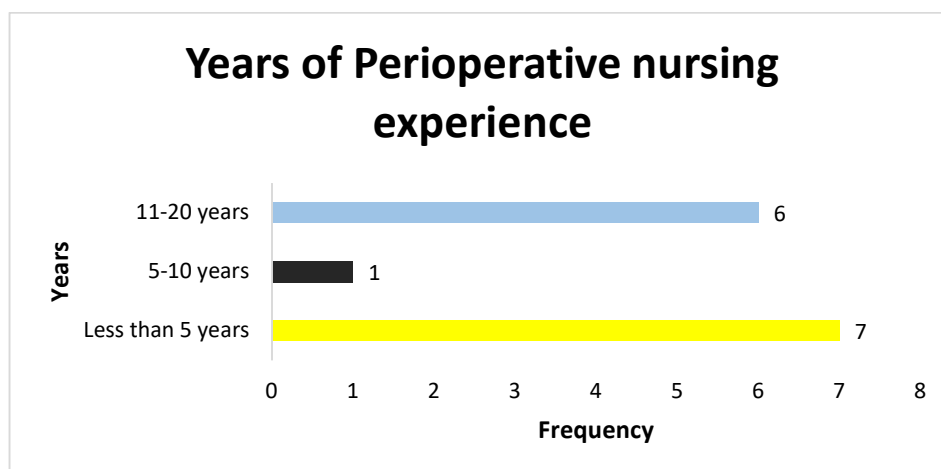


Figure 4: Years of Respondents Perioperative nursing experience

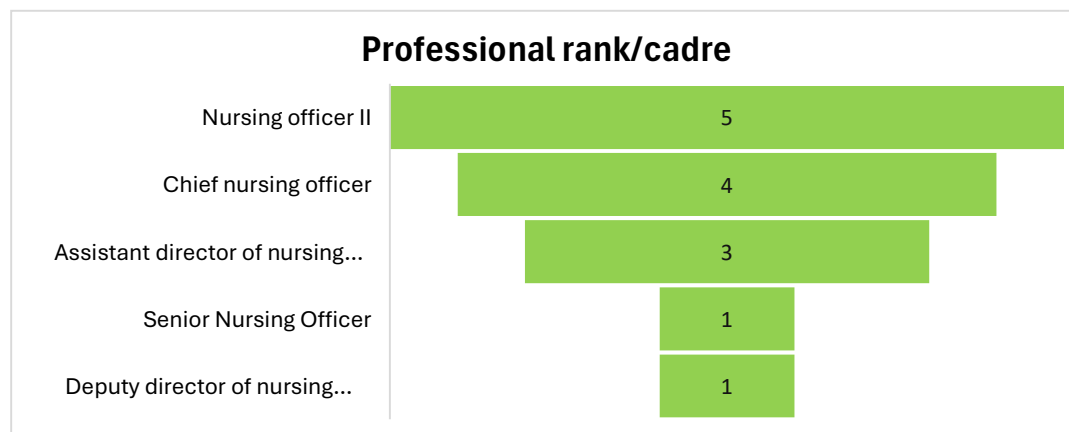


Figure 5: Professional rank/cadre of respondents

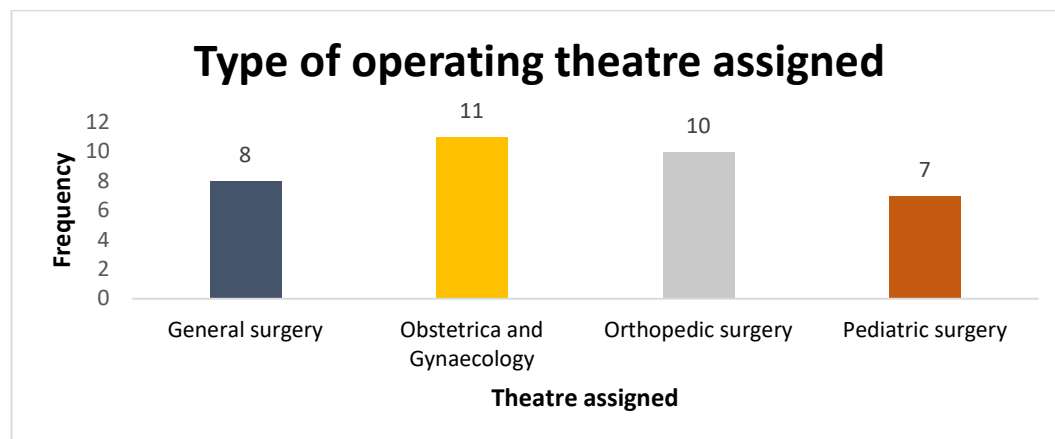


Figure 6: Type of operating theatre assigned

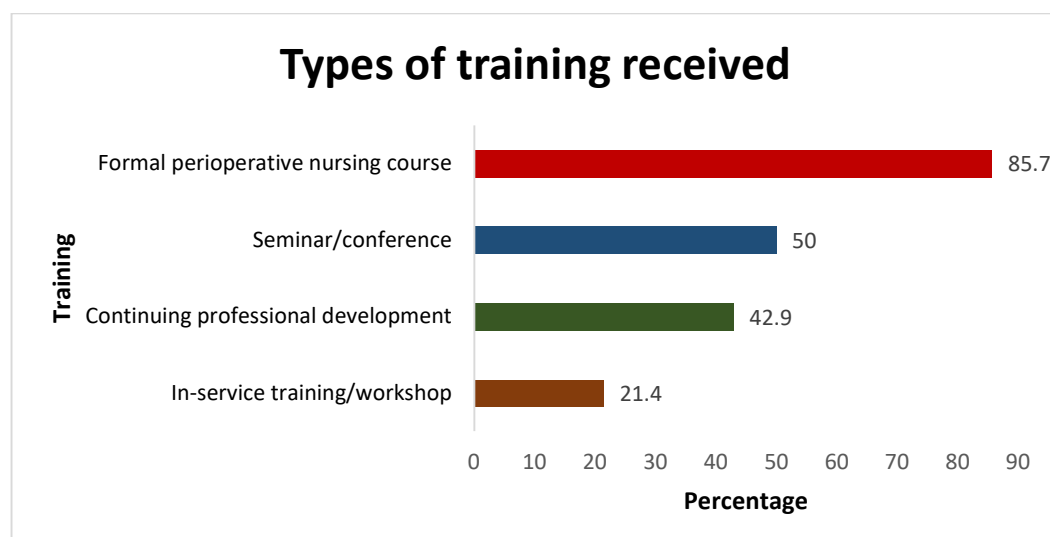


Figure 7: Types of training received by respondents

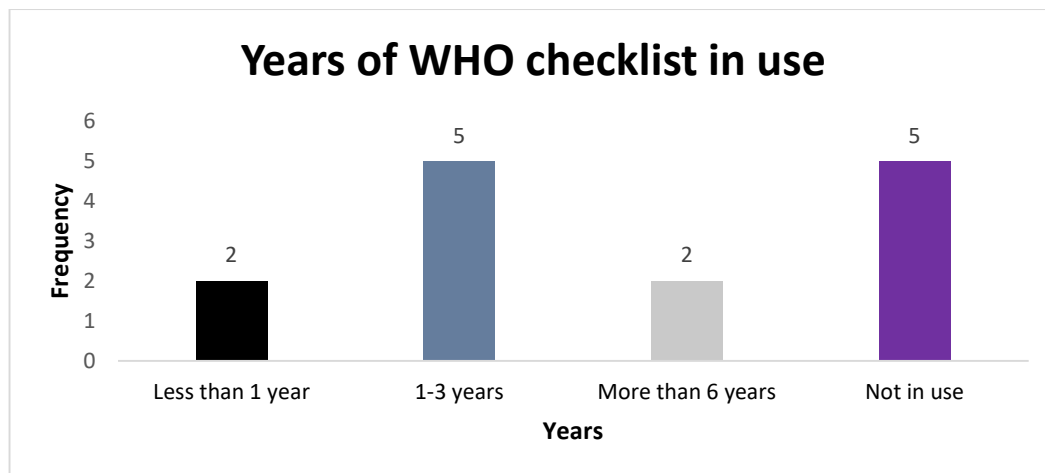


Figure 8.: Years of WHO checklist in use

Knowledge of participants regarding perioperative safety standards

13 (92.9%) strongly agreed that the WHO surgical safety checklist was developed to improve patient safety during surgery (4.9 ± 0.3). All the participants 14 (100.0%) were classified as having a high level of self-reported knowledge agreeing that perioperative safety standards apply to the perioperative, intraoperative, and postoperative phases of care (5.0 ± 0.0). Informed consent should be obtained and documented before surgery, Verification of patient allergies is part of the WHO surgical safety checklist. Almost all the respondents strongly agreed that One purpose of the surgical 'time-out' is to confirm the correct patient, procedure and surgical site, According to AORN guidelines, perioperative nursing practice should be patient-centered and safety-focused, Proper hand hygiene and sterile technique reduce the risk of surgical site infections, Instrument, needle and sponge counts are essential perioperative safety practices, Effective communication among the surgical team improves perioperative patient safety outcomes, Perioperative nurses are key implementers of the WHO surgical safety checklist, According to AORN, a culture of safety encourages healthcare workers to speak up about potential errors without fear of punishment, According to AORN standards, maintaining a sterile field is the responsibility of all members of the surgical team, According to AORN, perioperative nurses should participate in ongoing education and competency validation to maintain safety standards, According to AORN, proper positioning of the patient helps prevent injury and pressure ulcers during surgery, Fire safety precautions in the operating room include managing ignition sources, fuels, and oxidizers, According to AORN, personal protective equipment (PPE) must be worn to reduce exposure to blood borne pathogens, Documentation of perioperative safety practices is essential for quality improvement and legal accountability, Safe handling and disposal of sharps is a critical perioperative safety standard, The surgical safety checklist requires confirmation that prophylactic antibiotics have been administered within the appropriate timeframe, The WHO checklist requires confirmation of anticipated critical events before surgery begins, According to AORN, environmental cleaning between surgical cases reduces the risk of cross-contamination. (Table 2, Figure 9)

Table 2: Knowledge of participants regarding perioperative safety standards (N=14)

Variables	SA (n/%)	A (n/%)	N(n/%)	D(n/%)	SD (n/%)	Mean (SD)
The WHO surgical safety checklist was developed to improve patient safety during surgery	13 (92.9)	1 (7.1)	-	-	-	4.9 ± 0.3
Perioperative safety standards apply to the perioperative, intraoperative and postoperative phases of care	14 (100.0)	-	-	-	-	5.0 ± 0.0

One purpose of the surgical 'time-out' is to confirm the correct patient, procedure and surgical site	12 (85.7)	1 (7.1)	-	-	1 (7.1)	4.6±1.1
According to AORN guidelines, perioperative nursing practice should be patient-centered and safety-focused	12 (85.7)	2 (14.3)	-	-	-	4.9±0.4
Proper hand hygiene and sterile technique reduce the risk of surgical site infections	12 (85.7)	2 (14.3)	-	-	-	4.9±0.4
Instrument, needle and sponge counts are essential perioperative safety practices	13 (92.9)	-	1 (7.1)	-	-	4.9±0.5
Informed consent should be obtained and documented before surgery	14 (100.0)	-	-	-	-	5.0 (0.0)
Effective communication among the surgical team improves perioperative patient safety outcomes	13 (92.9)	1 (7.1)	-	-	-	4.9±0.3
Perioperative nurses are key implementers of the WHO surgical safety checklist	12 (85.7)	2 (14.3)	-	-	-	4.9±0.4
According to AORN, a culture of safety encourages healthcare workers to speak up about potential errors without fear of punishment	12 (85.7)	2 (14.3)	-	-	-	4.9±0.4
According to AORN standards, maintaining a sterile field is the responsibility of all members of the surgical team	13 (92.9)	1 (7.1)	-	-	-	4.9±0.3
Surgical smoke generated during procedures can contain toxic gases and viable microorganisms	9 (64.3)	5 (35.7)	-	-	-	4.6±0.5
According to AORN, perioperative nurses should participate in ongoing education and competency validation to maintain safety standards	13 (92.9)	1 (7.1)	-	-	-	4.9±0.3
Verification of patient allergies is part of the WHO surgical safety checklist	14 (100.0)	-	-	-	-	5.0±0.0
According to AORN, proper positioning of the patient helps prevent injury and pressure ulcers during surgery	13 (92.9)	1 (7.1)	-	-	-	4.9±0.3

Fire safety precautions in the operating room include managing ignition sources, fuels, and oxidizers	12 (85.7)	2 (14.3)	-	-	-	4.9±0.4
The surgical team should confirm availability of essential imaging before incision	9 (64.3)	5 (35.7)	-	-	-	4.6±0.5
According to AORN, personal protective equipment (PPE) must be worn to reduce exposure to blood borne pathogens	12 (85.7)	2 (14.3)	-	-	-	4.9±0.4
Documentation of perioperative safety practices is essential for quality improvement and legal accountability	13 (92.9)	1 (7.1)	-	-	-	4.8±0.5
Safe handling and disposal of sharps is a critical perioperative safety standard	13 (92.9)	1 (7.1)	-	-	-	4.9±0.3
The surgical safety checklist requires confirmation that prophylactic antibiotics have been administered within the appropriate timeframe	12 (85.7)	1 (7.1)	1 (7.1)	-	-	4.8±0.6
The WHO checklist requires confirmation of anticipated critical events before surgery begins	11 (78.6)	3 (21.4)	-	-	-	4.8±0.4
According to AORN, environmental cleaning between surgical cases reduces the risk of cross-contamination	11 (78.6)	3 (21.4)	-	-	-	4.8±0.4

Figure 9: Level of knowledge of participants regarding perioperative safety standards



Implementation of perioperative safety standards by participants

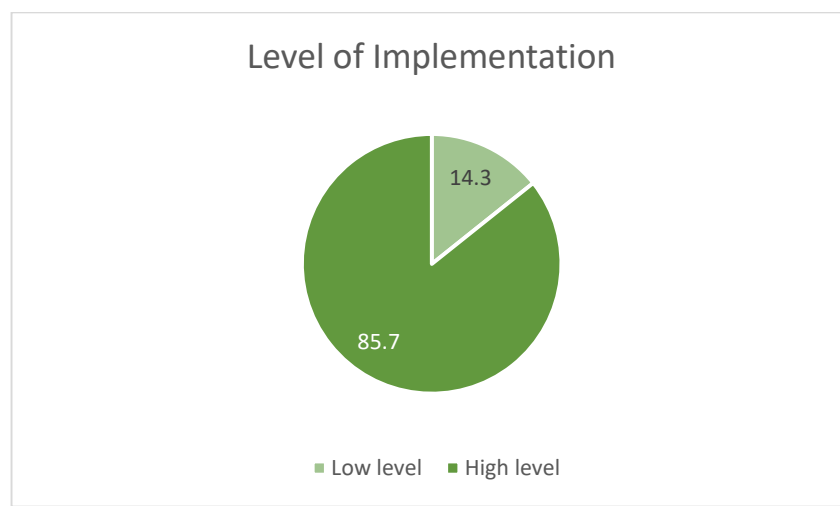
Majority of the participants “Always” verified the patient’s identity using at least two identifiers before surgery 9 (64.3%), confirmed that informed consent has been obtained and properly documented 11 (78.6%), assessed patients for allergies, commodities, and relevant medical history, 8 (57.1%), ensured adherence to perioperative fasting guidelines, 11 (78.6%), ensured strict compliance with sterile technique throughout the procedure, 12 (85.7%), participated in accurate counting of instruments, needles, and sponges 10 (71.4%), communicated clearly with surgeons, anesthetists, and other team members during surgery, 12 (85.7%), ensured perioperative safety standards are fully supported by hospital management 10 (71.4%), AORN safety standards guide my perioperative nursing practice 10 (71.4%), Availability of equipment and supplies supports my ability to implement safety standards 10 (71.4%), ensured complete coverage of hair before entering the operating room 11 (78.6%). Five (35.7%) out of fourteen participants “Often” advocated for smoke evacuation when it is not routinely used. (Table 3, Figure 10)

Table 3: Implementation of perioperative safety standards by participants (N=14)

Variables	Never (n/%)	Rarely (n/%)	Sometimes (n/%)	Often (n/%)	Always (n/%)
I verify the patient’s identity using at least two identifiers before surgery	2 (14.3)	-	-	3 (21.4)	9 (64.3)
I confirm that informed consent has been obtained and properly documented	2 (14.3)	-	-	1 (7.1)	11 (78.6)
I assess patients for allergies, comorbidities, and relevant medical history	2 (14.3)	-	2 (14.3)	2 (14.3)	8 (57.1)
I ensure adherence to perioperative fasting guidelines	2 (14.3)	-	-	1 (7.1)	11 (78.6)
I ensure strict compliance with sterile technique throughout the procedure	2 (14.3)	-	-	-	12 (85.7)
I participate in accurate counting of instruments, needles, and sponges	3 (21.4)	-	-	1 (7.1)	10 (71.4)
I communicate clearly with surgeons, anesthetists, and other team members during surgery	1 (7.1)	1 (7.1)	-	-	12 (85.7)
Perioperative safety standards are fully supported by hospital management	2 (14.3)	-	2 (14.3)	-	10 (71.4)
WHO surgical safety checklist is routinely used in my operating theatre	3 (21.4)	1 (7.1)	4 (28.6)	1 (7.1)	5 (35.7)
AORN safety standards guide my perioperative nursing practice	2 (14.3)	-	1 (7.1)	1 (7.1)	10 (71.4)
Workload and staffing levels allow me to consistently follow perioperative safety standards	2 (14.3)	-	1 (7.1)	5 (35.7)	6 (42.9)
Availability of equipment and supplies supports my ability to implement safety standards	1 (7.1)	1 (7.1)	1 (7.1)	1 (7.1)	10 (71.4)

I ensure the use of smoke evacuation systems during procedures that generate surgical smoke	2 (14.3)	2 (14.3)	3 (21.4)	2 (14.3)	5 (35.7)
I advocate for smoke evacuation when it is not routinely used	2 (14.3)	-	3 (21.4)	5 (35.7)	4 (28.6)
I ensure complete coverage of hair and facial hair before entering the operating room	1 (7.1)	1 (7.1)	-	1 (7.1)	11 (78.6)

Figure 10.: Level of implementation of perioperative safety standards by participants (N=14)



DISCUSSION

Participants were predominantly female, had BNSc, mostly in the 40–49-year age range, which is similar with perioperative and operating room nursing studies that also report female majority samples and degree-level preparation [9]. The age structure in this study is closer to studies reporting mean ages in the late 30s to early 40s than to checklist studies dominated by younger staff with median ages near 30 years [11]. Half of the participants had fewer than five years' experience, which is like studies of early career perioperative nurses, but contrast with studies in which most staff had five to twenty years or more than 10 years of experience [10]. This contrast matters, because the literature repeatedly associates longer experience and specialized operating room training with stronger competency, safer attitudes, and higher checklist compliance [12].

Knowledge of perioperative safety standards

This study found consistently high knowledge, with all participants classified as having good knowledge and strong agreement on core WHO checklist and AORN safety principles. That is more favorable than larger patient-safety surveys using cross-sectional questionnaire tools, where good knowledge is often only moderate rather than universal [11,13]. It is, however, consistent with perioperative-specific checklist studies using awareness and attitude questionnaires that found high awareness, positive attitudes, and strong endorsement of the WHO surgical safety checklist among operating room nurse [9,14,15].

The strongest point of agreement with literature is that education and training are central to knowledge acquisition. This study findings that all participants had formal perioperative safety training closely matches studies showing that initial education, continuing education, and Operating room specific training are associated with higher patient-safety knowledge and perioperative competency [11,16]. At the same time, the literature shows that high knowledge does

not always imply strong attitude or flawless practice; some studies found no direct persistence in specific safety domains even among operating room nurses [13,14].

Implementation of perioperative safety standards

This study showed a high self-reported implementation, especially identity verification, consent confirmation, allergy assessment, fasting checks, sterile technique, surgical counts, communication, and hair coverage. These findings are consistent with survey-based studies using checklist-related instruments, which also show strong self-reported adherence to core preoperative and intraoperative safety practices [17]. They also fit qualitative literature describing perioperative nurses as central implementers of patient identity checks, sterile practice, communication, standardization, and patient advocacy in the operating room [18].

The main contrast to these findings is that the sample reported 85.7% high implementation, whereas studies using audits, observations and mixed methods often show substantially weaker real-world compliance. Direct observational research similarly found overall perioperative safety compliance below 60%, with no SPOT domain reaching the 90% benchmark, showing a clear perception-practice gap [19].

In summary, compared with other literatures using similar cross-sectional questionnaires, attitude scales, audits, and observational tools, this study findings appear unusually strong in both knowledge and self-reported implementation. The comparison suggests that these results align with the literature on the value of training and professional awareness but are more optimistic than studies using observational or audit-based methods, which more often detect incomplete compliance and persistent system-level barriers.

STRENGTHS AND LIMITATIONS

The strength of this study was the inclusion of the entire accessible population of perioperative nurses in the selected hospital. The questionnaire also addressed both knowledge and implementation across several perioperative safety domains. This study appears limited by its observational design, which prevents causal conclusions about whether training, experience, or familiarity with standards produced the high knowledge and implementation levels. It is also limited to using self-administered responses, because self-report measures are vulnerable to recall bias, reporting bias, perceptual bias, and social desirability bias. The very small sample size of 14 participants also limits generalizability and reduces the stability of percentage-based interpretation, particularly when reporting near-universal agreement or practice. Another limitation is the apparent absence of direct observational or audit-based verification of perioperative practice, because studies using validated observation tools often detect lower compliance than questionnaire studies alone. The findings therefore reflect participants' reported knowledge and implementation and should not be interpreted as objective evidence of actual compliance with perioperative safety standards.

IMPLICATIONS FOR PRACTICE

The finding that all participants had formal training, good knowledge, and largely high self-reported implementation implies that training exposure at UNIOSUN Teaching Hospital is likely supporting perioperative safety readiness, which is consistent with evidence that initial education, continuing education, and OR-specific training improve knowledge, confidence, and safety practice. It also implies that perioperative nurses can serve as key drivers of checklist use, standardization, and patient advocacy in the operating room when training is translated into daily routines. At the same time, the literature indicates that favorable self-reports should not be interpreted as proof of uniformly high real-world compliance, because several studies found a clear perception-practice gap between positive attitudes and observed behavior. The smoke evacuation finding in this study especially implies that implementation is uneven across domains, which matches evidence that specific safety areas such as infection prevention, ergonomic protection, and specialized perioperative hazards often remain weaker than general checklist awareness.

CONCLUSION

This study suggests that perioperative nurses had high formal exposure, high self-reported knowledge of perioperative safety standards, and high self-reported implementation, indicating a favorable foundation for safe surgical nursing practice. The overall self-reported implementation score was classified as high in most participants, but implementation varied considerably across individual safety practices. However, published literature consistently shows that knowledge alone does not guarantee sustained compliance, and that stronger outcomes usually require continuing education, supportive leadership, teamwork, adequate resources, and audit-based monitoring. Also, the study supports the view that perioperative nurses at UNIOSUN Teaching Hospital, are well positioned to promote surgical safety but maintaining and validating that performance will require system-level reinforcement, broader evaluation, and future research beyond self-report measures

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CONFLICT OF INTEREST

The authors declare no competing interests.

ARTIFICIAL INTELLIGENCE USE DECLARATION

Artificial Intelligence tools were used to support language editing, formatting, structural organization. The authors retained responsibility for study design, ethical conduct, source verification, dataset validation, interpretation, scientific decisions and final manuscript approval. AI tools were not used to create participants data and entire dataset.

FUNDING STATEMENT

No external funding was received for this study.

DATA AVAILABILITY

The data supporting the findings of the study are not publicly available because of participants' confidentiality and the small size of the study population but may be available from the corresponding author subject to appropriate ethical and institutional considerations.

AUTHORS CONTRIBUTION

Dorcas Iyanuoluwa Odunlade conceived and designed the study, oversaw data collection, performed the descriptive analysis and drafted the manuscript. Myada Ibrahim supervised the study, contributed to the study design and interpretation, and critically revised the manuscript. Both authors approved the final version and agreed to be accountable for all aspects of the work.

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