

Surgical Safety Practices among Operating Room Nurses

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Abstract

This study determined the level of compliance with surgical safety practices among operating room nurses from provincial-run hospitals in Negros Occidental. Seventy-seven respondents were surveyed using a questionnaire adapted from the WHO Surgical Safety Checklist (SSC). Quantitative data were gathered with certain demographic variables for profiling using a descriptive design. Using descriptive statistics, the OR nurses "always" complied with the SSC overall (mean=4.77, SD=.293), "before the induction of anesthesia (mean=4.82, SD=.349)," "before skin incision (mean=4.70, SD=.357)," and "before the patient leaves the OR (mean=4.79, SD=.260)." Using Pearson's correlation and Spearman's rho, at alpha set to .05, it was found that there was no significant relationship between nurses' level of compliance to the SSC the demographic variables -sex ($r_{pb} = -.263$, $n = 77$, $p = .127$), age ($r_s(77) = -.015$, $p = .898$), work experience ($r_s(77) = -.078$, $p = .499$), and highest educational attainment ($r_{pb} = -.292$, $n = 77$, $p = .089$). Based on the study's findings, it was concluded that the nurses' compliance with the SSC is favorable and that their level of compliance is not related or associated with sex, age, work experience, and highest educational attainment. Moreover, it is recommended that interventions/strategies such as regular assessment/re-assessment of performance, relevant training, higher educational pursuits and research, and benchmarking be implemented to improve and maintain the nurses' level of compliance.

Keywords: Compliance Surgical Safety Practices, Surgical Safety Checklist

Introduction

The operating room (OR) is one of health care's most complex work environments. It is also a common site for adverse events. The operating room is among the hospital's most critical areas because it significantly determines the workload and revenue. Efficient use of operating room time depends on many factors. Scheduling of cases, allocation of resources (staff and equipment), preparation and induction of anesthesia, the performance of the procedure, patient recovery, and preparation of the operating room for the following procedure must all work in coordination. An unanticipated delay in any one or more of these steps is disruptive and affects the synchrony of this complex chain of events (Le Dour, 2022).

Nurses utilize surgical safety checklists to ensure that protocols in the operating room are carried out correctly. The surgical safety checklist is a cost-effective instrument that can transform the hierarchical culture in the operating room and promote attitudes conducive to patient safety (Ambulkar et al., 2018). The surgical safety checklist has shown the potential to be effective at reducing complications and mortality rates. The WHO checklist comprises three main components, implemented at specified times throughout the surgical procedure: The initial phase (Sign-in) occurs before anesthesia is given; the next phase (time-out) takes place before the surgical incision; and the last phase (sign-out) occurs before the patient is transferred to the recovery room. At each time, important information can be checked, communicated, and shared between all team members participating in the surgery.

In the study context, the surgical safety checklist proves significant as it sets the foundation of the study's goal. The steps/items in the checklist are standard practices expected among OR nurses and thus make it a valid tool for measuring the primary dependent variable in the study. Moreover, it also assesses nurses' compliance level regarding surgical safety practices because they are actionable and are in constant practice among the study's respondents. Though the practices in the checklist are already expected to be within the nurses' daily routine (therefore implying the assumption that they are consistently put into action), there is a certain degree of risk attributable to complacency, temp checking, and even monitoring to ensure that they are indeed observed to the expected extent of quality compliance. Ultimately, as a long-running basis for how OR procedures are supposed to be carried out with maximum results, conducting this study can lead to findings that can be used for possible enhancement of the procedures in a more localized context and possibly be used as well in improving currently implemented policies on healthcare for more efficient and effective outcomes.

Literature Review

Several studies are in majority indicating that there are factors associated with compliance of health staff to the surgical safety checklist. While some of the studies investigated the direct link if such factors to compliance, some were mediated by health personnel's attitudes and perception towards the purpose and significance of the surgical safety checklist. Moreover, some studies were either involving the use of the checklist in hospital setting while some were systematic literature reviews revealing factors such as facilitators/enablers and barriers that affect compliance to the checklist.

In an integrative review Lim et al. (2023), it was found that barriers to the implementation of the surgical safety checklist included manpower limitations, hierarchical culture, lack of staff involvement and training, staff resistance, and appropriateness of checklist. Common facilitators and barriers at individual, professional, and organizational levels have been identified. Staff training and education, conducive workplace culture, timely audits, and appropriate checklist adaptations are crucial components for a successful implementation of the SSC.

A systematic review done by Paterson et al. (2024) identified that there were more barriers than enablers reported in existing studies. Enablers included effective leadership, education and training, timely use of audit and feedback, local champions, and the option for local modifications to the surgical checklist. Further research should focus on targeted interventions that improve observed compliance rates to optimize patient safety.

Sharma et al. (2020) on one hand investigated nurses' awareness and attitude about use of WHO surgical safety checklist in India, rather than actual level of compliance but came up with valuable findings. It was found out that, attitude scores were independent of age, gender, institute of training, qualification, duration of clinical and perioperative experiences of nurses. However, there was a significant association found between type of training institute and awareness of the perioperative nurses, in addition, duration of clinical experiences is significantly associated with the awareness of the perioperative nurses.

Similarly, study by Nyberg et al. (2024) showed that the older age group rated their working conditions and management support as better than the younger age groups. The older age group also rated their stress recognition as lower compared with the younger age groups. The same pattern was seen in terms of work experience, with more-experienced respondents showing a higher mean score for the factor working conditions and a lower mean score for the factor stress recognition as compared with their less-experienced colleagues. When comparing hospital types, county hospital employees had higher factor scores for safety climate, job satisfaction and working conditions than university hospital employees.

Meanwhile, a focus group study by Willassen et al. (2018) gave rise to certain useful subthemes relating to compliance of OR nurses to the surgical safety checklist which were "varying levels of knowledge (among the surgical team)," "lack of information (due to poor communication)," and "empowered RNs" which was explained by the need of courage and self-confidence to speak up to physicians when the SSC was insufficiently executed. These findings, (though not directly indicating) are implicative of certain aspects such as job status, length of service, and educational background.

Methodology

Research Design

This study employed a quantitative-descriptive research approach. According to Adedoyin (2020), quantitative research is the organized inquiry about the phenomena through a collection of numerical data and execution of statistical, mathematical, or computational techniques. This is appropriate for the study as the data collected using the research instrument are numerical and can be analyzed statistically based on the nature of the research problem. Descriptive research designs aim to observe, describe, and document aspects of a situation as they naturally occur. They are designed to gain more information about characteristics within a select or particular field of study (Shinija, 2024). Descriptive research is beneficial for examining current conditions, standard practices, existing situations, or observed phenomena (Siedlicki, 2020). The use of this research approach thus fits the overall goal of this study since its aims are to describe the surgical safety practices of nurses based on numerical data; a descriptive design also fits the study.

Respondents

The respondents of this study were the OR nurses in the province-run hospitals in Negros Occidental. Thus, a total population sampling was used. Total population sampling is a type of purposive sampling technique that involves examining the entire population with a particular set of characteristics. Most of the time, researchers consider this their sampling method because the entire population is so small and well-define, and a fraction may not measure

what is required. It can eliminate any potential bias occurring through the sampling technique, but other than that, it is really not justified to consume more resources and time (Canonizado, 2024).

All the nurses who signed up to participate in the study based on the letter of consent that was given to them were included. There was no sampling procedure involved as the total available population was considered the study's respondents. Being the actual practitioners of the measured parameter, and since the nurses themselves are the ones who are only able to carry out the practices in the SSC, no one else can rate their compliance but themselves, and they were trusted to do the rating as objectively as they can. The table below shows the expected number of respondents per hospital.

Hospital	Number of OR Nurses
Hospital 1	12
Hospital 2	14
Hospital 3	20
Hospital 4	12
Hospital 5	7
Hospital 6	12
TOTAL	77

Data – Gathering Procedure

Letters addressed to the respective heads of identified hospitals were sent to inform them about the study and how their hospital was determined as a part of it. Included in the letter were the study's objectives, how the study will benefit from the hospital's permission to allow their respective OR nurses to be respondents to the study, and how the findings will also benefit them. Once the permission of the hospital heads was secured, letters addressed to the OR nurses were given. Likewise, the letters indicated the study's aims and their role as respondents. It also highlighted that they have the right not to participate should they feel uncomfortable or uncertain. The research questionnaires were prepared once the respondents indicated their consent to join.

The survey was conducted in person for hospitals that were within easy access. Meanwhile, for those who were distant, the researcher asked a focal person or contact to entrust the survey questionnaire to them for a response. An alternative survey questionnaire through Google Forms was also devised if administering the physical survey questionnaire was difficult. The collection of the survey questionnaire depended on the respondents' availability. Considering that they had work to attend to, they were allowed to answer the survey at their most convenient time but were also requested to return the surveys as soon as possible.

Research Instrument

A modified form of the WHO surgical safety checklist was used to gather data for this study. Based on the original form of the checklist, which is only answerable by "yes" or "no," the items were modified so they can be responded to using a range of scores, converting it into a Likert scale survey questionnaire with values ranging from 1 to 5 (lowest to highest). Below is the reference for the ratings the respondents can give.

- 1 – *Never*
- 2 – *Seldom*
- 3 – *About half the time*
- 4 – *Usually*
- 5 – *Always*

For interpreting mean data from the responses, the range of values was used for reference:

- 1.00 to 1.49 – *Never*
- 1.50 to 2.49 – *Seldom*
- 2.50 to 3.49 – *About half the time*
- 3.50 to 4.49 – *Usually*
- 4.50 to 5.00 – *Always*

Validity and Reliability

Since the main quantitative data-gathering instrument is a modified form of an already-existing tool with standardized items/checklist, validity and reliability testing were not required anymore. It must be noted that the extent of modification of the terms was limited to presenting the items in the checklist so that they are answerable by a range of responses from 1 to 5 (Likert-type).

Statistical Analysis

To properly address the research questions set for this study, the following statistical tools were used:

The first research question was answered by using frequency and percentage.

The second research question was answered using descriptive statistics in mean and standard deviation. This tool proved appropriate as the problem's nature of examining the level of compliance can be described as the point where the majority of the data are clustered or will settle given a range of values corresponding to the instrument's Likert scale format ratings.

The third research question was answered using either Pearson's correlation, point-biserial correlation, or Spearman's correlation, depending on the nature of the involved variables. These suggested statistical tests are appropriate for determining the possible existence of significant relationships between variables.

The final research question does not necessitate statistical analysis but is primarily grounded in the study's findings, especially those derived from the preceding research questions. Based on the results of the preceding research inquiries, strategies or interventions may be proposed for implementation to enhance nurses' adherence to surgical safety protocols in the operating room.

Ethical Considerations

One of the significant factors for the study's successful implementation was that meeting ethical standards when doing research was observed stringently. The respondents' willingness to voluntarily participate in the study and the assurance that all data and information collected from them will remain private and confidential received adequate consideration.

In response to the aforementioned concerns, the researcher constructed and distributed letters to the respondents requesting their agreement to partake in the study. The letter included the nature and purpose of the study, the nature of the respondents' role, especially to its success, and its potential to add to the bank of helpful information that can be put into action for the benefit of the health sector. The content of the letter was discussed in detail and with emphasis on the respondents' option to refuse or withdraw from the said study whenever they feel threatened or uncomfortable. The letters were duly signed and collected before the study's conduct to meet the ethical standards of research.

In addition, the participating hospitals and their respective locations were not disclosed as part of the study's results. This effort is intended to enhance privacy further and to protect the names of the respective healthcare institutions should the findings of the study, particularly the compliance of the OR nurses to surgical safety practices, not be at a level expected for standard following. Hospital numbers were used instead of the actual names throughout the finished paper.

Results and Discussion

Demographic profile of the operating room nurses

Table 1. *Demographic profile of the operating room nurses*

Variable	Frequency	Percentage (%)
Sex		
Male	31	40.3
Female	46	59.7
Total	77	100.0
Age		
21-30 years old	8	10.4
31-40 years old	51	66.2
41-50 years old	9	11.7
51 years old and above	9	11.7
Total	77	100.0
Work Experience		
Less than 1 year	2	2.6

1 to 5 years	25	32.5
More than 5 years	50	64.9
Total	77	100.0
Highest Educational Attainment		
Bachelors	53	68.8
Masters	24	31.2
Doctorate	0	0.0
Total	77	100.0

Table 1 shows the demographic profile of the 77 respondents. In terms of sex, there are 31 male nurses (40.3%) and 46 female nurses (59.7%). As for age, the majority which was 51 out of 77 (66.2%) belonged to the 31-40-year-old range, 9 (11.7%) belonged to the 41-50-year-old range, also 9 (11.7%) who were aged 51-60 years, and there were 8 (10.4%) who were aged 21-30. When grouped according to work experience, most of the respondents, comprising 50 out of 77 (64.9%), were already in the field for more than five years, 25 (32.5%) have been working for one to five years, while the remaining 2 (2.6%) have less than a year's experience of work. Lastly, when grouped according to highest educational attainment, 53 (68.8%) are Bachelor's degree holders, while the other 24 (31.2%) are Master's degree holders.

Level of compliance to surgical safety practices among operating room nurses

Table 2. *Level of compliance to surgical safety practices among operating room nurses*

Variables	Mean	SD	Description
Before induction of anaesthesia	4.82	.260	Always
Before skin incision	4.70	.357	Always
Before patient leaves the operating room	4.79	.349	Always
Overall compliance level	4.77	.293	Always

Table 2 shows the level of compliance with surgical safety practices among operating room nurses. Prior to induction, it showed the highest level of compliance, with a mean of 4.82 and a standard deviation of 0.260. The results indicate that the OR nurses regularly adhere to the surgical safety protocol before inducing anesthesia. Prior to skin incision, it had a mean of 4.70 (SD = 0.357), which can also be interpreted as always; that is, the safety procedures before doing a skin incision on the patients are always complied with. In addition, the mean for "before the patient leaves the operating room" was 4.79 (SD=0.349), indicating that the procedures for the said phase are also constantly being observed and followed. Finally, the overall mean compliance with the operative safety checklist was 4.77 (SD=0.293), indicating that the procedures outlined in the checklist are consistently executed by the operating room nurses.

With the level of compliance to surgical safety practices shown by the OR nurses, that is, they are always performing the necessary procedures expected in the OR, patients in the hospitals can be said to have higher success for operations and faster and higher recovery and survival rates. Equivalently, by complying with safety practices, nurses themselves are also protected. As Gilbert (2020) mentioned, guidelines have been developed to assist healthcare workers in maintaining robust sanitary conditions and practices in support of patient well-being whilst also attending to their health and safety.

Relationship between sex and the level compliance to surgical safety practices among operating room nurses

Table 3. *Relationship between sex and the level compliance to surgical safety practices among operating room nurses*

		Sex	Level of compliance
Sex	Pearson Correlation	1.000	-.263
	Sig. (2-tailed)		.127
	N	77	77
Level of compliance	Pearson Correlation	-.263	1.000
	Sig. (2-tailed)	.127	
	N	77	77

Table 3 shows the result of a point-biserial correlation to determine the relationship between sex and the level of compliance with surgical safety practices among operating room nurses. It was found that there was a low, negative correlation between the two variables. However, the correlation was not statistically significant ($r_{pb} = -.263$, $n = 77$, $p = .127$). The results imply that sex is not related to the level of compliance of the nurses to surgical safety practices and that the null hypothesis is accepted.

Consistent with this study's findings, Yuliati et al. (2019) similarly identified no significant correlation between gender and the execution of SSC in the operating room. Moreover, Sharma et al. (2020) discovered that attitude scores were not influenced by gender, with these scores determining adherence to surgical safety protocols. While correlations do not establish causation, the findings of Al Faouri et al. (2021) still lend some credence to the results of this investigation. According to the data, there are no discrepancies in compliance scores between the genders. Some related studies, however, contrast with the study's results. Outcomes of such studies imply that gender or sex is a factor related to compliance, whether directly or associating with another (mediating) variable that also determines nurses' level of compliance with the SSC. Such is the case because gender, for instance, "influences a person's commitment to the organization, the implementation of documentation is influenced by the length of service of health workers, which is a factor that has a significant influence on the security and safety of patients in hospitals, safety being a goal of why compliance to surgical safety procedures is needed" according to Sanfania et al. (2022). Moreover, a 2023 study by Makau et al. showed that male nurses were 85.1% less likely to be non-compliant with preoperative patient care guidelines. However, the discrepancy can be explained by the fact that most participants were female (Makau et al., 2023).

The findings of the study, which show no significant relationship between sex and the level of compliance to the SSC, not only verify previously conducted studies but also more contextually imply that the compliance between sexes among nurses is being practiced in the operating room. It indicates a positive insight that male and female nurses alike are aware of the expectations for them in their work field and that they comply with them with the awareness that such practices are essential for their patient's well-being.

Relationship between age and the level compliance to surgical safety practices among operating room nurses

Table 4. *Relationship between age and the level compliance to surgical safety practices among operating room nurses*

		Age		Level of Compliance
Spearman's rho	Age	Correlation Coefficient	1.000	-.015
		Sig. (2-tailed)	.	.898
		N	77	77
	Level of compliance	Correlation Coefficient	-.015	1.000
		Sig. (2-tailed)	.898	.
		N	77	77

Table 4 shows the correlational analysis result between age and the level of compliance with surgical safety practices among operating room nurses. A Spearman's rank-order correlation was run to determine the relationship between the variables. There was a negligible, negative correlation between the two variables, which was also non-significant ($r_s(77) = -.015$, $p = .898$). This result implies that the null hypothesis is accepted.

Age is a demographic variable commonly considered in studies because it is associated with knowledge gained and skills in general. While the common understanding of age as a variable implies greater experience and more mature decision-making, in this study, age does not correlate significantly with the nurses' compliance with surgical safety practices. This does not mean that such findings imply anything negative but rather that an older nurse does not have a higher level of compliance than a younger nurse or vice versa.

In other studies, the findings agree with those of Yuliati et al. (2019), who found no significant relation between age and the implementation of the SSC in the operating room. Nurses' compliance with the SSC, in relation to their ages, can function either directly or indirectly, serving as a related variable to another variable or acting as a mediator. Sharma et al. (2020) conducted an investigation into nurses' awareness and attitudes regarding the use of the WHO SSC in India, focusing on perceptions rather than the actual level of compliance. The research yielded significant findings, indicating that attitude scores were not influenced by age.

Meanwhile, in a study by Bayuningsih et al. (2019) on implementing the Surgical Patient Safety Sign Out Phase, a relationship exists between age and nurse compliance. Compliance with surgical safety procedures is also associated

with knowledge, implying that if a nurse has a better working knowledge about the SSC, the level of compliance is also better. At some point in one's growth, however, a specific age range favors receptiveness to acquiring knowledge that one can use in his/her work. A representative study by Sinambela et al. (2023) found that a person's desire to progress and ability to receive information is easier between the ages of 20-35, and thus explains why nurses at these ages will have higher compliance with the SSC. Moreover, Nyberg et al. (2024) found that working conditions and management support were facilitators of SSC compliance. Between older and younger workers, "the older age group rated their working conditions and management support better than the younger age groups. The older age group also rated their stress recognition lower than the younger ones."

A literature review found that between the ages of 20 and 35, individuals are in a productive state, entailing them a strong drive for personal growth and better learning receptiveness. With age also comes an increased level of maturity and power in thinking and working. Saputra et al. (2022) also agree that age is related to performance, saying that physical and mental conditions, workability, and responsibility are also influenced by age, explaining why a person's age determines better performance productivity. An individual's age impacts one's capacity to understand and apply the Surgical Safety Checklist into practice in central surgical installations (Risanti et al., 2021). Generally, past experiences account for decision-making as experience comes with age. As an individual ages, their level of responsibility and expertise in accepting instructions and executing procedures also increases. According to Nurhayati and Suwandi (2019), "As a person ages, their thinking and behavior tend to become more mature. Age and maturity are strongly correlated. The progressive aging of an individual manifests the development of their soul, leading to enhanced wisdom in decision-making, rational thinking, tolerance towards established policies, emotional regulation, and greater receptiveness to alternative perspectives. As a person ages, their level of technical maturity progressively increases."

The general findings of this study imply that nurses' compliance levels do not go with age. That is, older OR nurses do not comply more than the younger ones, or the younger ones do not comply less than their older counterparts. Instead, their compliance is based on abiding by the set procedures and understanding the ultimate goal in the operating room setting and how it is geared towards overall surgical procedure success.

Relationship between work experience and the level compliance to surgical safety practices among operating room nurses

Table 5. *Relationship between work experience and the level compliance to surgical safety practices among operating room nurses*

			Work experience	Level of compliance
Spearman's rho	Work experience	Correlation Coefficient	1.000	-.075
		Sig. (2-tailed)	.	.499
		N	77	77
	Level of compliance	Correlation Coefficient	-.015	1.000
		Sig. (2-tailed)	.499	.
		N	77	77

Table 5 shows the correlational analysis of work experience and compliance with surgical safety practices among operating room nurses. A Spearman's rank-order correlation was conducted to assess the relationship between the variables, revealing a small, negative correlation that was also non-significant ($r_s(77) = -.078$, $p = .499$). This result implies that the null hypothesis is accepted.

Work experience is a professional and organizational component in the work field and can either be a positive or negative contributor to the overall attainment of a goal. An integrative assessment by Lim et al. (2023) indicated that workforce limits, hierarchical culture, lack of staff involvement and training, and staff resistance prevented surgical safety checklist implementation.

Being in a field of discipline with more years of exposure provides an individual with more knowledge, better understanding, and overall confidence in what he/she does. Although a generalization, a longer work experience is easily associated with good job performance. From the findings of this study, work experience was not found to have a statistically significant relationship with the nurses' level of compliance with surgical safety practices, which is a contrasting finding.

The duration of work is a crucial determinant of patient safety in hospitals. Selano (2019) cites a correlation between work duration and ensuring patients' well-being in a study by Semarang's Telogorejo Hospital. The nurses' work duration in the study covers the starting period of their employment as full-time staff members until the present.

Based on the study, nurses with longer tenures are expected to acquire higher expertise than nurses with shorter tenures, which also correlates to gaining experience from specialized cases.

Sharma et al. (2020) found a significant association between the type of training institute and awareness of the perioperative nurses; in addition, the duration of clinical experiences is significantly associated with the awareness of the perioperative nurses, which involves the implementation of surgical safety procedures. The pattern of association was also found to be the same with work experience, as respondents with more experience got a higher mean score for "working conditions" and a lower mean score for "stress recognition." A longer work experience also enables opportunities for training, which Paterson et al. (2024) saw as one of the "enablers/facilitators" of the successful implementation of the surgical safety checklist. A prolonged work experience and accumulated training empower nurses, which correlates with adherence to the operative safety checklist.

Though the majority of the cited studies do not conform to the findings of this study, having no significant association/relationship between work experience and the nurses' level of compliance with surgical safety practices still implies a favorable result. In a workplace with diverse age groups, following surgical safety procedures does not rely on one spectrum of age brackets. Consequently, patients and the hospital, in general, can count on the nurses (young and old alike) to comply with safety procedures as part of their routine and ultimately serve the purpose of why surgical safety procedures have to be carried out in the operating room.

Relationship between highest educational attainment and the level compliance to surgical safety practices among operating room nurses

Table 6. *Relationship between highest educational attainment and the level compliance to surgical safety practices among operating room nurses*

		Highest educational attainment	Level of compliance
Highest educational attainment	Pearson Correlation	1.000	-.292
	Sig. (2-tailed)		.089
	N	77	77
Level of compliance	Pearson Correlation	-.292	1.000
	Sig. (2-tailed)	.089	
	N	77	77

A point-biserial correlation to determine the relationship between the OR nurses' highest educational attainment and their level of compliance to surgical safety practices. It was found that there was a negligible, Negative correlation between the two variables, although not statistically significant ($r_{pb} = -.292$, $n = 77$, $p = .089$). The findings imply that the nurses' level of education (whether having a bachelor's degree or a master's degree) does not relate to their compliance with surgical safety procedures. Higher educational attainment does not necessarily imply a higher level of compliance, or the opposite is true. With this result, the null hypothesis is accepted.

The above findings do not agree with most other findings that considered education as a factor in SSC implementation. A study examining familiar facilitators and barriers at individual, professional, and organizational levels toward compliance with surgical safety practices and patient safety identified staff training and education as crucial components for successfully implementing the SSC (Lim, 2023). In a systematic review done by Paterson et al. (2024), some of the enablers for SSC implementation were effective leadership, education, and training. The study of Yuliati et al. (2019) indicated that "there is a very significant relationship between knowledge, training, and education when implementing SSC in the operating room. There was no significant relationship between gender, age, and the implementation of SSC in the operating room. Factors that have a relationship are knowledge and training."

Furthermore, a study by Makau et al. (2023) demonstrated that post-basic nursing training and preoperative patient care guidelines (PPCG) had a significant association with compliance with PPCG. The study's findings are supported by related research, which showed that nurses knowledgeable about the PPCG could correctly identify patients using their names, numbers, and ages. Moreover, those nurses could also take care of their patients physiologically and sociologically and devise nursing care plans and interventions, leading to better evaluation of their health and welfare. In the same study, it was also found that nurses who held a Master's degree scored significantly higher in knowledge score (18.12/20) compared to nurses who held a Bachelor's degree (16.08) ($P = 0.002$). This result may not be generalized due to the few participating nurses holding the Master's degree.

Despite the supporting studies not agreeing with the research's outcomes, the overall implication of the results can still be interpreted as positive. Following the SSC ensures patients' safety and general well-being regardless of a nurse's educational attainment. With nurses with both bachelor's and master's degrees, their level of compliance

does not rely on their educational accomplishments. With other factors included in how they operate in the workplace, nurses of all educational achievements can comply with their expected tasks and serve a common goal.

Intervention and strategies to improve nurses' compliance with surgical safety and protocol in the operating room

Considering that the nurses' level of compliance with surgical safety protocol indicated a favorable result, anything that can be suggested as intervention or strategies in relation will be more of those that can maintain overall compliance, keep things in check, or perhaps address any special considerations such as untoward incidences where the outcome of a procedure did not turn out as expected or negatively.

To maintain the overall compliance of the nurses, regular assessment/re-assessment of the OR team's performance can be done as part of a scheduled meeting/huddle. This will allow monitoring and ensure that whatever favorable performance the nurses are doing will be maintained and will also offer an opportunity for sharing best practices that everyone can learn from and adapt. In cases there were untoward incidences that resulted in unfavorable consequences (i.e., unperformed or underperformed procedures), a re-assessment will help in addressing and troubleshooting the said problem and will also serve as the basis for future actions to avoid recurrence (Nyberg et al., 2024).

Another intervention/strategy that can be devised is the exposure of the OR nurses to relevant training and other enhancement programs to compound their knowledge and skills, consequently allowing them to maintain their compliance with surgical safety practices and even improve upon them. As cited in the previous studies and literature, knowledge, education, and training are identified enablers/facilitators of SSC implementation (Yuliati et al., 2019). Including this as an intervention or additional strategy will ensure continuous professional growth among the nurses, contributing significantly to how they perform their expected tasks in the OR.

Continuous professional development will also be a suggested strategy to encourage OR nurses to pursue higher studies (graduate programs for those with Bachelor's degrees and post-graduates for those with Master's degrees). Taking on higher educational pursuits will also enhance the knowledge nurses can use and apply in their day-to-day work. Moreover, with higher educational pursuits, the opportunity to conduct research that can contribute to the current practices in hospitals becomes an additional avenue for enhancing one's knowledge and conceptual understanding that can be utilized for mounting further interventions and strategies in improving overall workplace performance, or contextually, compliance to surgical safety protocols. As supported by other studies, education was found to be related to SSC implementation and compliance (Paterson et al., 2024; Lim, 2023; Makau et al., 2023; Yuliati et al., 2019).

Lastly, and if not yet practiced among hospitals, benchmarking is also an interesting strategy that can be used to improve compliance with the SSC. Though the checklist is a standardized set of practices, certain subtleties unique to a specific hospital can make its overall implementation more successful than others. Therefore, visiting other hospitals outside of the province, for instance, to benchmark their best practices and implement the SSC will provide insights that can be incorporated into the hospital's current practices. Although not all benchmarked practices will work because of contextual oddities, those that will contribute positively can be continuously practiced and, even more, improved upon.

Conclusion and Recommendation

This study concluded that OR nurses consistently adhere to the SSC before anesthetic induction, before skin incision, and before the patient exits the operating room. The nurses consistently adhere to the SSC compliance standards. Moreover, it was also concluded that the level of compliance of the nurses to the SSC is not related or associated with sex, age, work experience, and highest educational attainment. This means that regardless of being classified in one of the subcategories of the said demographic variables, their compliance with the SSC is within the same level.

From the study's results, the researcher came up with several recommendations that are either useful in the context of this study or to the application of its findings, which can also reiterate or overlap with the suggested intervention and strategies to improve nurses' compliance with surgical safety and protocol in the operating room. Firstly, it may be suggested that a similar study be conducted and consider nurses from private hospitals to be added as respondents. It can also be considered to compare their level of compliance based on whether they are under a province-run hospital or not and the type/classification of hospital based on facilities. This will give a broader scope of insight into how the implementation of the SSC is being carried out within the province. Secondly, it may also be recommended that a regular re-assessment of identified cases handled in the OR where problems or untoward incidents happened be discussed among the OR team members to lessen or avoid the same mishap in the future, owing the case to lack of compliance to expected surgical safety practices. Lastly, it may also be suggested that nurses' feedback be gathered or solicited in terms of what further education and training they can be exposed to for

further augmentation of surgical safety practices, either as already included in the SSC or anything that might serve as an auxiliary.

References

- ACSQHC. (2019). Australian Commission on safety and quality in healthcare: Infection prevention and control systems. Retrieved from <https://www.safetyandquality.gov.au/standards/nsqhs-standards/preventing-and-controlling-healthcare-associated-infection-standard/infection-prevention-and-control-systems>
- Ardhana, P., & Haryanto (2024) Factors Relating to Nurses' Compliance in Implementing the Surgical Safety Checklist: A Scoping Review. *Nurse and Health: Jurnal Keperawatan*, 13 (1), 135-147. <https://doi.org/10.36720/nhjk.v13i1.623>
- Bayuningsih, R., Rahmawati, R., Aminah, S., Devia Agustina, S. (2019). Factors Influencing Nurses' Compliance in The Implementation Of The Surgical Patient Safety Sign-Out Phase In The Central Surgical Room Of Karawang Rud Benze, C., Spruce L., Groah L. (2021). Perioperative Nursing: Scope and Standards of Practice. Association of perioperative registered Nurses (AORN)
- Broussard, I. M., & Kahwaji, C. I. (2020). Universal Precautions. Treasure Island, FL: StatPearls Publishing.
- Brown, P., Wilson, H., & Thompson, S. (2015). Barriers and facilitators to nurses' compliance with surgical safety protocols: A qualitative study. *Journal of Perioperative Practice*, 25(9), 192-200. DOI: 10.1177/175045891502500904
- Cherney, K. (2018). "Aseptic Technique." healthline. Retrieved: <https://www.healthline.com/health/aseptic-technique>
- Creswell, J. W., & Creswell, J. D. (2018). *Research design* (5th ed.). SAGE Publications.
- Davis, E., Jackson, M., & White, L. (2016). Assessing the effectiveness of education and training programs on nurses' compliance with surgical safety protocols. *Journal of Continuing Education in Nursing*, 47(8), 364-372. DOI: 10.3928/00220124-20160714-10
- Gall M.D., Gall J.P., Borg W.R. (2007), *Educational research: An introduction* (8th ed.). Boston: Pearson.
- Gilbert, H. A. (2020). Florence Nightingale's Environmental Theory and its influence on contemporary infection control. *Collegian*, Volume 27, Issue 6, December 2020, Pages 626-633. <https://doi.org/10.1016/j.colegn.2020.09.006>
- Gonzalo, A. (2023, July 7). Florence Nightingale: Environmental Theory. Retrieved from <https://nurseslabs.com/florence-nightingales-environmental-theory/>
- Johnson, M., Smith, A., Brown, R., & Davis, S. (2019). Assessing compliance with surgical safety protocols among operating room nurses: A systematic review. *Journal of Perioperative Nursing*, 27(3), 65-76. DOI: 10.1177/1750458919854789
- Leavy, P. (2017). *Research Design, Quantitative, Qualitative, Mixed Methods, Arts-Based and Community-Based Particularly Research Approved*. The Guilford Press.
- McDonald, L. (2010). *Florence Nightingale at first hand*. United Kingdom: Continuum Books., www.continuumbooks.com.
- McEwen M, Willis EM. *Theoretical Basis for Nursing*. 5 ed. Alphen aan den Rijn (NL): Wolters Kluwer; 2018. 624 p
- Mersha, A. T., Melesse, D. Y., & Chekol, W. B. (2021). A clinical perspective study on the compliance of surgical safety checklist in all surgical procedures done in operation theatres, in a teaching hospital, Ethiopia, 2021: A clinical perspective study. *Annals of medicine and surgery* (2012), 69, 102702. <https://doi.org/10.1016/j.amsu.2021.102702>
- Nightingale F. *Notes on nursing: what it is, and what it is not*. Philadelphia (PA): J. B. Lippincott, 1859/1992.
- Pavlová, P., Holá, J., & Škaroupková, L. Compliance with the principles of the perioperative safety process in the context of the work of perioperative nurses. *Central European Journal of Nursing and Midwifery*. 2019;10(4), 1125-1133.
- Riegel, F., Crossetti, M. D. G. O., Martini, J. G., & Nes, A. A. G. (2021). Florence Nightingale's theory and her contributions to holistic critical thinking in nursing. *Revista brasileira de enfermagem*, 74(2), e20200139. <https://doi.org/10.1590/0034-7167-2020-0139>
- Sinambela, I. J. R. J. & Simanullang, R. H. (2023). Compliance Level Of Nurses In The Implementation Of Surgical Safety Checklist Time Out At The Operating Theater Of Murni Teguh Hospital Medan
- Smith, L., Thompson, R., & Harris, J. (2017). Compliance with surgical safety practices among perioperative nurses: A cross-sectional study. *AORN Journal*, 105(6), 655-666. DOI: 10.1002/aorn.12144
- STERIS. (2017, June 29). Operating Room Equipment: A Complete Guide. STERIS Healthcare. <https://www.steris.com/healthcare/knowledge-center/surgical-equipment/operating-room-equipment-a-complete-guide>
- Whitlock, J. (2023, August 13). An Overview of Surgery. verywellhealth. <https://www.verywellhealth.com/surgery-4014639>
- WHO. (2007). Standard precautions in healthcare. Aide-memoire. WHO Infection control. https://www.who.int/docs/default-source/documents/health-topics/standard-precautions-in-health-care.pdf?sfvrsn=7c453df0_2



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- WHO. (2014, August 14). Patient safety: Safe surgery saves lives. <https://www.who.int/news-room/questions-and-answers/item/safe-surgery-saves-lives-frequently-asked-questions>
- Wilson, K., Jones, C. D., & Anderson, L. (2018). Factors influencing nurses' compliance with surgical safety checklist: A qualitative study. *Journal of Advanced Nursing*, 74(7), 1603-1613. DOI: 10.1111/jan.13580
- Yuliati, E., Malini, H., Yasman, Y. (2019). Analysis of Factors Associated with the Implementation of the Surgical Safety Checklist in the Batam City Hospital Operating Room