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ORIGINAL RESEARCH

Importance-Performance Analysis of Patient-Safety Nursing in the Operating Room: A Cross-Sectional Study

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Purpose: This study attempted to assess the perceived importance and performance of patient-safety nursing among operating room (OR) nurses and to identify the "concentrate here" level using importance-performance analysis (IPA). The goal was to identify the educational priorities of patient-safety nursing and to use it as foundational data to develop educational programs.

Methods: The IPA of patient-safety nursing (infection control, patient identification, specimen management, surgical coefficient, medical equipment and supplies, high-alert medicines, and damage prevention) was surveyed online for nurses in general hospitals in Korea, and the data of 47 participants were analyzed. Differences in the importance and performance of patient-safety nursing were analyzed using Wilcoxon signed rank test, and IPA was conducted to identify areas on which improvement efforts should be focused.

Results: Within the six areas of OR patient-safety nursing, notable differences in importance and performance were observed in infection control and surgical count areas. The IPA revealed specific items that require "concentrate here", including handwashing, checking the cleanliness and sterility of medical equipment, and conducting 5-Rights checks before administering high-alert medications.

Conclusion: Regular training for OR nurses should encompass preoperative, intraoperative, and postoperative infection control, as well as appropriate surgical counts. In particular, training, monitoring, feedback, and intervention should be provided on hand hygiene, sterilization maintenance, and accurate administration of high-alert medications, which are items included in "concentrate here".

Keywords: patient safety, perioperative, education, importance-performance analysis, nursing

Introduction

As an important healthcare issue worldwide, patient safety is defined as an event or situation that can cause unnecessary harm to patients.[1] In particular, patient-safety incidents in operating rooms (ORs) require special attention, since they can cause fatal and irreversible conditions.[2] There are various types of patient-safety incidents in ORs, namely wrong-site /patient surgery, postoperative residual foreign bodies, errors in surgical instrument reprocessing, pressure ulcers, fires, and hypothermia.[3] Wrong-site surgery is reported to occur in 4.5 out of 10,000 cases,[4] while postoperative residual foreign bodies are reported to occur in 1 out of 6975 cases.[5] The Joint Commission on Accreditation of Health Organization (JCAHO) emphasizes the importance of teamwork, constant quality control, prompt communication, and information-sharing among healthcare professionals to ensure the safety of surgical patients.[6] Moreover, although the Association of PeriOperation Registered Nurses (AORN) has recommended rapid streamlining and standardization of tasks to detect and correct errors that occur during surgery,[7] patient-safety incidents nevertheless continue to occur in ORs. A systematic literature review of adverse events in hospitals reported that surgery-related incidents accounted for 39.6% of all incidents.[8] In Korea, efforts are being made to improve the quality of patient safety through the evaluation of medical institutions. However, the number of patient safety incidents in ORs continues to rise by 2.3% per year.[9] Therefore, patient-safety nursing in ORs is vital when it comes to preventing possible harm or incidents.

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Nurses constitute the largest proportion of healthcare workers in the OR, with OR nurses acting as a conduit in the delivery of all medical services.[10] Accordingly, OR nurses engage in patient safety nursing, delivering both direct and indirect nursing to patients. OR nurses are responsible for maintaining accurate records and smooth operation based on speed, expertise, and advanced technology.[11,12] Patient safety is one of the most important responsibilities of OR nursing. They are responsible for accurately counting surgical instruments, preventing patient damage during all stages of the procedure, and accurately checking patients before surgery to ensure patient safety.[12] They must also undertake additional activities to guarantee the safety of the surgical patients, such as accurate management of specimens collected during surgery, handling of instruments and equipment used in surgery, and infection control.[13] Despite technological and intellectual advances, healthcare remains dependent on human intervention; thus, the perception and performance of nurses in ORs is crucial to ensuring patient safety, as they deliver direct and indirect care immediately next to the patient and contribute the most to patient safety. However, education and training on patient safety nursing in ORs are not systematically implemented in Korea; rather, they are partially conducted by hospitals. While it is accurate that patient safety nursing education programs should align with the unique characteristics of each hospital's OR environment (structure, guidelines, composition of healthcare worker, etc.), there is a pressing need to establish a foundational education program for basic patient safety nursing in the OR. Therefore, it is necessary to first check the priority of the items for patient safety nursing in the OR. A number of preceding studies on OR patient-safety nursing have reported the influence of patient-safety culture.[12,14,15] Other related factors included the experience of patient-safety incidents,[16] the hospital safety system,[13] and clinical experience.[17] Although previous studies have suggested factors related to patient-safety nursing performance, it is necessary to categorize the key items of patient-safety nursing and specifically examine differences in perception and performance so as to formulate effective OR patient-safety nursing training. Importance-performance analysis (IPA) is an effective tool for identifying items that require additional training and priorities for training by visualizing the differences in importance and performance of each item in four quadrants on the x- and y-axes, allowing for easy visual comparison.[18] By identifying the differences between how nurses perceive the importance of OR patient-safety nursing and how much they actually perform it, it will be possible to ascertain the areas that need concentration and reinforcement in OR patient-safety nursing training. Therefore, this study aimed to gather basic data for future educational data development by confirming the importance and performance of patient-safety nursing by OR nurses and using IPA to confirm the educational needs and priorities of patient-safety nursing in OR.

Materials and Methods

Research Design

This descriptive study attempted to identify the importance and performance of OR nurses in patient-safety nursing and to provide a basis for the development of future educational materials by identifying the need for training in OR patient-safety nursing through the use of IPA.

Participants and Data Collection

Participants were OR nurses. The inclusion criteria were nurses who 1) worked in the OR, 2) had more than 6 months of working experience, and 3) understood the purpose of the study and agreed to voluntary participate. The exclusion criteria were nurses who 1) did not currently work in the OR, 2) had less than 6 months of working experience, and 3) did not agree to participate in the study. Approval was obtained from the Institutional Review Board (IRB) of K University before the start of the study (IRB No.: KYH 2023-02-017). Regarding the number of subjects, the minimum required sample size was 44 based on an effect size of 0.5, a significance level of 0.05, and a power of 0.9 in a *t*-test using G*Power 3.1.9. The final number of subjects was determined to be 48 considering a 10% dropout rate.

Data were collected between June 1 and June 30, 2023, using an online questionnaire. Research participants were recruited by uploading recruitment notices and questionnaire links to online bulletin boards (at 2 general hospitals) freely available to nurses. The recruitment announcement outlined the purpose of the study, the inclusion and exclusion criteria, and ensured autonomy of participation by allowing the individuals who consented to proceed to the survey stage. A total

of 48 participants completed the survey, but only the data of 47 participants were used in the final analysis owing to one participant not responding to the importance and performance questions.

Instruments

Patient-Safety Nursing

To measure the patient-safety nursing practices of OR nurses, three questions on high-risk drug management were revised and supplemented based on the International Patient Safety Goals (IPSGs) within the tools developed by Kim and Jeong.13 To enhance clarity, the word "drug" was modified to "high-alert medications", and "two nurses" was specifically described as "scrub nurses and circulating nurses". Seven subsections were created by adding high-alert medications as a sub-factor. To examine whether each item in the revised and supplemented tools was related to the characteristics to be measured, content validation was conducted with two PhDs in nursing, two nurses with more than 10 years of clinical experience in ORs, and two managers from the patient-safety department of a university hospital. All of the items were found to have a content validity index (CVI) of 0.8 or higher, making them suitable for use.

The tool used in this study consisted of 39 items categorized into seven subsections: infection control (six items), patient identification (five items), specimen management (five items), surgical counting (eight items), medical equipment and supplies (four items), high-alert medications (four items), and damage prevention (seven items). Each item in the survey was measured on a 5-point Likert scale, separating importance from performance. Importance was measured on a scale of 1 (not important at all) to 5 (very important), based on the degree of perceived importance of the item in OR patient-safety nursing. Performance was measured on a scale of 1 (never) to 5 (always) based on the extent to which the respondents performed OR patient-safety nursing. Cronbach's α was 0.91 in the current study for both importance and performance.

Sociodemographic Characteristics of the Subjects

The sociodemographic characteristics of the subjects were examined in terms of sex, age, years of experience in the OR, number of times they had received training on surgical patient safety in the last three months, experience with patient-safety incidents, and experience with domestic medical center evaluation and accreditation. Considering the normality of the subjects by group, age, experience in the OR, and number of times they had received training, they were divided into two groups.

Data Analysis

The collected data were analyzed using SPSS 25.0 (SPSS; IBM, Armonk, NY, USA). The general characteristics of the participants were identified by frequency and percentage, while the differences in patient-safety nursing based on the general characteristics of the participants were analyzed using the Mann–Whitney *U*-test—a non-parametric method. Differences in the importance and performance of patient-safety nursing were analyzed using a Wilcoxon signed rank test, and IPA was performed for visualization. The centerline of the IPA matrix was divided into four levels—"Keep up the good work", "Concentrate here", "Possible overkill", and "Low priority"—based on the mean of importance and performance.[19]

Results

General Characteristics of the Subjects

The subjects' general characteristics included sex, age, experience in the OR, number of times they had received training on surgical patient safety, experience in medical center evaluation and accreditation, and experience in patient-safety incidents. Overall, 89.4% of the subjects were female, with a mean age of 36.60±8.80 years. The average number of years of experience in the OR was 13.48±10.18, with 42.6% having less than 10 years and 57.4% having more than 10 years. Regarding the number of times they received training on surgical patient safety, 61.7% had received one or fewer training sessions, and 38.3% had received two or more. Additionally, 85.1% had experience with medical center evaluation and accreditation, while 36.2% had experience with patient-safety incidents (Table 1).

Table 1 General Characteristics of Participants (n=47)

Characteristics	Categories	n	%	Mean±SD
Gender	M F	5 42	10.6 89.4	
Age (yr)	< 40 ≥ 40	25 22	53.2 46.8	36.60±8.80
OR career (yr)	< 10 ≥ 10	20 27	42.6 57.4	13.48±10.18
Experience of patient-safety education	< 2 ≥ 2	29 18	61.7 38.3	
Experience of medical institution evaluation certification	No Yes	7 40	14.9 85.1	
Experience of patient-safety incident	No Yes	30 17	63.8 36.2	
Total		47	100.0	

Abbreviation: OR, operation room nursing.

Differences in the Importance and Performance of or Patient-Safety Nursing

The median importance of OR patient-safety nursing was 4.85 (Mean±SD: 4.79±0.22), while the median performance was 4.82 (4.78±0.24); the difference between importance and performance was not statistically significant. When divided into seven sub-factors of OR patient-safety nursing, infection management (z=2.144, p=0.032) and surgical count (z=2.110, p=0.035) showed a statistically significant difference in importance and performance. Infection management recorded a median importance of 4.83 (4.68±0.36) and a median performance of 4.67 (4.54±0.46), which was lower than importance. Surgical count recorded a median importance of 4.88 (4.77±0.26) and a median performance of 5 (4.82 ±0.29), which was higher than importance (Table 2).

The Importance and Performance of or Patient-Safety Nursing by General Characteristics

When analyzing the differences in importance and performance according to general characteristics, only some importance results exhibited differences. The importance of OR patient-safety nursing showed a statistically significant

Table 2 Importance-Performance Comparison

No	Item	Importance (Median) M±SD	Performance (Median) M±SD	Difference M±SD	z	p
1	Compliance with hand hygiene regulations	(5) 4.85±0.36	(5) 4.68±0.56	0.17±0.48	2.309	0.021
2	Close door during surgery	(5) 4.64±0.61	(5) 4.34±0.84	0.30±0.55	3.300	0.001
3	Wearing protective equipment	(5) 4.62±0.57	(5) 4.43±0.80	0.19±0.74	1.789	0.074
4	Environmental management for surgery of infected patients	(5) 4.38±0.74	(4) 4.28±0.85	0.11±0.73	0.994	0.320
5	Surgical instruments management for infected patients	(5) 4.85±0.42	(5) 4.87±0.34	−0.02±0.39	0.378	0.705
6	Coordinate surgery schedules for infected patients	(5) 4.72±0.65	(5) 4.66±0.60	0.06±0.76	0.774	0.439
A	Infection management	(4.83) 4.68±0.36	(4.67) 4.54±0.46	0.13±0.42	2.144	0.032
7	Specimen identification and recording	(5) 4.89±0.31	(5) 4.85±0.42	0.04±0.46	0.632	0.527
8	Management according to specimen type	(5) 4.91±0.28	(5) 4.91±0.28	0.00±0.36	0.000	1.000
9	Use of exclusive containers for specimens	(5) 4.74±0.49	(5) 4.83±0.43	−0.09±0.46	1.265	0.206
10	Attach specimen label	(5) 4.87±0.40	(5) 4.96±0.20	−0.09±0.46	1.265	0.206
11	Management of human extracts	(5) 4.83±0.43	(5) 4.89±0.31	−0.06±0.53	0.832	0.405

(*Continued*)

Table 2 (Continued).

No	Item	Importance (Median) M±SD	Performance (Median) M±SD	Difference M±SD	z	p
B	Specimen management	(5) 4.85±0.25	(5) 4.89±0.25	−0.04±0.33	1.203	0.229
12	Patient identification with more than one piece of information	(5) 4.98±0.15	(5) 4.94±0.25	0.04±0.29	1.000	0.317
13	Check the surgical site mark	(5) 4.98±0.15	(5) 4.91±0.35	0.06±0.25	1.732	0.083
14	Time-out	(5) 4.79±0.51	(5) 4.74±0.61	0.04±0.66	0.312	0.755
15	Procedure in case of patient identification error	(5) 4.87±0.40	(5) 4.85±0.47	0.02±0.44	0.333	0.739
16	Check "5 Rights" before medication	(5) 4.87±0.40	(5) 4.81±0.45	0.06±0.32	1.342	0.180
C	Patient identification	(5) 4.90±0.20	(5) 4.85±0.33	0.05±0.33	0.673	0.501
17	Medical item sterilization check	(5) 4.81±0.45	(5) 4.72±0.54	0.09±0.54	1.069	0.285
18	Sealing of medical item, checking the expiry date, use	(5) 4.85±0.36	(5) 4.85±0.47	0.00±0.51	0.000	1.000
19	Gas (CO2, Argon, N2, etc.) safety check	(5) 4.38±0.74	(5) 4.30±0.91	0.09±0.93	0.613	0.540
20	Check medical equipment before surgery	(5) 4.79±0.51	(5) 4.83±0.38	−0.04±0.59	0.500	0.617
D	Medical equipment and item management	(5) 4.71±0.37	(5) 4.68±0.48	0.03±0.49	0.000	1.000
21	Storage of high-alert medications	(5) 4.81±0.50	(5) 4.94±0.25	−0.13±0.49	1.732	0.083
22	High-alert medications 5-Rights check	(5) 4.87±0.40	(5) 4.77±0.52	0.11±0.48	1.508	0.132
23	High-alert medications checked by 2 people	(5) 4.74±0.53	(5) 4.68±0.63	0.06±0.67	0.660	0.509
24	Dispose of high-alert medications immediately after use	(5) 4.68±0.56	(5) 4.70±0.55	−0.02±0.57	0.250	0.803
E	High-alert medications	(5) 4.78±0.34	(5) 4.77±0.39	0.01±0.42	0.044	0.965
25	Use only x-ray detectable surgical gauze	(5) 4.38±0.85	(5) 4.45±0.97	−0.06±0.82	0.513	0.608
26	Use gauze without cutting	(5) 4.38±0.82	(5) 4.51±0.86	−0.13±0.80	0.847	0.397
27	All counted gauze remain until surgery is over	(5) 4.96±0.20	(5) 4.94±0.25	0.02±0.25	0.577	0.564
28	Do not use count items before count is completed	(5) 4.68±0.52	(5) 4.83±0.43	−0.15±0.55	1.087	0.071
29	Checking with circulating nurse and scrub nurse during counting	(5) 4.87±0.40	(5) 4.94±0.32	−0.06±0.48	0.828	0.408
30	Check broken sharps complete	(5) 4.91±0.35	(5) 4.94±0.25	−0.02±0.39	0.378	0.705
31	After checking the gauze count, inform the surgeon and record	(5) 4.94±0.25	(5) 4.98±0.15	−0.04±0.29	1.000	0.317
32	Procedure in case of surgical count error	(5) 5.00±0.00	(5) 4.98±0.15	0.02±0.15	1.000	0.317
F	Surgical count	(4.88) 4.77±0.26	(5) 4.82±0.29	−0.05±0.31	2.110	0.035
33	Attach electrode plate to appropriate area	(5) 4.89±0.37	(5) 4.87±0.40	0.02±0.25	0.577	0.564
34	Electrode plates are used according to the patient's age and weight	(5) 4.79±0.55	(5) 4.85±0.42	−0.06±0.38	1.134	0.257
35	Operating room environment management	(5) 4.72±0.50	(5) 4.74±0.57	−0.02±0.57	0.250	0.803
36	Check the side rail when moving the patient	(5) 4.96±0.20	(5) 4.91±0.28	0.04±0.20	1.414	0.157
37	Fix patient bed wheels	(5) 5.00±0.00	(5) 4.98±0.15	0.02±0.15	1.000	0.317
38	Safety belt use during surgery	(5) 4.91±0.28	(5) 4.83±0.43	0.09±0.46	1.265	0.206
39	Use of pressure sore prevention pads when positioning the patient	(5) 4.81±0.40	(5) 4.81±0.54	0.00±0.63	0.277	0.782
G	Damage prevention	(5) 4.87±0.21	(5) 4.86±0.26	0.01±0.22	0.021	0.984
	Total	(4.85) 4.79±0.22	(4.82) 4.78±0.24	0.02±0.26	0.126	0.900

difference in training experience (z=−2.322, p=0.020), with a median of 4.82 (4.74±0.23) for those with two or more training experiences compared to 4.85 (4.87±0.17) for those with one or fewer training experiences. There were no differences between the groups in terms of sex, age, years of experience in the OR, medical center evaluation and accreditation experience, or experience with patient-safety incidents (Table 3).

The Needs for Training in or Patient-Safety Nursing Based on the IPA

For the IPA, a two-dimensional matrix with importance as the x-axis and performance as the y-axis was drawn, and the points where the scores of importance and performance of OR patient-safety nursing met were placed in four quadrants, centered on

Table 3 Differences in Importance and Performance According to General Characteristics (n=47)

Characteristics		Importance (Median) M±SD	z	p	Performance (Median) M±SD	z	p
Gender	M	(4.92) 4.90±0.12	−1.27	0.215	(4.90) 4.74±0.38	0.312	0.776
	F	(4.82) 4.78±0.22			(4.82) 4.78±0.23		
Age (yr)	<40	(4.82) 4.76±0.21	−1.55	0.108	(4.77) 4.75±0.25	1.307	0.191
	≥40	(4.88) 4.83±0.22			(4.88) 4.81±0.24		
OR career (yr)	0–9	(4.82) 4.74±0.23	−0.52	0.604	(4.77) 4.77±0.22	0.746	0.456
	≥10	(4.85) 4.87±0.17			(4.87) 4.78±0.29		
Experience of patient safety education	≤1	(4.82) 4.77±0.23	−2.32	0.020	(4.79) 4.74±0.27	0.825	0.410
	≥2	(4.94) 4.81±0.21			(4.88) 4.80±0,22		
Experience of Medical institution evaluation	No	(4.64) 4.68±0.31	0.41	0.420	(4.74) 4.70±0.34	0.495	0.629
	Yes	(4.85) 4.81±0.19			(4.87) 4.79±0.23		
Experience of patient safety incident	No	(4.83) 4.79±0.20	−0.66	0.511	(4.81) 4.76±0.25	0.645	0.519
	Yes	(4.85) 4.81±0.24			(4.90) 4.80±0.23		

Abbreviation: OR, operation room nursing.

the mean of 4.79 for importance and 4.78 for performance. Items with a score of 4.79 or higher were considered to be of high perceived importance, and items scoring 4.79 or lower were considered of low perceived importance. Regarding performance, items with a score of 4.78 or higher were considered to be of high perceived performance, and those scoring 4.78 or lower were considered of low perceived performance (Figure 1). Based on the IPA analysis, the areas on which to focus

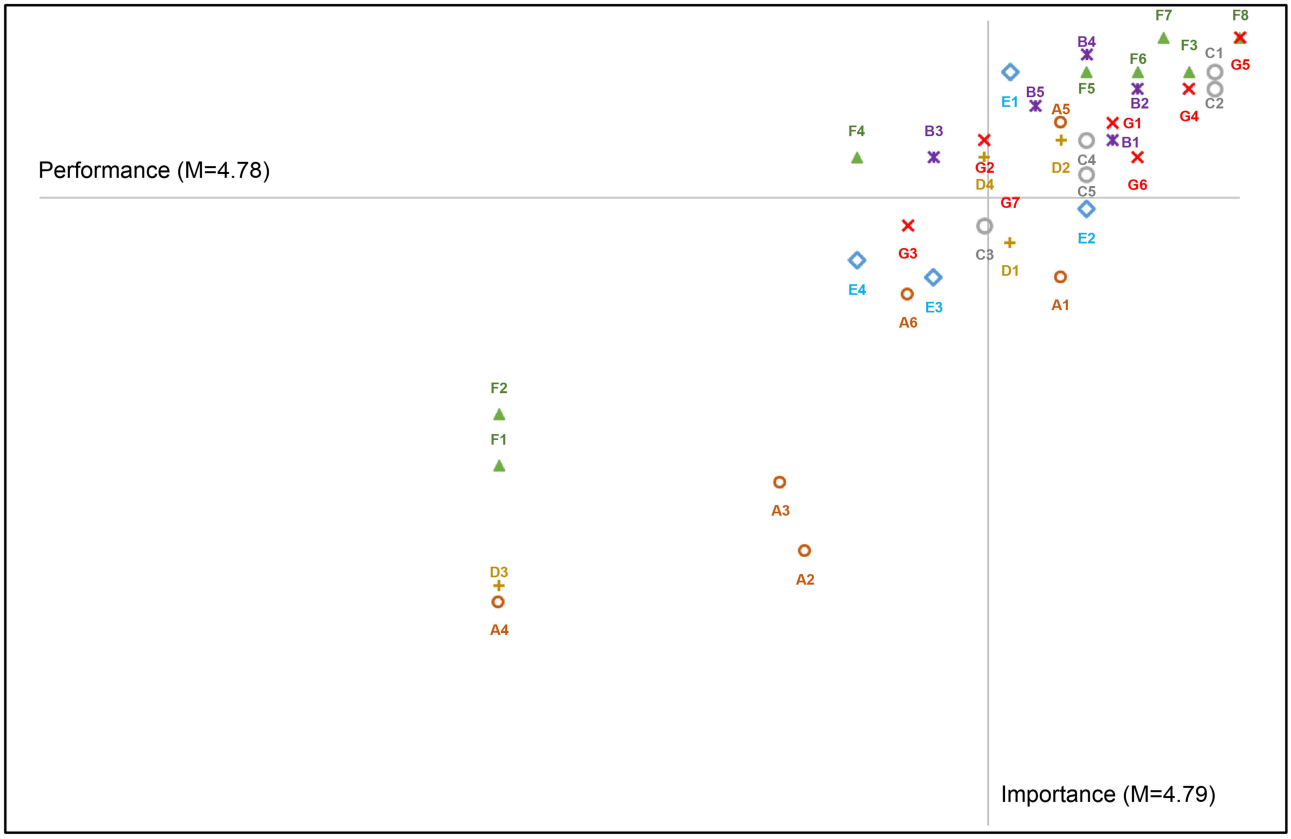

Figure 1 Importance-performance analysis of patient-safety nursing.
Notes: A: infection management; B: specimen management; C: patient identification; D: medical equipment and item management; E: high-alert medications; F: surgical count; G: damage prevention.

improvement efforts ("Concentrate here") that showed high importance but low performance were "I follow the hospital's hand hygiene protocol (Item 1)" in the infection control area, "I check the cleanliness and sterility of medical equipment before use (Item 17)" in the supplies management area, and "I check the 5 Rights before administering high-alert medications to surgical patients (Item 22)" in the high-alert medications area (Figure 2).

Possible overkill		Keep up the good work	
9 Use of exclusive containers for specimens	B3	5 Surgical instruments management for infected patients	A5
20 Check medical equipment before surgery	D4	7 Specimen Identification and Recording	B1
28 Do not use count items before count is completed	F4	8 Management according to specimen type	B2
34 Electrode plates are used	G2	10 Attach specimen label	B4
		11 Management of Human Extracts	B5
		12 Patient identification(name, medical number)	C1
		13 Check the surgical site mark	C2
		15 Procedure in case of patient identification error	C4
		16 Check '5 right' before medication	C5
		18 Sealing of medical item, checking the expiry date, use	D2
		21 Storage of high-risk drugs	E1
		27 All counted gauze remain until surgery is over	F3
		29 Checking 2 nurses surgical item counting	F5
		30 Check broken sharps complete	F6
		31 Read and record gauze count results	F7
		32 Procedure in case of surgical count error	F8
		33 Attach electrode plate to appropriate area	G1
		36 Check the side rail when moving the patient	G4
		37 Fix patient bed wheels	G5
		38 Safety belt use during surgery	G6
		39 Use of pressure sore prevention pads	G7
Low priority		**Concentrate here**	
2 Close door during surgery	A2	1 Compliance with hand hygiene regulations	A1
3 Wearing protective equipment	A3	17 Medical item sterilization check	D1
4 Environmental management for surgery of infected patients	A4	22 High-risk drugs 5 right check	E2
5 Coordinate surgery schedules for infected patients	A6		
14 Time-Out	C3		
19 Gas (CO2, Argon, N2, etc.) safety check	D3		
23 High-Risk Drugs Checked by 2 nurses	E3		
24 Dispose of high-risk drugs immediately after use	E4		
25 Use only x-ray detectable surgical gauze	F1		
26 Use gauze without cutting	F2		
35 Operating room environment management	G3		

Figure 2 Patient-safety nursing matrix.
Notes: A: infection management; B: specimen management; C: patient identification; D: medical equipment and item management; E: high-alert medications; F: surgical count; G: damage prevention.

Discussion

This study identified the importance and performance of patient-safety nursing among OR nurses and determined the need for training in OR patient-safety nursing using IPA. The study's significance is that the importance and performance of patient-safety nursing, as perceived by OR nurses, were compared and analyzed to identify areas for intensive improvement.

The mean performance of OR nurses in patient-safety nursing was 4.78, which was higher than the 4.15 and 4.30 reported by studies concerning hospital nurses.[20,21] The importance of patient-safety nursing in the OR has been repeatedly emphasized, because patient safety incidents can cause fatal and irreversible conditions for patients. Patient-safety incidents in the OR have led to medical disputes and have been publicized,[22,23] while surgery-related patient-safety incidents are designated critical events that require mandatory reporting in the Korean Patient Safety Incident Report.[24] Therefore, it is reasonable to assume that the level of importance and performance of patient-safety nursing, as perceived by OR nurses, is higher than that perceived by general nurses.

Based on general characteristics, the perceived importance of OR patient-safety nursing varied according to training experience. The group with more training in OR patient-safety nursing had a higher level of perceived importance, confirming the importance of consistent training. Previous studies have shown that training affects nurses' knowledge, awareness, and performance.[25] However, in terms of performance, while the group with more training scored higher, there was no statistically significant difference, unlike in preceding studies. It is necessary to expand the number of subjects and repeat the study in the future, since the number of subjects in this study differs from that in previous studies.

The sub-factors that showed differences in the importance and performance of patient-safety nursing in the OR were infection control and surgical count. Among the sub-factors of patient-safety nursing in this study, infection control was also the one with the lowest level of performance, suggesting that interventions are needed. Infection control in the OR includes the application of surgical asepsis to surgical patients, ensuring that the OR environment (maintaining positive pressure) does not cause infection, and ensuring that surgery on a patient who already has an infectious disease does not cause transmission of the disease to other surgical patients. While many factors contribute to postoperative infections, including length of surgery, patient condition, surgical asepsis by healthcare providers, and antibiotic use,[26] infection prevention activities by OR nurses throughout the surgical procedure are key factors. Examples include surgical hand washing, ensuring that sterile gowns are not contaminated after donning, sterilization of the surgical site, management of sterile supplies, disinfection of the OR environment, sterilization of surgical tools, and management of intraoperative surgical team changeover.[27] Notably, training for OR nurses in infection control specific to pre-, intra-, and postoperative procedures should be regularly provided. Surgical count is a crucial procedure aimed at preventing retained surgical items, which can lead to complications such as infection and pain, reoperation and, in severe cases, can be fatal.[28] The main causes of retained surgical items include omission of the preoperative count, error in recording the surgical count, neglect of safety protocols, and communication errors.[28] As digital systems (microchips, etc.) for surgical counts are also being developed, efforts must be made to implement surgical count guidelines suitable for each hospital.

The results of the IPA of OR patient-safety nursing identified the following areas for improvement efforts: handwashing before administering high-alert medications, checking cleanliness and aseptic conditions, and checking 5-Right. Direct comparison is challenging owing to limited studies exploring the educational needs of OR nurses using the analysis of patient safety nursing importance-performance. However, a survey of 3000 OR nurses worldwide, who had joined AORN, identified the top 10 patient safety issues (accurate patient identification, surgical item count, medication error, instrument reprocessing disinfection, and bedsores, etc).[3] Most of the "concentrate here" items identified in this study were found to be consistent.

Because pathogens can be transmitted through direct or indirect contact, surgical teams must practice good hand hygiene before surgery to avoid inadvertently touching door handles, surgical patient carts, computer keyboards, or other equipment in the OR, and transferring microbial contaminants from those items to the patient. All surgical teams should use alcohol-based hand sanitizers before donning non-sterile gloves and complete hand hygiene procedures by removing gloves and using alcohol-based hand sanitizers or traditional hand washing when patient contact has ended.[29,30] Hand hygiene reduces the risk of transmission of endogenous organisms from patients and exogenous organisms from other patients, healthcare teams, and the OR environment.[31] Surgical hand washing is also important because there is a risk of

transmitting microorganisms that can cause infection through the sterile gloves of surgical team members. Before and after surgery, the surgical team members must complete a surgical hand scrub with a brush using running water, antibacterial scrubbing agents, and a non-abrasive sponge for at least 3–5 minutes.[27] Subsequently, brushless handwashing is recommended, since it reduces microscopic cuts in the dermis, causes excessive shedding of skin cells, and removes pathogens from the skin surface.[32]

Medical equipment and sterilized supplies must be checked before use, and their packaging and expiration dates verified. All surgeries involve the use of medical devices or surgical tools in contact with sterile tissues or mucous membranes.[33] Therefore, if surgical equipment or tools are not properly disinfected or sterilized, they can cause infections in patients through contaminated instruments. Additionally, unsealed or expired supplies and tools should be considered contaminated and should not be used during surgery.

High-alert medications used in patients undergoing surgery include sedatives/hypnotics (eg, midazolam), induction agents (eg, propofol), neuromuscular blocking agents (eg, rocuronium), inhaled anesthetic agents (eg, sevoflurane), and opioids (eg, fentanyl and morphine).[34] It has been reported that medication errors involving high-alert medications are particularly common in the OR,[35] and can result in hypertension, ventricular arrhythmias, pulmonary edema, and cardiac arrest.[33] Therefore, to minimize risk for surgical patients, the access, storage, administration, and monitoring of high-alert medications must be strictly controlled. Such medications need to be stored separately in a restricted area, and warning labels must be attached to the bottles for visibility.[33] Efforts should also be made to reduce the risk of medication errors by having at least two healthcare providers make a 5-Right check before administering medications.

Based on this information, "handwashing before administering high-alert medications", "checking cleanliness and aseptic conditions", and "checking 5-Right" should be prioritized in the OR patient-safety nursing program. In addition, infection control should be given top priority among the seven subsections of OR patient-safety nursing. According to the Theory of Planned Behavior, an individual's behavior is influenced by their attitude toward the behavior itself, subjective norms, and perceived behavioral control. Given the great importance of patient-safety nursing among OR nurses, attitudes toward the behavior appear to be positive. Therefore, subjective norms (the pressure to perform a particular behavior) and perceived behavioral control (how much control an individual has over their behavior) should be strengthened to increase the performance of patient-safety nursing in the OR. It is necessary to monitor the performance of patient-safety nursing, evaluate the results, and provide feedback or improve systems (such as increasing personnel and creating checklists) and environments (such as facility structures and supplies) to remove barriers to patient-safety nursing.[13] In particular, based on the results of this study, training and interventions should focus on areas where improvement efforts can be concentrated.

Limitations and Suggestions

First, this study collected data from OR nurses; however, as the number of samples was small and OR nurses were recruited from two general hospitals, there is a potential for significant bias (ceiling effects, etc.) in the research results. Therefore, care should be taken in generalizing the research results. Second, the items related to OR patient-safety nursing may vary by medical institution, but this study collected data from only two hospitals. Therefore, it is necessary to categorize and research different hospitals, and develop training programs and interventions tailored to each hospital based on the results.

This study aimed to explore the importance and performance of patient-safety nursing education needs (priority) among OR nurses using IPA. In particular, the importance and performance of OR patient-safety nursing perceived by OR nurses were compared and analyzed to identify areas in need of intensive improvement. As a result of the analysis, "hand washing before administration of high-alert medications", "checking cleanliness and aseptic condition", and "checking 5-Right" were found to be "Concentrate here" aspects. Because patient-safety incidents in OR can be fatal, education to improve OR nurses' performance on "Concentrate here" items should be prioritized, and monitoring, feedback, and intervention should be provided. To this end, health and medical policies related to patient safety in ORs (eg, implementing patient safety education as essential education for medical personnel, strengthening monitoring in ORs, reflecting patient safety indicators in medical institution evaluation) should be prioritized. Hospitals should first establish an OR patient-safety nursing education program, emphasizing the importance of patient-safety nursing. Adequate resources, including surgical goods and manpower necessary to improve performance, should be provided.

Nursing managers should encourage nurses to internalize and independently prioritize patient-safety nursing by continuously monitoring and feedback, particularly focusing on the "Concentrate here" aspects.

Data Sharing Statement

Data cannot be shared publicly because of restrictions by the Konyang University Institutional Review Board. Data are available from the Konyang University Institutional Data Access/Ethics Committee for researchers who meet the criteria for access to confidential data. Data requests can be addressed to the Konyang University Institutional Review Board (82-42-600-8466, kirb@konyang.ac.kr).

Ethics Approval and Informed Consent

This study submitted a research plan to the Konyang University IRB. This study was approved for review (IRB No.: KYU 2023-02-017).

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

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