

## ORIGINAL

# Operating-room nurses' classifications in job satisfaction

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**Abstract : Purpose :** The purpose of this study was to investigate the operating environment, degree of operating-room nurses', and to clarify the job satisfaction, experience, and emotions categorized characteristics operating-room nurses. **Method :** The study surveyed 1177 operating-room nurses. For 38 questionnaire items, a 5-point Likert scale was applied regarding job satisfaction, workplace environment, experiences, and emotions. **Classification** was performed by cluster analysis based on operating-room nurses' job satisfaction. **Results :** Results of cluster analysis were classified into five groups with unique characteristics based on factors such as age, years of nursing experience, years of operating-room nursing experience, workplace environment, experience, and emotion. **Conclusion:** Results suggest providing support tailored to characteristics of each of the five groups to optimize their job satisfaction. *J. Med. Invest.* 67:113-123, February, 2020

**Keywords :** Operating-room nurses, Job satisfaction, Classification

## INTRODUCTION

In recent years, nursing has been affected by increased numbers of patients with serious illnesses through such factors as reduced hospitalization periods, reinforced risk management, and diversification of patient needs, in addition to increasing advancement and complication of medical care (1). Greater degrees of specialist knowledge and competence in diverse techniques are required of nurses, especially those in specialist areas (2). The same holds for operating-room nursing, in which minimally invasive surgical techniques that reduce the burden on the patient's body are often selected, resulting in clear reduction in operating times (3-5). With such striking development and expansion of medical care technologies and operating-room management methods, there is a need for management of highly profitable operating rooms (6, 7) and for utilization of specialist knowledge.

Meanwhile, training for scrub nursing, a specialist technique in operating-room nursing (8), is conducted only through manuals for nurses and individual hospitals. Including content based on nurses' specialist experience that cannot be handled in joint training in hospitals, no systematic methods or guidelines exist for training operating-room nurses.

Operating-room nurses' job satisfaction tends to be lower than that of ward nurses (9); this indicates the difficulty of maintaining operating-room nurses' sense of satisfaction and worth (10, 11). Factors affecting operating-room nursing job continuity include personnel and environmental factors such as recognition, relationships, and cooperation with people other than patients (12-14). These factors are thought important in operating-room nursing job satisfaction and work environments. Furthermore, rather than limiting our scope to adjusting job satisfaction and the working environment, making adjustments according to individual needs based on operating-room and general nursing experience might be necessary.

Therefore, it is important to analyze by categorizing groups according to operating-room nursing job satisfaction, work environment, and differences in nurses' backgrounds. The authors believed that by identifying each group's characteristics, it would be possible to clarify support methods for enhancing nurses' job satisfaction.

The purpose of this study was to investigate the operating environment, degree of operating-room nurses', and to clarify the job satisfaction, experience, and emotions categorized characteristics operating-room nurses.

## DEFINITION OF OPERATIONAL TERMS

**Job satisfaction :** The definition of "work" in operating-room nursing, according to Rhodes *et al.* (15), is a job position with the same duties, skills, knowledge, and responsibilities. In the present study, to confirm job satisfaction in operating rooms, using specialist characteristics of Japanese people and operating-room nurses in Japan, organizational order (16) was added to the definition of job satisfaction alongside duties, skills, knowledge, and responsibilities.

## STUDY METHOD

### 1. Participants

Survey participants were operating-room nurses working in operating rooms at general hospitals with 100 or more beds in the Chugoku/Shikoku region of Japan.

### 2. Survey method

The survey questionnaire's content was explained, in advance, to the head nurse and the head operating-room nurse at general hospitals (N = 113) within the survey's scope, and 1523 questionnaires were distributed to the 82 hospitals that consented to participate. Nurse participants responded to questionnaires privately and anonymously, after which questionnaires were individually sealed and mailed to researchers.

### 3. Survey questionnaire content and time required

The following were included as nurses' basic attributes in

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the questionnaire: age; gender; number of operating-room nurses; job type; years of nursing experience; years of operating-room nursing experience; position; hours of overtime/month; typical weekday work shifts; number of hospital beds; and number of surgical operations/year.

With regard to job satisfaction, there were seven items, namely: "the job itself and job details" with regard to duties and skills of operating-room nursing work (15); "education and training systems" with regard to knowledge (17); "ability of senior management" (17), "sense of achievement in team medical care" (17) with regard to responsibilities; as well as "work hours and work systems," "personal relationships at work," and "pay and remuneration" with regard to organizational order (16). Answers were given according to a 5-point Likert scale, with choices ranging from "Satisfied" (5 points) to "Dissatisfied" (1 point) degree of job satisfaction. Thus, a higher score indicated greater job satisfaction.

Six unique questions regarding the work environment (relating to aspects that are considered to affect operating-room work job satisfaction) were set based upon the results of surveys by Yamazaki *et al.* (10), Fukasawa (11), and Kitawaki *et al.* (14). These were: "relationships of trust with others"; "obtaining consultation/cooperation"; "study, training, and career progression"; "job flexibility"; "communication"; and "pride and goals regarding specialization/the nursing profession." Answers were given according to a 5-point Likert scale, with choices ranging from "Agree" (5 points) to "Disagree" (1 point) with satisfaction of work environment. Thus, a higher score indicated that the work environment had a greater effect on job satisfaction.

Questions were set regarding the experiences and emotions of operating-room nurses while working in operating rooms. For experiences, ten unique questions were set based upon the results of a study by Hasebe (18). Answers were given according to a 5-point Likert scale, with choices ranging from "Strongly agree" (5 points) to "Strongly disagree" (1 point) with specific example. A higher score reflected a stronger influence of operating-room experiences. For emotions, 15 unique questions were set based upon the authors' experiences of operating-room work along with specific examples. The same Likert scale was used with a higher score relating to more negative emotions. The question items regarding job satisfaction, workplace environments, experiences, and emotions were all carefully selected after being checked and amended by multiple nurses with experience in operating-room nursing.

Completing the questionnaire required approximately 10–15 minutes.

#### 4. Analytical method

Analysis tabulated the basic attributes listed above. For job satisfaction, workplace environment, experience, and emotion, the Kaiser-Meyer-Olkin (KMO) measure was used for sampling adequacy. Regarding reliability of the job satisfaction items, factor analysis was performed with Promax rotation of the main factor. Also, Cronbach's alpha was used to assess the internal consistency of question items.

Focusing on similarity of approach to satisfaction with operating-room nursing work, classifications were based on hierarchical cluster analysis according to Ward's method, and determination of cluster numbers used a dendrogram. Furthermore, we aimed to clarify characteristics of each group of cluster-classified operating-room nurses.

A chi-square test and calculated adjusted residuals was performed on age, years of nursing experience, years of operating-room nursing experience, position, monthly overtime hours, typical weekday work shifts, number of hospital beds, annual number of operations, and number of operating-room nurses. In

each cluster classification, a test was conducted on differences in average values of each group according to workplace environment, nursing experiences, and nurses' emotions in the operation room. In case of Levene's test for equal variance, this study performed a one-way analysis of variance (Tukey's multiple comparison test between groups). When equal dispersion is not guaranteed a Kruskal-Wallis test (Dunn-Bonferroni's multiple comparison between groups).

In the aforementioned analyses using statistical software SPSS ver. 25, the level of significance was set at 5% or less.

#### 5. Ethical considerations

This study was conducted with approval from the Tokushima University Hospital Medical Ethics Committee (approval number 1986-2). Oral and written explanations of the study's purpose were provided to nursing managers (head nurses), and questionnaires were distributed to facilities that had approved research cooperation. Some facilities requested application to the facility ethics committee; such application was produced, and then approval was received. The questionnaire stated the purpose and provided an explanation of the survey, which was responded to anonymously. Participation was optional. Ethical considerations were addressed by an explanatory page sent with the questionnaire, informing participants of the following: Non-participation would not incur any disadvantages; data processing and analysis would be codified so that individuals could not be identified; questionnaire responses would be stored and managed in strict confidence, shared only with researchers, and responsibly disposed of after data analysis; and consent would be obtained from participants before any related announcements at academic societies.

## RESULTS

The survey was sent to 1523 individuals at 82 consenting facilities; 1277 surveys were collected (83.8%). Responses in which all questions were answered were considered valid, such that the analytical target became 1177 (valid response rate = 92.2%). Regarding the 38 items in the questionnaire, the relevance of job satisfaction, workplace environment, experience, and emotion was as high as 0.905, with KMO sampling appropriate criteria. Cronbach's alpha coefficient was 0.885, and the alpha coefficient of 4 factors (job satisfaction, workplace environment, experience, emotion) ranged from 0.825 to 0.909 (Table 1).

#### 1. The characteristics of the participants (Table 2)

There were 258 (21.9% of total) nurses in the aged from 31–35 years, and 216 (18.9%) nurses in aged from 20–25 years. There were 980 women (83.3%) and 197 men (16.7%). 401 (34.1%) nurses had 11–20 years of experience, while 323 (27.4%) had five years or less of experience. The latter are defined by Benner as beginners that are still learning. 522 (44.4%) who had work experience of five years or less. Regarding positions, most were staff (81.2%). 603 nurses (51.2%) worked overtime for up to 11–20 hours. With regard to work patterns, the largest group among weekday work shifts comprised those who were engaged in daytime shifts and call-outs (635 people; 54.0%), followed by those engaged in two-shift systems (269 people; 22.9%). There were 486 nurses (41.3%) working in hospitals with 500–899 beds, with 341 (29.0%) working in institutions undertaking 4,001–6,000 operations per year. 329 (27.9%) worked in groups of 11–20 people.

Table 1. Factor analysis of job satisfaction, workplace environment, experience and emotion

Questionnaire items		factor				$\alpha$ coefficient
		1	2	3	4	
<b>Emotions</b>	Workload that clearly exceeds my capacity	<b>.731</b>	-.024	.062	-.023	0.889
	No clear communication with doctors	<b>.647</b>	.062	.236	-.137	
	No desire to work on difficult operations	<b>.640</b>	-.054	.100	-.100	
	Constant emergency surgeries, Not able to make sufficient preparation	<b>.638</b>	-.004	.141	-.152	
	Always busy	<b>.617</b>	-.008	-.152	.088	
	No coordination with other departments	<b>.617</b>	.079	.130	-.078	
	Constant overtime	<b>.603</b>	.009	-.199	.157	
	Always considering quitting	<b>.596</b>	-.104	-.218	.080	
	Using rest time to complete tasks	<b>.586</b>	.012	-.162	.051	
	Resentment toward coworkers	<b>.581</b>	-.019	.204	-.060	
	Always being criticized	<b>.580</b>	.037	-.047	.082	
	Always considering job change	<b>.576</b>	-.092	-.225	.084	
	Always doing the same tasks	<b>.554</b>	-.053	-.161	.134	
	No continuity in work	<b>.403</b>	.077	-.108	.077	
No operating room training programs	<b>.345</b>	.156	-.129	-.009		
<b>Experience</b>	Recognition from superiors	-.059	<b>.860</b>	-.108	.092	0.909
	Entrusted by superior	-.058	<b>.799</b>	-.097	.085	
	Recognition from doctors	-.027	<b>.793</b>	-.277	.149	
	Useful	-.043	<b>.756</b>	-.122	.139	
	Rewarded for struggle	-.018	<b>.750</b>	-.114	.125	
	Listened to	.073	<b>.691</b>	.248	-.136	
	Protected from unfounded criticism	.089	<b>.636</b>	.041	-.051	
	Given advice	.101	<b>.619</b>	.332	-.185	
	Casually supervised when lacking confidence	.097	<b>.582</b>	.298	-.135	
	Competing with colleagues	-.011	<b>.482</b>	-.101	.060	
<b>Job satisfaction</b>	Ability of senior management	.030	-.122	<b>.749</b>	.014	0.825
	Education and training systems	.037	-.117	<b>.727</b>	.080	
	Sense of achievement in team medical care	-.025	-.019	<b>.570</b>	.098	
	Personal relationships at work	-.025	-.029	<b>.556</b>	.139	
	Pay and remuneration	-.023	-.149	<b>.508</b>	.117	
	Work hours and work systems	-.139	.039	<b>.496</b>	.029	
	The job itself and job details	-.163	.087	<b>.473</b>	.088	
<b>Workplace environment</b>	Communication	-.014	.067	.098	<b>.768</b>	0.907
	Pride and goals regarding specialization/the nursing profession	.033	.066	.284	<b>.702</b>	
	Relationships of trust with others	.001	.183	-.090	<b>.701</b>	
	Job flexibility	.031	.082	.247	<b>.638</b>	
	Study, training, and career progression	.024	.049	.349	<b>.502</b>	
	Obtaining consultation/cooperation	.051	.069	.467	<b>.493</b>	
Factor contribution		6.209	5.694	6.660	4.869	
Cronbach's $\alpha$ coefficient						0.885

2. Fig. 1 and Tables 3–7 show characteristics of the five cluster-classified groups based on job satisfaction.

Five groups were classified by using cluster analysis of job satisfaction scores via Ward's method, according to operating-room nursing job satisfaction based on a dendrogram (Fig. 1). In the five cluster-classified groups' basic attributes (Table 3), significant differences were recognized for age ( $p = 0.016$ ), years of nursing experience ( $p = 0.004$ ), years of operating-room nursing experience ( $p = 0.025$ ), weekday work shifts ( $p < 0.001$ ), and annual number of operations ( $p = 0.021$ ) (5 items). Six items of significant difference ( $p < 0.001$ ) were recognized in the five cluster-classified groups' workplace environments (Tables 4–5). For nurses' experiences and emotions, there were 20 items of significant difference (Tables 4, 6–7). Characteristics of Groups I–V are explained below.

1) Group I (High job satisfaction and proud of being recognized)

Among the five groups, this one had the highest job satisfaction and the greatest number in the younger age range age of 20–25 years. Many had 5 years or less of experience in nursing and operating-room nursing experience; these group members were employed immediately after graduation from nursing school. Work environment and experience items were significantly higher ( $p < 0.001$ ) than other groups', and this group had significantly lower average values for the 13 items that indicate reduced emotional well-being ( $p < 0.001$ ). Therefore, Group I was described as having "High job satisfaction and pride in their recognition."

2) Group II (Somewhat high job satisfaction but the worst emotions toward doctors and coworkers)

This group had somewhat high job satisfaction; they belonged either to the age range of 20–25 years or the middle-age range of 31–35. Many had operating-room nurse experience of less than 5 years. Although the difference was not significant, this group

Table 2. Summary of participant characteristics

n=1177

		Number	(%)
Age	20~25	216	(18.4)
	26~30	206	(17.5)
	31~35	258	(21.9)
	36~40	206	(17.5)
	41~45	159	(13.5)
	46 or more	132	(11.2)
Gender	Female	980	(83.3)
	male	197	(16.7)
Years of nursing experience	Less than 5	323	(27.4)
	5~10	249	(21.2)
	11~20	401	(34.1)
	21 or more	204	(17.3)
Years of operating room nursing experience	Less than 5	522	(44.4)
	5~10	383	(32.5)
	11 or more	272	(23.1)
Position	Deputy nurse chief, Chief	127	(10.8)
	Team leader	86	(7.3)
	Staff	956	(81.2)
	Other	8	(0.7)
Hours of overtime/month	Less than 10	386	(32.8)
	11~20	603	(51.2)
	21~30	160	(13.6)
	30 or more	21	(1.8)
	No answer	7	(0.6)
Weekday work shifts	2 shift	269	(22.9)
	3 hree-shift	130	(11.0)
	Day shifts and night duty	44	(3.7)
	Day shifts and call-outs	635	(54.0)
	Other	99	(8.4)
Number of hospital beds	500~899	486	(41.3)
	300~499	479	(40.7)
	100~299	212	(18.0)
Number of surgical operations/year	6,001 or more	214	(18.2)
	4,001~6000	341	(29.0)
	2,001~4000	290	(24.6)
	Less than 2,000	332	(28.2)
Number of operating room nurses	41 or more	181	(15.4)
	31~40	227	(19.3)
	21~30	239	(20.3)
	11~20	329	(27.9)
	Less than 10	201	(17.1)

provided the most responses for “No clear communication with doctors” and “Resentment toward coworkers.” Therefore, Group II was described as having “Somewhat high job satisfaction but the worst emotions toward doctors and coworkers.”

3) Group III (Moderate job satisfaction and adaptable to the workplace environment)

This group had job moderate satisfaction and the highest nursing experience, 11–20 years, but for operating-room nursing experience, the highest was 5 years or less. For all items on workplace environment, their average value was moderate. No particular satisfaction or dissatisfaction was revealed in emotion. Therefore, Group III was described as having “Moderate job

satisfaction and being adaptable to the workplace environment.”

4) Group IV (Dissatisfied veteran nurses with somewhat low job satisfaction)

This group had somewhat low job satisfaction. Despite having the highest ratio of “veteran” nurses with 11–20 years of experience, the group also had many with 5 years or less of operating-room nursing experience. Regarding emotion, items on “Workload that clearly exceeds my capacity ( $p < 0.001$ )” and “Always busy ( $p < 0.001$ )” were significantly higher than in other groups. Therefore, Group IV was described as “Dissatisfied veteran nurses with somewhat low job satisfaction.”

5) Group V (Dissatisfied operating-room veterans with the lowest

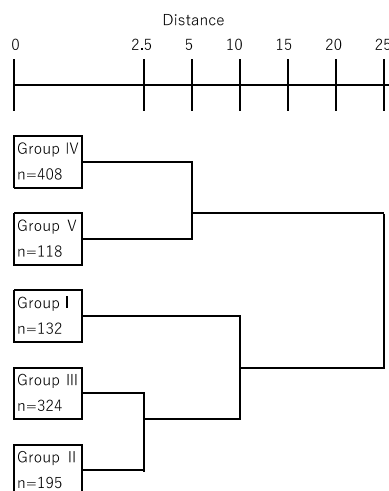


Fig 1. Classification of participants based on job satisfaction using a cluster analysis n=1177

Table 3. Basic attributes of the 5 groups classified by cluster analysis

Basic attributes		Number	Group I Very high satisfaction group	Group II Somewhat high satisfaction group	Group III Moderate satisfaction group	Group IV Somewhat low satisfaction group	Group V Low satisfaction group	χ <sup>2</sup> test	
								132 (%)	195 (%)
Age (n=1177)	20~25	216 (18.4)	37 (28.0)	46 (23.6)	67 (20.7)	55 (13.5)	11 (9.3)	35.8	0.016
	26~30	206 (17.5)	19 (14.4)	30 (15.4)	59 (18.2)	72 (17.6)	26 (22.0)		
	31~35	258 (21.9)	29 (22.0)	44 (22.6)	61 (18.8)	99 (24.3)	25 (21.2)		
	36~40	206 (17.5)	17 (12.9)	33 (16.9)	54 (16.7)	82 (20.1)	20 (17.0)		
	41~45	159 (13.5)	16 (12.1)	24 (12.3)	42 (13.0)	53 (13.0)	24 (20.3)		
	46 or more	132 (11.2)	14 (10.6)	18 (9.2)	41 (12.6)	47 (11.5)	12 (10.2)		
Gender (n=1177)	Female	980 (83.3)	108 (81.8)	158 (81.0)	276 (85.2)	343 (84.1)	95 (80.5)	2.6	0.629
	male	197 (16.7)	24 (18.2)	37 (19.0)	48 (14.8)	65 (15.9)	23 (19.5)		
Years of nursing experience (n=1177)	Less than 5	323 (27.4)	52 (39.4)	66 (33.8)	90 (27.8)	94 (23.0)	21 (17.8)	29.2	0.004
	5~10	249 (21.2)	23 (17.4)	39 (20.0)	72 (22.2)	84 (20.6)	31 (26.3)		
	11~20	401 (34.1)	38 (28.8)	65 (33.3)	98 (30.2)	158 (38.7)	42 (35.6)		
	21 or more	204 (17.3)	19 (14.4)	25 (12.8)	64 (19.7)	72 (17.7)	24 (20.3)		
Years of operating room nursing experience (n=1177)	Less than 5	522 (44.4)	72 (54.6)	95 (48.7)	150 (46.3)	163 (39.9)	42 (35.6)	17.6	0.025
	5~10	383 (32.5)	30 (22.7)	62 (31.8)	104 (32.1)	139 (34.1)	48 (40.7)		
	11 or more	272 (23.1)	30 (22.7)	38 (19.5)	70 (21.6)	106 (26.0)	28 (23.7)		
Position (n=1177)	Deputy nurse chief, Chief	127 (10.8)	10 (7.6)	29 (14.9)	28 (8.6)	49 (12.0)	11 (9.3)	16.5	0.171
	Team leader	86 (7.3)	7 (5.3)	9 (4.6)	23 (7.1)	35 (8.6)	12 (10.2)		
	Staff	956 (81.2)	114 (86.4)	157 (80.5)	271 (83.7)	319 (78.2)	95 (80.5)		
	Other	8 (0.7)	1 (0.7)	0 (0.0)	2 (0.6)	5 (1.2)	0 (0.0)		
Hours of overtime/month (n=1170)	Less than 10	386 (33.0)	45 (34.1)	54 (28.0)	114 (35.2)	134 (33.3)	39 (33.1)	17.3	0.138
	11~20	603 (51.5)	74 (56.1)	104 (53.9)	170 (52.5)	196 (48.6)	59 (50.0)		
	21~30	160 (13.7)	9 (6.8)	29 (15.0)	36 (11.1)	68 (16.9)	18 (15.2)		
	30 or more	21 (1.8)	4 (3.0)	6 (3.1)	4 (1.2)	5 (1.2)	2 (1.7)		
Weekday work shifts (n=1177)	2 shift	269 (22.9)	32 (24.3)	53 (27.2)	60 (18.5)	105 (25.7)	19 (16.1)	41.9	0.000
	3 shift	130 (11.0)	9 (6.8)	17 (8.7)	30 (9.3)	48 (11.8)	26 (22.0)		
	Day shifts and night duty	44 (3.7)	3 (2.3)	8 (4.1)	9 (2.8)	23 (5.6)	1 (0.9)		
	Day shifts and call-outs	635 (54.0)	77 (58.3)	101 (51.8)	192 (59.2)	199 (48.8)	66 (55.9)		
	Other	99 (8.4)	11 (8.3)	16 (8.2)	33 (10.2)	33 (8.1)	6 (5.1)		
Number of hospital beds (n=1177)	500~899	486 (41.3)	57 (43.2)	87 (44.6)	115 (35.5)	178 (43.6)	49 (41.5)	10.0	0.266
	300~499	479 (40.7)	58 (43.9)	74 (38.0)	138 (42.6)	160 (39.2)	49 (41.5)		
	100~299	212 (18.0)	17 (12.9)	34 (17.4)	71 (21.9)	70 (17.2)	20 (17.0)		
Number of surgical operations/year (n=1177)	6,001 or more	214 (18.2)	22 (16.7)	31 (15.9)	54 (16.7)	72 (17.6)	35 (29.7)	24.0	0.021
	4,001~6000	341 (29.0)	43 (32.6)	67 (34.3)	92 (28.4)	115 (28.2)	24 (20.3)		
	2,001~4000	290 (24.6)	35 (26.5)	44 (22.6)	69 (21.3)	113 (27.7)	29 (24.6)		
	Less than 2,000	332 (28.2)	32 (24.2)	53 (27.2)	109 (33.6)	108 (26.5)	30 (25.4)		
Number of operating room nurses (n=1177)	41 or more	181 (15.4)	21 (15.9)	31 (15.9)	38 (11.7)	62 (15.2)	29 (24.6)	19.8	0.230
	31~40	227 (19.3)	22 (16.7)	37 (19.0)	66 (20.4)	88 (21.6)	14 (11.9)		
	21~30	239 (20.3)	29 (22.0)	38 (19.5)	61 (18.8)	85 (20.8)	26 (22.0)		
	11~20	329 (27.9)	40 (30.3)	58 (29.7)	95 (29.3)	109 (26.7)	27 (22.9)		
	Less than 10	201 (17.1)	20 (15.1)	31 (15.9)	64 (19.8)	64 (15.7)	22 (18.6)		

**Table 4.** Job satisfaction, workplace environment, experience and emotions of the 5 groups classified by cluster analysis

	n=1177					One-way analysis of variance
	Group I Very high satisfaction group n=132	Group II Somewhat high satisfaction group n=195	Group III Moderate satisfaction group n=324	Group IV Somewhat low satisfaction group n=408	Group V Low satisfaction group n=118	
<b>Job satisfaction (7 items average)</b>	Average (SD)	Average (SD)	Average (SD)	Average (SD)	Average (SD)	F value
	4.00 (0.328)	3.31 (0.296)	3.03 (0.214)	2.53 (0.297)	1.91 (0.419)	1069.37 0.000
<b>Workplace environment</b>						
Relationships of trust with others	3.34 (0.837)	3.23 (0.795)	3.10 (0.850)	3.08 (0.918)	2.73 (1.141)	8.34 0.000
Obtaining consultation/cooperation	4.38 (0.515)	3.97 (0.609)	3.67 (0.705)	3.43 (0.876)	2.76 (1.155)	80.52 0.000
Study, training, and career progression	3.95 (0.591)	3.65 (0.644)	3.42 (0.685)	3.26 (0.864)	2.98 (0.966)	34.40 0.000
Job flexibility	3.90 (0.528)	3.55 (0.652)	3.46 (0.688)	3.24 (0.903)	2.92 (1.111)	30.08 0.000
Communication	3.59 (0.641)	3.41 (0.716)	3.22 (0.716)	3.10 (0.875)	2.65 (1.089)	26.08 0.000
Pride and goals regarding specialization/the nursing profession	3.74 (0.537)	3.54 (0.662)	3.28 (0.670)	3.09 (0.899)	2.71 (1.003)	38.21 0.000
<b>Experiences</b>						
Listened to	4.34 (0.686)	4.13 (0.773)	3.85 (0.807)	3.79 (0.903)	3.46 (1.099)	21.955 0.000
Recognition from doctors	3.89 (0.946)	3.87 (0.946)	3.63 (0.989)	3.68 (1.034)	3.59 (1.193)	3.266 0.011
Recognition from superiors	4.14 (0.722)	3.98 (0.846)	3.69 (0.909)	3.63 (1.011)	3.35 (1.243)	15.734 0.000
Entrusted by superior	4.06 (0.749)	3.91 (0.813)	3.58 (0.885)	3.55 (0.960)	3.30 (1.179)	16.438 0.000
Rewarded for struggle	3.92 (0.811)	3.78 (0.836)	3.50 (0.909)	3.40 (1.079)	3.17 (1.290)	13.637 0.000
Useful	4.08 (0.752)	3.90 (0.831)	3.65 (0.886)	3.60 (1.001)	3.33 (1.140)	13.666 0.000
Casually supervised when lacking confidence	4.39 (0.696)	4.22 (0.756)	4.05 (0.791)	3.92 (0.871)	3.62 (1.116)	17.207 0.000
Given advice	4.50 (0.559)	4.28 (0.664)	4.01 (0.787)	3.91 (0.838)	3.57 (1.050)	28.579 0.000
Protected from unfounded criticism	3.80 (0.994)	3.53 (0.986)	3.48 (0.932)	3.37 (1.078)	3.25 (1.260)	5.848 0.000
Competing with colleagues	3.14 (1.071)	3.04 (0.924)	2.91 (0.972)	2.84 (0.995)	2.62 (1.154)	5.591 0.000
<b>Emotions</b>						
No operating room training programs	3.03 (0.972)	3.15 (0.916)	3.24 (0.879)	3.39 (0.928)	3.42 (1.057)	5.404 0.000
No continuity in work	3.24 (0.989)	3.28 (0.912)	3.31 (0.836)	3.54 (0.976)	3.57 (1.025)	5.637 0.000
No desire to work on difficult operations	3.27 (1.090)	3.39 (1.006)	3.35 (1.005)	3.55 (1.066)	3.61 (1.148)	3.518 0.007
Constant overtime	3.06 (1.061)	3.35 (1.113)	3.29 (1.086)	3.70 (1.058)	3.75 (1.139)	14.130 0.000
Always doing the same tasks	2.87 (1.073)	3.05 (0.970)	3.12 (0.976)	3.37 (1.021)	3.46 (1.059)	9.808 0.000
Using rest time to complete tasks	3.11 (1.093)	3.45 (1.075)	3.44 (1.090)	3.72 (1.093)	3.81 (1.149)	10.667 0.000
Always being criticized	2.92 (1.176)	3.16 (1.159)	3.24 (1.072)	3.25 (1.135)	3.45 (1.137)	3.709 0.005
Always busy	3.00 (1.026)	3.37 (1.049)	3.34 (0.984)	3.69 (1.022)	3.69 (1.136)	14.888 0.000
Constant emergency surgeries, Not able to make sufficient preparation	3.38 (1.008)	3.50 (0.997)	3.52 (1.036)	3.61 (0.995)	3.57 (1.025)	1.491 0.203
Workload that clearly exceeds my capacity	3.30 (0.996)	3.55 (0.980)	3.61 (0.936)	3.79 (0.982)	3.78 (1.055)	7.317 0.000
Resentment toward coworkers	3.32 (1.086)	3.42 (1.034)	3.27 (1.011)	3.36 (1.075)	3.31 (1.084)	0.657 0.622
No clear communication with doctors	3.72 (0.960)	3.82 (0.972)	3.69 (0.940)	3.76 (1.004)	3.82 (1.043)	0.738 0.566
No coordination with other departments	3.36 (0.934)	3.39 (0.965)	3.37 (0.846)	3.48 (0.935)	3.58 (0.991)	1.675 0.153
Always considering job change	2.58 (1.120)	3.06 (1.129)	3.19 (1.109)	3.45 (1.239)	3.81 (1.193)	22.151 0.000
Always considering quitting	2.50 (1.220)	3.03 (1.237)	3.23 (1.165)	3.52 (1.300)	3.88 (1.207)	26.323 0.000

**Table 5.** One-way ANOVA of workplace environment of the 5 groups classified by cluster analysis n=1177

	Group I	Group II	Group III	Group IV	Group V	
	Very high	Somewhat high	Moderate	Somewhat low	Low	
	satisfaction group	satisfaction group	satisfaction group	satisfaction group	satisfaction group	
Group	n=132	n=195	n=324	n=408	n=118	
Relationships of trust with others	I			0.041	0.000	
	II				0.000	
	III				0.001	
	IV	0.041				0.002
	V	0.000	0.000	0.001	0.002	
Obtaining consultation/ cooperation	I	0.000	0.000	0.000	0.000	
	II	0.000		0.000	0.000	
	III	0.000	0.000		0.000	
	IV	0.000	0.000	0.000		0.000
	V	0.000	0.000	0.000	0.000	
Study, training, and career progression	I	0.005	0.000	0.000	0.000	
	II	0.005		0.010	0.000	
	III	0.000	0.010		0.038	
	IV	0.000	0.000	0.038		0.003
	V	0.000	0.000	0.000	0.003	
Job flexibility	I	0.001	0.000	0.000	0.000	
	II	0.001			0.000	
	III	0.000			0.002	
	IV	0.000	0.000	0.002		0.001
	V	0.000	0.000	0.000	0.001	
Communication	I		0.000	0.000	0.000	
	II	0.000			0.000	
	III	0.000				
	IV	0.000	0.000			
	V	0.000	0.000	0.000	0.000	
Pride and goals regarding specialization/ the nursing profession	I		0.000	0.000	0.000	
	II			0.003	0.000	
	III	0.000	0.003		0.009	
	IV	0.000	0.000	0.009		0.000
	V	0.000	0.000	0.000	0.000	

**Table 6.** One-way ANOVA of experience of the 5 groups classified by cluster analysis n=1177

		Group I Very high satisfaction group n=132	Group II Somewhat high satisfaction group n=195	Group III Moderate satisfaction group n=324	Group IV Somewhat low satisfaction group n=408	Group V Low satisfaction group n=118
Listened to	I			0.000	0.000	0.000
	II			0.004	0.000	0.000
	III	0.000	0.004			0.000
	IV	0.000	0.000			0.002
	V	0.000	0.000	0.000	0.002	
Recognition from doctors	I					
	II					
	III					
	IV					
	V					
Recognition from superiors	I			0.000	0.000	0.000
	II			0.007	0.000	0.000
	III	0.000	0.007			0.008
	IV	0.000	0.000			0.044
	V	0.000	0.000	0.008	0.044	
Entrusted by superior	I			0.000	0.000	0.000
	II			0.001	0.000	0.000
	III	0.000	0.001			0.034
	IV	0.000	0.000			
	V	0.000	0.000	0.034		
Rewarded for struggle	I			0.001	0.000	0.000
	II			0.019	0.000	0.000
	III	0.001	0.019			0.016
	IV	0.000	0.000			
	V	0.000	0.000	0.016		
Useful	I			0.000	0.000	0.000
	II			0.030	0.003	0.000
	III	0.000	0.030			0.012
	IV	0.000	0.003			0.042
	V	0.000	0.000	0.012	0.042	
Casually supervised when lacking confidence	I			0.001	0.000	0.000
	II				0.001	0.000
	III	0.001				0.000
	IV	0.000	0.001			0.005
	V	0.000	0.000	0.000	0.005	
Given advice	I			0.000	0.000	0.000
	II			0.002	0.000	0.000
	III	0.000	0.002			0.000
	IV	0.000	0.000			0.000
	V	0.000	0.000	0.000	0.000	
Protected from unfounded criticism	I			0.026	0.000	0.000
	II					
	III	0.026				
	IV	0.000				
	V	0.000				
Competing with colleagues	I				0.022	0.000
	II					0.003
	III					
	IV	0.022				
	V	0.000	0.003			



Table 7. One-way ANOVA of emotion of the 5 groups classified by cluster analysis n=1177

	Group	Group I Very high satisfaction group n=132	Group II Somewhat high satisfaction group n=195	Group III Moderate satisfaction group n=324	Group IV Somewhat low satisfaction group n=408	Group V Low satisfaction group n=118
No operating room training programs	I				0.001	0.010
	II				0.028	
	III					
	IV	0.001	0.028			
	V	0.010				
No continuity in work	I				0.014	0.048
	II				0.014	
	III				0.010	
	IV	0.014	0.014	0.010		
	V	0.048				
No desire to work on difficult operations	I				0.048	
	II					
	III					
	IV	0.048				
	V					
Constant overtime	I				0.000	0.000
	II				0.002	0.012
	III				0.000	0.001
	IV	0.000	0.002	0.000		
	V	0.000	0.012	0.001		
Always doing the same tasks	I				0.000	0.000
	II				0.003	0.005
	III				0.009	0.015
	IV	0.000	0.003	0.009		
	V	0.000	0.005	0.015		
Using rest time to complete tasks	I		0.042	0.030	0.000	0.000
	II	0.042			0.042	0.045
	III	0.030			0.005	0.015
	IV	0.000	0.042	0.005		
	V	0.000	0.045	0.015		
Always being criticized	I				0.032	0.002
	II					
	III					
	IV	0.032				
	V	0.002				
Always busy	I		0.013	0.012	0.000	0.000
	II	0.013			0.003	
	III	0.012			0.000	0.012
	IV	0.000	0.003	0.000		
	V	0.000		0.012		
Constant emergency surgeries, Not able to make sufficient preparation	I					
	II					
	III					
	IV					
	V					
Workload that clearly exceeds my capacity	I			0.022	0.000	0.001
	II				0.042	
	III	0.022				
	IV	0.000	0.042			
	V	0.001				
Resentment toward coworkers	I					
	II					
	III					
	IV					
	V					
No clear communication with doctors	I					
	II					
	III					
	IV					
	V					
No coordination with other departments	I					
	II					
	III					
	IV					
	V					
Always considering job change	I		0.002	0.000	0.000	0.000
	II	0.002			0.001	0.000
	III	0.000			0.022	0.000
	IV	0.000	0.001	0.022		0.031
	V	0.000	0.000	0.000	0.031	
Always considering quitting	I		0.002	0.000	0.000	0.000
	II	0.002			0.000	0.000
	III	0.000			0.014	0.000
	IV	0.000	0.000	0.014		0.046
	V	0.000	0.000	0.000	0.046	

job satisfaction)

This group had very low job satisfaction and was characterized by operating-room nursing experience of 5–10 years (40.7%) and significantly longer ( $p = 0.025$ ). Workplace environment items were significantly low ( $p < 0.001$ ). Items that led to decreased emotions showed significant dissatisfaction with nursing work, such as “always doing the same tasks ( $p < 0.001$ )” and “always busy ( $p < 0.001$ ).” Therefore, Group V was described as “Dissatisfied operating-room veterans with the lowest job satisfaction.”

## DISCUSSION

Job satisfaction was classified five groups after the survey below.

Group I (High job satisfaction and pride in being recognized) comprised nurses employed immediately after graduation, with a clear sense of purpose in learning about operating-room work. Because they did not have any prior employment experience, no factors caused dissatisfaction in interpersonal relationships, superiors' management ability, or work patterns. With regard to the workplace environment, their scores were significant and the highest among groups. Because they lacked confidence in their knowledge and skills, they required a stable workplace environment (19). This group greatly affected job satisfaction in operating-room work.

Group II (Somewhat high job satisfaction but the worst emotions toward doctors and coworkers) comprised nurses in young and middle-age ranges, both having 5 years or less of operating-room nursing experience. For all items on workplace environment and experience, they had high levels of satisfaction (second to Group I). In contrast to Group I, however, Group II gave the most responses of “No clear communication with doctors” and “Resentment toward coworkers,” indicating decreased job satisfaction because of difficulties communicating with doctors and feeling that they work harder than other nurses but without any results.

Group III (Moderate job satisfaction and adaptable to the workplace environment) had a wide range of ages and a greater number of years of nursing experience than years of operating-room nursing experience. Since they had experience of other posts, for both interpersonal relationships and operating-room work content while undergoing difficulties, they desired to take on and adapt to any workplace environment. As Aina (20) states, the pleasure of making the effort to adapt to a workplace leads to increased job motivation. With no clear satisfaction or dissatisfaction, this was a flexible group that could adapt to the environment while communicating with coworkers and doctors, despite changing positions, because they had a sense of fellowship and appreciation for others working in the same post.

Group IV (Dissatisfied veteran nurses with somewhat low job satisfaction) had the largest ratio of experienced nurses, with 11–20 years of nursing experience. They were assigned to the operating room, possibly because they could not properly adapt to changes in their career paths or in workplace environments and job details differing from previous ones (20, 21). For that reason, results were somewhat low for job satisfaction, workplace environments, experiences, and emotion.

Among the five groups, Group V (Dissatisfied operating-room veterans with the lowest job satisfaction) had the most nurses with 5–10 years of operating-room nursing experience. Motivation plateaus at 5–7 years, after which, in contrast to general-ward nurses who maintain their motivation (22), the motivation of operating-room nurses clearly drops off at 4–5 years (11). This might be why this group had the lowest results

for workplace environment, experiences, and emotion. This might show why, in turn, there are no study, training, and career progression systems at work facilities, as identified in many prior studies (22–25). In such workplace environments, nurses are unable to find new goals despite having mastered surgical techniques.

Based on age and number of years' experience, clearly, there were differences among the five groups in the importance of the workplace environment, nursing experience, and nurses' emotions. In cluster analysis, support methods suited to each group were investigated according to each of the five groups' characteristics.

Group I comprised nurses assigned immediately after entering employment, and their experience of others' approval affected their job satisfaction, which increased as their acquisition of knowledge and skills in surgical techniques were rated and approved. Group II had difficulty building relationships with doctors while also resenting coworkers. This group requires individual training methods suited to their skill level and organizational management that builds favorable relationships with doctors. Group III had many years of nursing experience but few years of experience in the operating room; in the future, this group's job satisfaction must be raised, so they acquire operating-room nursing experience and so their motivation does not decrease. While Group IV had the highest ratio of overall experience, many have 5 years or less of operating-room experience. This might signify a high ratio of reassigned nurses, so leaders must consider their experience and respect their values and perspectives; leaders should adjust their workloads according to individual skill levels. Although having the most operating-room nursing experience, Group V also had low job satisfaction. This might signify that their knowledge and skills remained tacit.

By intentionally supporting and maintaining vocalization of tacit knowledge, as described by Nonaka (16), sharing it between organizations, and converting it to explicit knowledge, this group is expected to increase their practical capacity for nursing in operating-room organizations.

## CONCLUSION

On the basis of job satisfaction, cluster analysis categorized operating-room nurses into five groups, characterizing each group and recommending appropriate support methods.

## STUDY LIMITATIONS AND FUTURE CHALLENGE

This study categorized five operating-room nursing groups based on job satisfaction, workplace environment, experiences, and emotions. The study proposed support methods suited to each group's characteristics and proposed enhancements to operating-room nursing job satisfaction and to operating-room nursing itself, which can further contribute to work in the operating room. However, no report is made here on a practical level.

The future challenge is to create and implement an operating-room nursing training program that utilizes operating-room nurses' tacit mastery techniques and converts them to the systematic, explicit knowledge of the Group V that desires to be more active.

## CONFLICT OF INTERESTS

There is no conflict of interest for both authors and co-authors.

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