



## Research Article

## Development and Validation of a Person-Centered Perioperative Nursing Scale

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## ABSTRACT

**Purpose:** The purpose of this study was to develop a scale to measure person-centered perioperative nursing (PCPON) and validate its psychometric properties.

**Methods:** The preliminary items of the PCPON scale were developed through a literature review, in-depth interviews, and content validity analysis. A total of 459 nurses working in the operating rooms of 21 hospitals in Korea responded to the questionnaire from September to October 2017. The collected data were analyzed by exploratory factor analysis (EFA) and confirmative factor analysis (CFA) using SPSS and AMOS programs.

**Results:** The final PCPON scale consists of 20 items. Through EFA, five factors, compassionate interaction, respect, providing comfort, information sharing, and nursing expertise, were derived. The internal consistency of each factor of the PCPON scale, as represented by Cronbach  $\alpha$ , was .76–.88. The model fit of the scale was satisfactory, and the items of the scale demonstrated convergent and discriminant validity.

**Conclusion:** The evaluation of the new PCPON scale indicated good reliability and validity. The PCPON scale is easy to administer and implies factors of person-centered care. This scale can be used to assess the person-centered care in the perioperative nursing field.

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## Introduction

Surgery is stressful for anyone, and surgical patients can suffer anxiety and loneliness in the operating room. In addition, the advancement of surgical technologies and equipment has led to a distancing of perioperative nurses from direct patient care. As a result, surgical patients often deviate from the center of nursing care or medical treatment [1]. In this situation of dehumanization, the growing interest in person-centered care is noteworthy. “Person-centeredness” is a concept that has long been important in nursing. Nightingale mentioned that nursing is different from medicine in that it focuses on patients rather than disease itself [2], and person-centered nursing is accordingly based on human

dignity and acceptance of individuality. It allows nurses to communicate and empathize with patients and to involve them in their own care plan [3].

Person-centered care improves both the patient’s satisfaction and health condition, as well as has other positive effects such as shortening hospitalization and reducing medical expenses [4]. Patient-centered care in a perioperative setting can be achieved through the practice of evidence-based guidelines and positively affects a number of patient outcomes including reductions in surgical site infections and length of hospital stay [5]. Patient and family engagement is a key factor in improving the quality of nursing care. Perioperative nurses can improve patient safety by ensuring their participation in preoperative assessment, education, intervention, and decision-making [6]. Studies aimed at understanding and applying person-centered care to clinical practice have been conducted. In particular, concept analysis [3], the development of measurement tools [7,8], and the effects of person-centered care interventions [9] have been reported.

In the field of perioperative nursing, Rothrock and Smith [10] proposed a perioperative patient-focused model (PPFM). The

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PPFM is composed of four areas centered on the surgical patient. The three areas of behavioral response, patient safety, and physiological response best describe the preoperative and postoperative characteristics of patients. The last area, the health system, includes the environments needed for patient-centered nursing practice such as staff, equipment, and supplies. The PPFM can be found in a variety of perioperative nursing practices, particularly for patient education and empowerment [11]. The Association of periOperative Registered Nurses (AORN) has established the perioperative nursing data set and standards of perioperative nursing based on the PPFM [11,12]. According to the AORN practice standards [12], the perioperative nurse must respect the patients' goals and preferences in developing and performing the practice. Therefore, an individualized care plan that responds to the physiological, sociocultural, and spiritual needs of the patient should be developed.

Several researchers [5,6] have discussed the importance of person-centered care in the area of perioperative nursing in terms of reducing complications and improving patient outcomes. In addition, the AORN has proposed person-centered care as the core of nursing curriculum along with teamwork and collaboration, evidence-based practice, quality improvement, safety, and informatics [12]. While previous studies have used “patient-centered” and “person-centered” interchangeably, in the present study, authors would like to use the term “person-centered” in a broad sense.

As mentioned previously, there have been models, policy proposals, and integrated reviews on person-centered care reported in the field of perioperative nursing. However, to the best of our knowledge, no empirical studies have evaluated the influencing factors or developed interventions of person-centered care. To facilitate related studies, it is necessary to develop a tool to quantitatively measure person-centered perioperative nursing (PCPON). To date, person-centered nursing measurement tools have been developed in a variety of clinical settings, including dementia care [7], oncologic nursing [13], and critical care nursing [14]. However, no tools related to PCPON have been reported. Because perioperative nursing is a specialty that requires an enclosed and isolated atmosphere, it is necessary to develop a tool that reflects its unique characteristics.

The present study aimed to develop a reliable and valid scale to assess PCPON. Specifically, the first aim was to develop a PCPON scale based on the theoretical framework. The second aim was to psychometrically validate the developed scale. The development of a PCPON scale would contribute to the understanding and performing of person-centered nursing in the operating room.

## Methods

### Study design

This was a methodological study to develop a scale to assess PCPON and to test its psychometric properties.

### Scale development

#### Conceptual framework

Before developing the preliminary items for the PCPON scale, the authors established the concept definition and constructs of PCPON through reviewing related literature. Based on the conceptual analysis of person-centered nursing [3], the PPFM [10], and the integrative review of person-centered care in the perioperative context [15], PCPON was defined as recognizing the individuality of the surgical patient, interacting and sharing information with the patient, and demonstrating nursing expertise.

The constructs of PCPON were set as “individuality,” “information sharing,” “compassionate interaction,” and “nursing

expertise.” Individuality, a representative concept of person-centered nursing, means providing care and making decisions based on the individual patient's unique needs and specific interests [3]. From the perspective of the surgical patient, it is important to be recognized as a unique entity and be accepted as he/she is [15]. The second construct, information sharing, involves helping patients participate in decision-making through the provision of adequate information. Patients undergoing surgical intervention can participate in decision-making related to their treatment through “information dissemination”, “formulation of options”, “integration of information”, and “control”. This information support process lasts the whole perioperative period [16]. The third construct is compassionate interaction. The PPFM [10] is a model that demonstrates that safety, physiological responses, behavioral responses, and health systems surrounding surgical patients constantly interact with nursing. Interaction between nurses and patients based on a comprehensive understanding and empathy for the patient's situation is a key component of person-centered nursing [4]. The last construct, nursing expertise, means that nurses provide skilled nursing care to surgical patients based on their expertise and experience. Jakimowicz and Perry [17] described this as “biomedical nursing practice” in the analysis of the concept of patient-centered critical care nursing.

#### Preliminary items

Based on the conceptual framework, the authors derived 36 relevant preliminary items from the literature. To incorporate the opinions of the people concerned, this study conducted one-on-one in-depth interviews with 10 perioperative nurses and 10 postoperative patients. All interviews were conducted by one of the authors. The nurse interview was conducted in the meeting room of the hospital, and the patient interview was conducted in the patient room. The questions used in the interview were along the lines of “What do you think PCPON in the operating room involves?” and “What are the specific examples of PCPON?” The contents of the interviews were all recorded and transcribed with the consent of the interviewees. After collecting relevant opinions from interview contents, the authors grouped them together, deleted the overlapping items, and added four items to form a total of 40 preliminary items.

To examine whether the preliminary items reflected the attributes of PCPON, two rounds of content validity tests were performed with experts including a nursing professor, five perioperative nurses, and three postoperative patients. In the first round for 40 preliminary items, five items with item-content validity index (I-CVI) coefficients of less than .78 were deleted [18]. There was no item with an I-CVI coefficient of less than .78 in the second round for the remaining 35 items. However, based on the opinions of the experts, we modified the phrasing of six items to reflect the operating room environment.

This study conducted the pretest of the 35-item questionnaire on 20 perioperative nurses. The nurses took less than 10 minutes to complete the questionnaire. On a five-point scale, the understandability of the items was  $3.88 \pm 0.99$ , letter size appropriateness was  $3.96 \pm 0.91$ , appropriateness of item arrangement was  $3.71 \pm 0.99$ , and adequacy of item length was  $3.75 \pm 1.15$ . The expressions of two items were modified in keeping with the opinions of the participants.

#### Evaluation of the PCPON scale

##### Setting and samples

The participants of the present study were nurses who had worked for more than six months in the operating rooms of 21 hospitals located in Busan, Korea. Nurses with less than six months

of experience in operating rooms were excluded because of relative inexperience.

Data were collected from September 11 to October 20, 2017. The authors contacted all general and university hospitals in Busan, which was listed in the Health Insurance Review & Assessment Service of Korea. Among them, the authors conducted questionnaire surveys at the 21 hospitals that permitted us to collect data. Participants were asked to sign the accompanying informed consent form and then respond to the questionnaire. The completed questionnaire was collected by one of the authors after one week.

It is desirable that exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) be performed to separate samples when evaluating the scale [19]. In the present study, after recruitment, all participants were randomly assigned to the EFA or CFA group. A sample of at least five to 10 times the number of items is required for EFA [20]. As the preliminary scale included 35 items, 175–350 participants were needed. In addition, a minimum of 200 samples were required for the CFA [21], thus requiring a total of 375–550 participants for the study. 480 questionnaires were distributed, considering a dropout rate of 20.0%; 462 were collected, and 459 were finally used for analysis. Using random case selection in the SPSS program (IBM Inc. Armonk, NY, USA), 229 persons—50% of the total participants—were selected for the EFA group and the remaining 230 persons were assigned to the CFA group.

#### Data analysis

The collected data were analyzed using IBM SPSS/Win 24.0 and AMOS/Win 24.0 (IBM Corp., Armonk, NY, USA) program as follows.

- 1) The characteristics of participants were analyzed by descriptive statistics such as frequency, percentage, mean, and standard deviation. The differences between the CFA and EFA groups were analyzed by  $\chi^2$  tests, *t* tests, and analysis of variance.
- 2) For item analysis, the mean, standard deviation, skewness, and kurtosis of each item were obtained and the interitem correlation and item–total correlation (ITC) coefficients were analyzed.
- 3) In EFA, the principal axis factor method was used to extract meaningful structures common to all items. To facilitate the interpretation of the factor structure, factor rotation was performed using the Varimax method of orthogonal rotation. The Kaiser–Meyer–Olkin measure and Bartlett's test for sphericity were conducted to determine if the collected data were suitable for factor analysis.
- 4) In the CFA, the fit indices were calculated using the  $\chi^2$  statistic (*p*-value), normed  $\chi^2$  [Chi-square minimum/degree of freedom (CMIN/DF)], goodness of fit index (GFI), root mean square residual (RMR), standardized root mean square residual (SRMR), root mean square error of approximation (RMSEA), Tucker–Lewis index (TLI), and comparative fit index (CFI). The reference values for each fitness index were *p* > .05 for  $\chi^2$ , CMIN/DF < 3.0, GFI > .90, RMR < .08, SRMR < .08, RMSEA < .08, TLI > .90, and CFI > .90.
- 5) Convergent validity and discriminant validity were analyzed by construct reliability, average variance extracted, and Pearson correlation coefficients.
- 6) The Pearson correlation coefficient between the PCPON scale and the Korean version of the Caring Attributes Questionnaire [22,23] was calculated to verify concurrent validity. Because “caring” meets the needs of individual patients based on human respect [22], it can be considered in line with person-centered nursing. The Caring Attributes Questionnaire includes 42 items rated on a five-point Likert scale (1 point: not at all, 5 points: very much), and the higher the score, the higher the caring

perception. The reliability (Cronbach  $\alpha$ ) reported by Song [23] was .94, which was .90 in the present study.

- 7) To evaluate the known-groups validity, the differences of the PCPON scores according to the characteristics of the participants were compared using *t* test and analysis of variance.
- 8) The reliability of the PCPON scale was assessed by the corrected ITC and Cronbach  $\alpha$ , the internal consistency coefficient.

#### Ethical consideration

The present study was approved by the Institutional Review Board of Dong-A University, with which the authors are affiliated (Approval no. #2-104709-AB-N-01- 201705-HR-019-02). Approval from the participating institutions was also obtained. The nurses voluntarily decided to participate in the study. All participants provided written informed consent before completing the questionnaires.

#### Results

##### Characteristics of participants

A total of 459 perioperative nurses participated in the study. Most of them (96.9%) were female, and their mean age was  $31.76 \pm 7.82$  years. Most participants were staff nurses with one to five years of experience in university hospitals. There were no significant differences in mean age, sex, marital status, religion, education, hospital size, years of clinical experience, and position of participants in the EFA and CFA groups (Table 1).

##### Validity and reliability of the scale

As a result of the item analysis, the mean score of each of the 35 items was 3.54–4.75, and the range of the standard deviation was 0.60–1.09. This study deleted two items by considering the mean score (> 4.5), skewness, and kurtosis. In addition, four items with an interitem correlation of less than .30 and a corrected ITC of less than .40 were deleted.

EFA was conducted for the remaining 29 items. The Kaiser–Meyer–Olkin value of the data was .94, and Bartlett's test of sphericity was  $\chi^2 = 5874.42$  (*p* < .001), so the condition for the factor analysis was satisfied. Five factors with an eigenvalue of 1.0 or greater were derived, and seven items with a communality of less than .40 and one item with a factor load of less than .40 were deleted [24,25]. Four items were considered as being cross-loaded on two factors, and the difference of factor loading value was less than .20 [25]. However, three of these items were not deleted considering the theoretical relevancy of PCPON. They were item numbers 19 “I look at the patient's preoperative history”, 25 “I often check the patient's needs”, and 28 “If the patient complains of pain, I take appropriate action.” As a result, nine items were eliminated through EFA, and the final five factors and 20 items were confirmed, accounting for 68.2% of the total variance. Factor 1 was composed of six items, and its explained variance was 18.5%. Factor 2 was composed of five items with explained variance of 16.5%. Factor 3 was composed of three items with explained variance of 11.4%. Factor 4 was composed of three items with explained variance of 11.2%. Factor 5 was composed of three items with explained variance of 10.6%. These five factors were named compassionate interaction, respect, providing comfort, information sharing, and nursing expertise, respectively (Table 2).

The CFA was performed on the five factors and 20 items of the PCPON scale. Because the final 20 items were all with a standardized factor load of .50 or greater, had a critical ratio value of 1.97 or greater (*p* < .05), and consisted of three or more items per factor, there was no problem of model identification. For the final PCPON

**Table 1** The Difference of PCPON according to the Participants' Characteristics (N = 459).

Characteristics	Categories	EFA group (n = 229)	CFA group (n = 230)	t/ $\chi^2$ (p)	Total (n = 459)	PCPON	t/F (p)
		n (%)	n (%)		n (%)	M $\pm$ SD	
Age (yrs)	21–25	43 (18.8)	36 (15.6)	1.17 (.242)	79 (17.2)	3.85 $\pm$ 0.53	1.86 (.135)
	26–30	81 (35.4)	86 (37.4)		167 (36.4)	3.91 $\pm$ 0.42	
	31–35	24 (10.5)	36 (15.7)		60 (13.1)	3.91 $\pm$ 0.38	
	$\geq$ 36	81 (35.3)	72 (31.3)		153 (33.3)	3.98 $\pm$ 0.41	
	M $\pm$ SD	31.81 $\pm$ 7.88	31.71 $\pm$ 7.75		31.76 $\pm$ 7.82		
Sex	Men	4 (1.7)	10 (4.3)	1.62 (.105)	14 (3.1)	3.99 $\pm$ 0.33	1.55 (.213)
	Women	225 (98.3)	220 (95.7)		445 (96.9)	3.92 $\pm$ 0.44	
Marital status	Married	88 (38.4)	83 (36.1)	1.27 (.203)	171 (37.3)	3.95 $\pm$ 0.42	0.21 (.646)
	Unmarried	141 (61.6)	147 (63.9)		288 (62.7)	3.91 $\pm$ 0.45	
Religion	Yes	106 (46.3)	105 (45.7)	0.89 (.372)	211 (46.0)	3.91 $\pm$ 0.44	0.03 (.873)
	No	123 (53.7)	125 (54.3)		248 (54.0)	3.93 $\pm$ 0.44	
Educational degree	Diploma	62 (27.1)	65 (28.3)	1.51 (.131)	127 (27.7)	3.84 $\pm$ 0.45	2.35 (.004)
	Bachelor	149 (65.1)	151 (65.6)		300 (65.3)	3.89 $\pm$ 0.43	
	$\geq$ Master	18 (7.8)	14 (6.1)		32 (7.0)	4.06 $\pm$ 0.40	
Type of hospital	General	82 (35.8)	91 (39.5)	0.97 (.335)	173 (37.7)	3.90 $\pm$ 0.45	1.17 (.279)
	Advance general	147 (64.2)	139 (60.5)		286 (62.3)	3.96 $\pm$ 0.41	
OR experience (yrs)	<1	19 (8.3)	15 (6.5)	0.82 (.935)	34 (7.4)	3.90 $\pm$ 0.42	1.60 (.187)
	1–5	94 (41.1)	98 (42.6)		192 (41.8)	3.88 $\pm$ 0.48	
	6–10	28 (12.2)	35 (15.2)		63 (13.7)	3.99 $\pm$ 0.35	
	$\geq$ 11	88 (38.4)	82 (35.7)		170 (37.1)	3.96 $\pm$ 0.41	
Position	Staff nurse	184 (80.4)	189 (82.2)	0.77 (.582)	373 (81.3)	3.84 $\pm$ 0.40	4.95 (.001)
	Charge nurse	30 (13.1)	31 (13.5)		61 (13.3)	4.00 $\pm$ 0.35	
	Head nurse	15 (6.5)	10 (4.3)		25 (5.4)	4.08 $\pm$ 0.05	

Note. CFA = confirmatory factor analysis; EFA = exploratory factor analysis; M = mean; OR = operating room; PCPON = person-centered perioperative nursing; SD = standard deviation.

**Table 2** Rotated Factor Pattern Matrix (N = 229).

No	Items	Communality	Factors				
			1	2	3	4	5
23	I empathize when the patient expresses emotions.	.69	<b>.74</b>	.32	-.06	.20	.18
24	I actively listen to the patient.	.68	<b>.72</b>	.35	.06	.19	.20
27	I attempt nonverbal communication with patients who cannot speak.	.43	<b>.68</b>	.03	.09	.14	.28
15	I try to reduce the anxiety of the patient through words or actions.	.53	<b>.65</b>	.17	.38	-.01	.23
26	I use terms patients can understand.	.66	<b>.60</b>	.37	.14	.34	.23
25	I often check the patient's needs (e.g., breathing, voiding).	.60	<b>.50</b>	.30	.35	.44	.09
8	I use honorific words for the patient.	.58	.12	<b>.78</b>	.01	.25	.15
12	I call the patient by a proper title.	.64	.10	<b>.78</b>	.18	.15	.19
11	I avoid unnecessary body exposure of the patient.	.55	.24	<b>.69</b>	.33	.06	.06
7	I respond quickly to the patient's needs or questions.	.54	.32	<b>.61</b>	.20	.01	.34
19	I look at the patient's preoperative history.	.52	.43	<b>.49</b>	.23	.31	.06
2	I identify the patient's discomfort from the surgical position and take appropriate action.	.71	.14	.16	<b>.83</b>	.10	.17
1	I check whether the patient is feeling cold and take appropriate action.	.48	-.02	.22	<b>.79</b>	.13	.10
28	If the patient complains of pain, I take appropriate action.	.64	.49	.13	<b>.61</b>	.27	.12
21	I explain the procedure to the patient before surgery.	.40	-.02	.16	.11	<b>.73</b>	.37
22	I explain the reason for a delay in the operation to the patient.	.67	.42	.12	.19	<b>.70</b>	.15
31	I provide the patient with an explanation before taking any nursing action.	.36	.38	.33	.13	<b>.65</b>	.10
33	I regularly attend perioperative nursing education.	.67	.27	.18	.10	.14	<b>.81</b>
32	I participate in quality improvement activities on perioperative nursing.	.64	.26	.26	.17	.31	<b>.69</b>
35	I cooperate with other departments to treat patients.	.60	.36	.27	.22	.21	<b>.63</b>
Eigenvalue			3.88	3.48	2.40	2.34	2.23
Explained variance (%)			18.5	16.5	11.4	11.2	10.6
Total explained variance (%)			18.5	35.0	46.4	57.6	68.2

The bold values indicate the items that make up each factor.

scale, the fitness indices of the model were as follows:  $\chi^2 = 264.46$  ( $p > .05$ ), CMIN/DF = 1.65, GFI = .90, RMR = .03, SRMR = .06, RMSEA = .05, TLI = .92, and CFI = .93. All the fit indices were satisfactory except for the  $\chi^2$  statistic, which is sensitive to sample size (Table 3).

The results of correlation analysis between factors are shown in Table 3. The standardized factor loadings were above the reference value of .5, and the critical ratio value was above 1.97 in all items. The construct reliability was also .82–.94, which was higher than the reference value of .70, demonstrating convergent validity [20]. Discriminant validity was also demonstrated because the squares of correlation coefficients between latent variables (range: .04–.26)

were smaller than the average variance extracted values (range: .61–.74) [20]. The correlation between the PCPON scale and the Caring Perception Scale was analyzed for concurrent validity estimation. The correlation coefficient between the two instruments was  $r = .69$  ( $p < .001$ ).

In regard to known-groups validity, the PCPON varied according to the education and position of the perioperative nurse. The PCPON scores of nurses with master's degrees or higher were significantly higher than the scores of those with bachelor's degrees or lower ( $F = 2.35$ ,  $p = .004$ ). The PCPON scores of charge nurses were higher than those of general staff nurses ( $F = 4.95$ ,  $p = .001$ ; Table 1).

**Table 3** Results of Confirmatory Factor Analysis (N = 230).

Factors	Item	Standardized estimates ( $\beta$ )	SE	C.R.	Correlation between factors				AVE	CR
					1 (r)	2 (r)	3 (r)	4 (r)		
1. Compassionate interaction	15	.68			1				.71	.94
	23	.79	.11	10.25						
	24	.75	.11	9.89						
	25	.74	.11	9.70						
	26	.69	.10	9.12						
2. Respect	27	.72	.10	9.48					.68	.91
	7	.67			.30	1				
	8	.67	.12	8.31						
	11	.75	.13	8.99						
	12	.72	.12	8.76						
3. Comfort	19	.56	.11	7.22					.68	.86
	1	.80			.31	.36	1			
	2	.72	.19	7.71						
4. Sharing information	28	.52	.10	6.52					.61	.82
	21	.64			.20	.19	.36	1		
	22	.59	.12	6.47						
5. Expertise	31	.73	.16	6.94					.74	.89
	32	.75			.19	.21	.19	.51		
	33	.85	.11	10.82						
	35	.75	.10	10.36						
Fitness index	$\chi^2(p)$	df	CMIN/df	GFI	RMR	SRMR	RMSEA	TLI	CFI	
Reference values	(>.05)		<3.0	>.90	<.08	<.08	<.08	>.90	>.90	
Model	264.46 ( $p < .05$ )	160	1.65	.90	.03	.06	.05	.92	.93	

Note. AVE = average variance extracted; CFI = comparative fit index; CI = confidence interval; CMIN/df = Chi-square minimum/degree of freedom; CR = construct reliability; C.R. = critical ratio; GFI = goodness of fit index; RMR = root mean square residual; RMSEA = root mean square error of approximation; SE=standard error; SRMR=standardized root mean square residual; TLI = Tucker–Lewis index.

The ITC values of the 20 items of the PCPON scale were .42–.64, and there was a positive correlation between all items. Cronbach  $\alpha$  of the compassionate interaction, respect, providing comfort, information sharing, and nursing expertise factors were .88, .86, .78, .76, and .83, respectively (Table 4).

## Discussion

This study developed a self-report scale composed of five factors and 20 items to measure PCPON practice considering the characteristics of surgical patients and the operating room environment. The reliability and validity of the developed PCPON scale were

found to be suitable for measuring perioperative nurses' person-centered nursing practice.

The five factors of the final PCPON scale were compassionate interaction, respect, providing comfort, information sharing, and nursing expertise. The first factor, compassionate interaction, consists of items related to listening to patients' stories and empathizing with them and providing nursing that suits their needs. Surgical patients are often frightened and afraid of loss of control because of anesthesia. A strong relationship is needed to share stories and experiences with patients in PCPON [15]. According to the intraoperative caring model [26], the nurse can show the presence of caring through compassionate interaction that reflects

**Table 4** Internal Consistency of the Final Scale.

Factors	Items	Corrected item–total correlation	Cronbach $\alpha$ if item deleted	Cronbach $\alpha$
Compassionate interaction	I empathize when the patient expresses emotions.	.60	.90	.88
	I actively listen to the patient.	.63	.90	
	I attempt nonverbal communication with patients who cannot speak.	.55	.90	
	I try to reduce the anxiety of the patient through words or actions.	.60	.90	
	I use terms that patients can understand.	.45	.91	
Respect	I often check the patient's for needs (e.g., breathing, voiding).	.64	.90	.86
	I use honorific words for the patient.	.56	.90	
	I call the patient by a proper title.	.51	.90	
	I avoid unnecessary body exposure of the patient.	.51	.90	
	I respond quickly to the patient's needs or questions.	.58	.90	
Comfort	I look at the patient's preoperative history.	.52	.90	.78
	I identify the patient's discomfort from the surgical position and take appropriate action.	.46	.91	
	I check whether the patient is feeling cold and take appropriate action.	.42	.91	
Sharing information	If the patient complains of pain, I take appropriate action.	.55	.90	.76
	I explain the procedure to the patient before surgery.	.56	.90	
	I explain the reason for a delay in the operation to the patient.	.57	.90	
Expertise	I provide the patient with an explanation before taking any nursing action.	.52	.90	.83
	I regularly attend perioperative nursing education.	.58	.90	
	I participate in quality improvement activities on perioperative nursing.	.61	.90	
	I cooperate with other departments to treat patients.	.49	.90	

the lived experience of the patient. Sometimes simple body language, touch, or eye contact can lead a human relationship between the patient and the nurse [27].

The second factor, respect, refers to the value of recognizing the uniqueness of every patient [3] and includes items on polite behaviors toward and prompt responses to patients. It is important for patients, and especially perioperative patients who are surrounded by state-of-the-art equipment and machines, to be recognized as unique individuals who possess dignity [15]. The perioperative nurse should respect the individual patient's intent and preferences [12]. Respect can be expressed differently depending on the sociocultural background of the patient and nurse. In this PCPON scale developed in Korea, the items on the use of honorifics, appellations, and minimum body exposure were included under the respect factor. In the West, however, the meaning of respect could be not to use demeaning terms such as “failed” or “losing” to patients, but rather to refer patients to their names instead of calling them subjects [28]. To administer the PCPON scale elsewhere, it is necessary for it to undergo a cultural validation process.

The third factor, providing comfort, consists of items on position adjustment and pain and temperature control. Improving the physical and emotional well-being of surgical patients can promote recovery [15]. It is difficult to separate “providing comfort” from the other three factors of PCPON. One of the ways perioperative nurses understand patients' unique individual experiences is by showing empathy and providing comfort, and reassurance with high-quality care [26]. Although there have been many studies on patients' comfort after surgery, there is limited empirical research on patients' discomfort or well-being in the operating room [29]. Therefore, it is necessary to develop more diverse nursing interventions to improve perioperative patients' comfort in the operating room.

The fourth factor, information sharing, consists of items about perioperative nurses' explanations to patients regarding surgical procedures, delays, and nursing practices. Sundqvist et al. [30] reported that the four categories of protecting, informing, value preserving, and supporting behaviors were required to promote person-centered care in perioperative settings. Informing includes information gathering and sharing through bidirectional communication with surgical patients. This information sharing can provide an opportunity for surgical patients to participate in their own care.

The final factor, nursing expertise, includes items on the education and quality improvement activities of the perioperative nurse and cooperation among professionals. This factor reflects a unique aspect of perioperative nursing, which is distinct from other person-centered nursing measurement tools [7,8]. Perioperative nurses should have a knowledge base that can lead to high-quality patient outcomes and be responsible for lifelong learning. They also should be aware of the latest nursing trends to provide quality care and constantly accumulate new knowledge, skills, and attitudes to improve their performance [12]. This competency can be achieved through not only nursing education but also participation in related research and quality improvement activities.

Two items—“Identify patient name, name of surgical procedure, and surgical site to the patient” and “Perform a surgical count thoroughly”—were deleted in the item analysis process. These two items correspond to the most basic aspect of perioperative nursing care, and relevant guidelines for specific procedures are also presented [31]. Although these are items that measure core performance of perioperative nursing, they are naturally required by nurses, so the average score was extreme. It is recommended that items with extremely high average scores be deleted because they may reduce the discrimination of the scale [32].

As a result of EFA, five factors were derived and the total explanatory power was 68.2%, exceeding the standard value of 60% [20]. These factors differ slightly from those of the initial conceptual framework. In particular, “individuality” of the conceptual framework was divided into “respect” and “comfort.” This result can be interpreted as meaning that the actual perioperative nurses are highly aware of the importance of the patient's comfort in the operating room. Surgical patients are mostly preoccupied with their discomfort, and their comfort is positively correlated with hope [33]. The physical, psychospiritual, environmental, and sociocultural aspects of comfort measures and interventions provided by perioperative nurses ensure that surgical patients' needs of relief, ease, and transcendence are met [34].

Analyses of the model fit through CFA showed that most of the fit indexes met the recommended criteria; therefore, the structure of PCPON scale and empirical data were well consistent. In addition, the results of convergent validity and discriminant validity analyses show that the items constituting each factor of the PCPON scale are correlated with each other and at the same time are different from the items constituting the other factors. Eventually, the five factors are interrelated, together measuring the unique attributes of PCPON.

The Cronbach  $\alpha$  value of the PCPON factors was .76–.88, indicating that the scale had good internal consistency. Internal consistency reliability is influenced by the number of items, and the more the items, the higher the reliability [32]. It is necessary to reduce the number of items if the reliability of each construct factors shows an internal consistency of more than .90 [20]. The number of items included in the construct factors of the PCPON is three to six, which does not affect reliability. In addition, because the reliability of each factor of the PCPON is less than .90, the final item number of the scale can be considered appropriate.

The analysis of PCPON difference according to the characteristics of perioperative nurses showed that the PCPON scores of nurses with master's degrees were high and that nurses with higher positions had higher PCPON scores. These results are in line with the findings of Bagherian et al. [35] that nurses' attitudes toward caring are higher with higher education and more career experience. Therefore, to improve the person-centered nursing practice in the operating room, various types of career experience and education for nurses are needed.

The present study is significant in that it provides a conceptual framework and measurement tool for person-centered nursing in the operating room. The scale is expected to contribute to the development of the theory of PCPON because its reliability and validity were satisfactory. In addition, the PCPON scale can serve as a basis for the development of person-centered interventions in perioperative nursing.

On the other hand, the present study has some limitations. First, although the authors generated initial items through literature review and in-depth interviews, it is possible that not all the attributes of PCPON were included. Second, participants in the present study were recruited from a single city in Korea and therefore do not represent all perioperative nurses. Finally, the cultural view of the participants might be reflected in the PCPON scale. Hence, it is necessary to conduct research on perioperative nurses working in various regions in the future and to reevaluate the psychometric properties of the PCPON scale in the different samples of various cultures.

## Conclusion

This study developed a scale to measure the PCPON practice and evaluated its psychometric properties. A preliminary tool was developed through literature review, in-depth interviews, and

expert content validity analyses, followed by a survey on 459 operating room nurses and factor analyses to complete the final PCPON scale with 5 factors and 20 items. The reliability of the PCPON scale was satisfactory. Construct validity was demonstrated through EFA and CFA. In addition, the concurrent validity based on the correlation with another validated tool was also appropriate. Because the PCPON scale has acceptable reliability and validity, it can be used to assess person-centered care and its effects on perioperative nursing practice. Further studies are needed to estimate the reliability and validity of the PCPON scale for larger samples in various cultures and countries.

### Conflicts of interest

There are no conflicts of interest to declare.

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### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.anr.2019.07.002>.

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