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Competency in Operating Room Nursing: A Scoping Review

Abstract

Aim: One of the most important indicators of patient safety and professional practice standards is operating room nursing competency. This study aimed to conduct a systematic review of the literature on operating room nurse competency, influencing factors, and evaluation.

Methods: The study was conducted according to the PRISMA-ScR criteria. The searches were conducted using CINAHL, Cochrane Library, PUBMED, Scopus and ProQuest, Ulakbim electronic databases, and the reference lists were completed after the literature review. Two researchers used the systematic review method to choose the studies that would be included. Finally, tables were prepared and reported for data extraction and analysis by summarising and combining the data.

Results: This review includes research articles between 2006 and 2019 that meet the inclusion criteria. Nineteen studies, seven of which were methodological, five quantitative, five qualitative, and two mixed methods, were examined. Studies are mainly from Australia. Operating room nursing competency encompasses both technical and non-technical areas. It was determined that the technical areas consist of fundamental nursing knowledge and skills specific to the operating room, while the non-technical competence areas include social, affective, and cognitive skills that ensure safe and effective performance. It has been shown that the most critical factors influencing competence are education and experience, and five instruments have been developed to measure and evaluate.

Conclusion: In this study, it was concluded that the technical and non-technical areas of operating room nursing competency and the influencing factors should be investigated more comprehensively and in more detail. Implicit competence, composed of personality and self-motivation dimensions, should be examined more closely along these lines. The establishment of national and international standards for developing competency assessment instruments is also an essential requirement.

Keywords: Operating room nursing, Competency, Competence, Evaluation

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Introduction

Competence is a holistic term denoting quality or state.[1] Despite the differences, the terms competency and competence are sometimes used interchangeably.[2] Competency qualifies the individual qualities that distinguish excellence, while competence qualifies the minimum job requirements that a person needs to do their job effectively. For a person to be competent, it is also important to be sufficient.[3] Competency in nursing is defined as the nurse's ability to effectively demonstrate the qualities such as knowledge, skills, values, attitudes, and personality traits required to fulfill their professional responsibilities.[4] Operating room nursing competency, one of the specialties of professional nursing, includes psychomotor skills and technical aspects of nursing and non-technical areas.[5-9] Technical skills are described as protocols and standards of practice related to experimental and scientific knowledge.[6,10–12] Non-technical skills are described in the context of communication, coordination, teamwork, and providing holistic and empathetic care.[6,10,13–15] Operating room nursing competency refers to having sufficient knowledge, skills, and attitudes to provide safe preoperative, intraoperative, and postoperative care.[16] Competent operating room nurses, in collaboration with the surgical team, are the fundamental elements of safe care.[5,7,17]

Being a woman in operating room nursing,[18,19] age[15,19] and increasing operating room experience[15,19–24] positively affect competency. Training is found to have a positive effect on[15,19,21] competency, but experience in the operating room makes a more substantial contribution than training.[15] There are significant disparities in nurses' competency areas[19,25] based on their job titles (trainer, manager, preceptor, and anesthesia nursing)[21,26] and the countries in which they live.

Measuring and assessing nurses' competencies is a significant factor in developing and improving the quality of care.[27] Individual evaluations can be done by nurses, colleagues, managers, educators, and other health professionals using instruments designed in the literature to evaluate the competency of operating room nurses.[14,15,22,28–31] Regular assessment of the competencies of operating room nurses helps them identify their needs for additional knowledge, skills, personal development, and integrative learning experiences, recognize[28–30]their strengths and weaknesses,[32] and make rational personal career plans.[27,32] Competency measurement and assessment have several purposes and benefits, such as facilitating nursing human resource management strategies,[32,33] effectively utilizing human resources,[34] comparing different hospitals,[35] identifying assessment differences between nurses and managers,[36] and creating a model for competency development.[27] Competency evaluation is also significant in terms of ethical values and professional accountability.[15,37] In the light of this information, the aim is to examine the literature on the competency of operating room nurses, the factors influencing it, and the instruments used in its

assessment. Consistent with this objective, the research question was determined as "What is competency in operating room nursing, the factors that influence it, and the measurement instruments that have been developed to assess competency?"

Methods

In this study, the PRISMA-ScR criteria (Preferred Reporting Items for Systematic reviews and Meta-Analysis-extension for Scoping Reviews) was applied in the preparation of the scope review protocol and the writing of the article.[38] Two researchers worked independently on the literature review, data extraction, and quality evaluation stages of the study.

Review Strategy

Article review was performed on "CINAHL", "Cochrane Library", "PUBMED", "Scopus", "ProQuest", and "Ulakbim" electronic databases between 01 and 15 January 2019. Searches were made in English and Turkish. English keywords were searched for Medical Subject Heading "MeSH" index, Turkish keywords were searched for "Turkey Science Terms." The searches were conducted through various combinations of key terms in English, such as "perioperative nursing," "surgical nursing," "operating room nursing," "competence," "competency," "skill," "assessment," "measurement," "scale," and the Turkish key terms' perioperatif hemşirelik,' "cerrahi hemşireliği," "ameliyathane hemşireliği," "yetkinlik," "yeterlilik," "beceri," 'ölçme, "değerlendirme," "araç" and the words "OR" and "AND," which are Boolean Operators, are supplemented by various combinations with Turkish "VE," "VEYA." Articles in key article references and a general internet browser (Google Scholar) were used to uncover other publications in the literature.

Selection Criteria and Selection of Studies

The PCC method was used to determine the selection criteria for this scoping review, based on our research questions. PCC consists of population design (P-Population), concept design (C-Concept), context design (C-Context), and identification of sources of evidence.[39] The study population is operating room nurses working in the scrub, circulating, manager, and trainer positions and team members, including operating room nurses. The research's concepts are operating room nurse competency areas, influencing factors, and competency evaluation instruments. Articles written in Turkish and English are context types, and original research articles published in national/international refereed journals whose full text can be accessed are the source types of the study. The study exclusion criteria consisted of studies that did not include operating room nurses in the sample (P), did not include competency domains, influencing factors, and competency assessments (C), studies written in languages other than Turkish and English (C), and dissertation studies, literature reviews, and articles whose full text could not be obtained (resource types).

Systematic review methodological steps were used in the selection of studies. Two researchers independently searched databases for articles using keywords, titles, and abstracts (n = 5404). Research results were merged using the EndNoteX7 reference management system, and duplicate articles were identified and deleted (n = 4259). Another publication reached by the additional search for other publications in the literature that met the inclusion criteria could not be found. No Turkish publication could be found in the reviews. After completing the assessment processes of the studies whose full texts were reached and met the inclusion criteria, a decision was made on which studies would be included in the search. The full texts of 38 studies were examined in detail after 1046 articles that did not match the inclusion criteria based on their titles, and 61 articles that did not fulfill the abstracts were excluded. The researchers included studies that they agreed on, and disagreements were resolved through discussion. The PRISMA flowchart describes the article selection process in detail (Figure 1).[40]

Quality Assessment

The researchers independently evaluated the studies' methodological quality using instruments appropriate for the research types. Quantitative analyses were assessed using the Clearinghouse for Labor Evaluation and Research- CLEAR 2014 guidelines, including 22 criteria. The suitability of each criterion is rated as "Yes, No, or Partially"; no rating is given.[41] The Joanna Briggs Institute Critical Appraisal Checklist for Qualitative Research 2017 was used to assess the quality of qualitative studies. Each of the 10 criteria in this assessment instrument is scored as Yes (1 point), No, Uncertain, and Not Applicable (0 points).[42] Methodological and mixed-method studies were conducted following the Five Criteria Mixed-Methods Appraisal Tool (MMAT) 2018. Ratings are Yes, No, Uncertain.[43] Since there is no explanation of scoring in the MMAT 2018 version, scoring was done as stated in the MMAT 2011. In this scoring instrument, the "Yes" answer to each question is worth 25%.[44]

Data Extraction

The researchers prepared a joint data extraction and analysis table based on the research questions and study characteristics to provide detailed information from the studies analysed (Table 1). Data extraction and analysis table; It includes findings of the competency areas of operating room nurses, influencing factors, and assessment instruments. Both researchers performed the data extraction processes independently.

Data Analysis

The findings in the data extraction table are offered as a descriptive and narrative overview in the data analysis by comparing them with different methodological studies within the scope of research questions. The data are provided by analysing the data of various studies together under three subtitles as areas of competence in operating room nursing, affecting factors, and evaluation instruments.

Results

Search Findings

As a result of the search, 5404 studies were found initially. No additional studies were found in further investigations. After repetitive studies, 38 articles were reached by reviewing the title, abstract and full text. The study examined 19 research articles published between January 2006 and January 2019 that met the inclusion criteria. Figure 1 depicts explanations for the selection of articles.

The majority of the studies were performed between 2006 and 2019 in Australia (n = 10), Scotland (n = 4), England (n = 1), China (n = 1), Sweden (n = 1), Finland (n = 1), and Italy (n = 1). The studies were designed using methodological (n = 7), quantitative (n = 5), qualitative (n = 5), and mixed (n = 2) methods. According to methodological studies, competency assessment is done by observation and self-assessment. Quantitative studies consist of cross-sectional and observational studies. Data were collected through observation, individual interviews, focus group interviews, and document analysis in qualitative studies. 4643 operating room nurses (4492 scrub + circulated; 116 scrubs; 21 trainees/assistants; nine managers, five nurses-in-training) and 508 nurse anesthetists, nine anesthesiologists, and 23 surgeons were included in the studies. Tables 1 and 2 summarize the outcomes and features of the studies based on the study questions.

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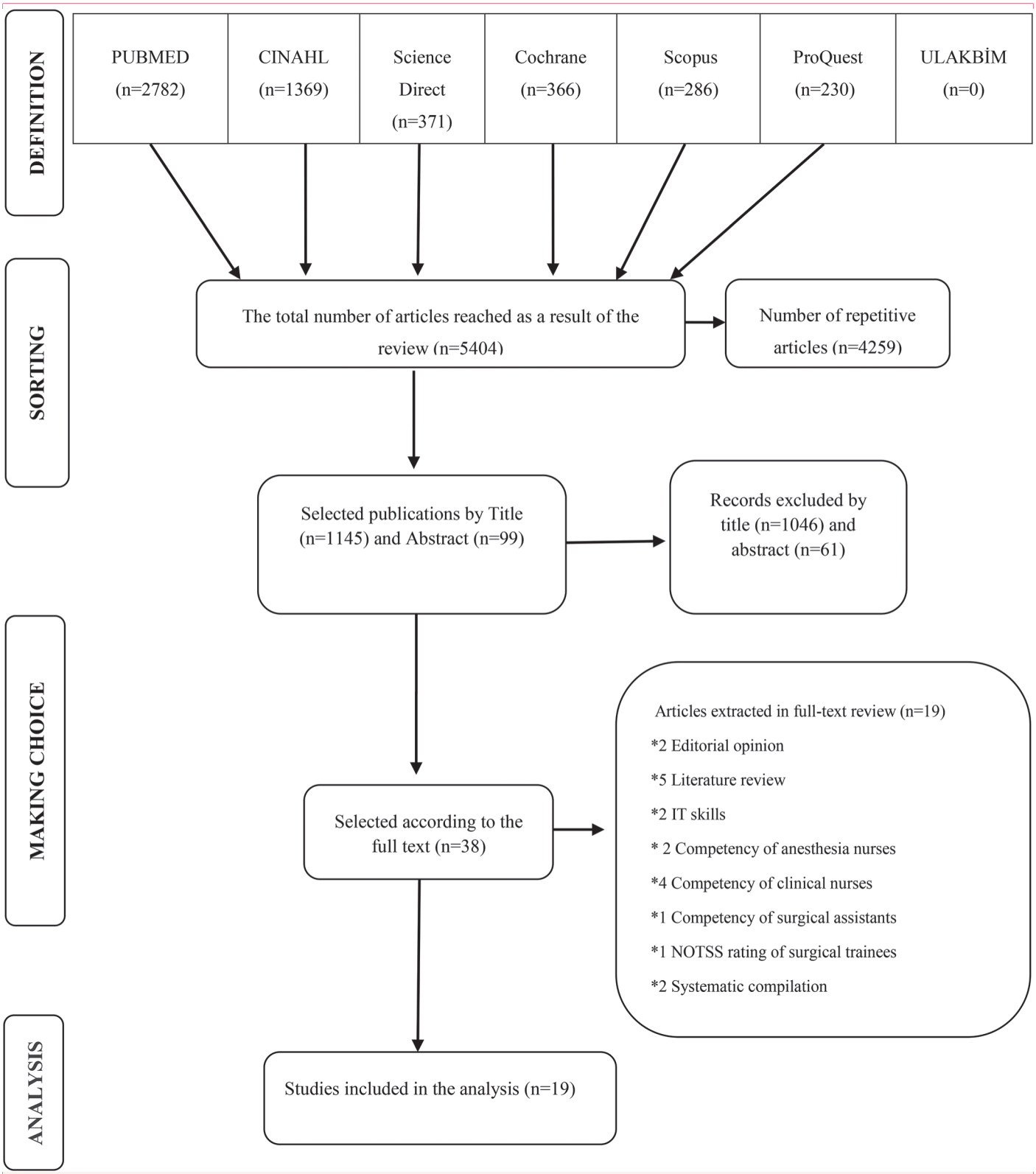

Figure 1. Flowchart of studies included in the scope compilation (PRISMA flowchart).

Table 1. Competency in Operating Room Nursing, Influencing Factors and Measurement Instruments Analysis

Competency Areas			Competency Influencing Factors			Assessment Instruments		
Fields	Number of Research	The number of participants	Factors	Number of Research	The number of participants	Instrument	Number of Research	The number of participants
Technical skills	14	4890	Age	3	2367	ICATS-N	1	22
Communication	7	454	Gender	4	2581	Analytical observation form	2	72
Empathy	6	475	Operating room specialization training	6	4474	SPLINTS	2	216
Coordination	2	161	Operating room experience	13	4666	PPCS-R	7	4688
Leadership	8	4715	Job title	2	1354	NCS	1	24
Task management	5	293	Country	2	1078			
Situational awareness	4	259						
Collaboration/ Teamwork	11	4513						
Professional development	6	4554						
Peer support	1	27						
Motivation	1	30						
Personality	1	30						
Stress and fatigue Management	1	34						

Quality Assessment Findings

The mean quality score of the qualitative studies included in the review was 8.2 (1.00 ± 1.00 (8.0-9.0) $\bar{x}$ ± SD (min.-max.). Quality scores of methodological studies are at least 75%, maximum 100%, and mixed-method studies score 80%. For the quantitative studies, the quality assessment was done according to the criteria, and it was found that all of them answered "yes" or "partially" to the criteria. Table 2 displays the quality assessment instruments and study scores.

Competency in Operating Room Nursing

The studies included in the review reported that the competencies of operating room nurses consisted of technical and non-technical areas. In the studies, technical skills were found to include medical knowledge, basic nursing and operating room specific knowledge and skills,[15,22,26,32,45,46] and knowledge based on previous experience with various situations.[15,46] Non-technical skills were assessed as communication and teamwork,[14,15,18,19,21,22,24,26,45,47,48] situational awareness and task management,[14,23,34,47] leadership,[15,19,21,22,26,47] empathy,[19,21,22,25,26] peer support, and coordination.[15,46]

Factors Affecting Competency

It was found that the fact that operating room nurses are female,[18,19] age increase,[19] operating room specialty training,[15,19,21] operating room experience,[15,19,21–24,46] and job title[19] positively influence the competency domains. In two studies, differences between countries were assessed.[21,26]

Instruments for the Assessment of Competence

This review noted that five instruments had been developed to assess operating room nurses' competency. The Imperial College Assessment of Technical Skills for Nurses (ICATS-N) Scale assessed technical skills in four categories by observation. ICATS-N shows acceptable reliability in all ability categories (Cronbach alpha > 0.70).[49,50] Technical skills are assessed using the Analytical Observation Form and the Holistic Performance Level Evaluation Chart. The analytical observation sheet is used to assess technical skills in 12 areas.[50] Cronbach's alpha reliability coefficient is 0.94.[51] The Scrub Practitioners' List of Intraoperative Non-Technical Skills (SPLINTS) consists of three categories and a nine-point structure that makes up these categories. The scrub is used to assess nurses' non-technical skills. SPLINTS sensitivity is 0.50 and 0.49 points at the category and element levels, respectively.[14] The Perceived Perioperative Competence Scale-Revised-PPCS-R with 40 items assesses technical and non-technical skills together in six competence domains. Cronbach's alpha reliability coefficient is 0.96.[22] Nurse Competence Scale (NCS), on the other hand, consists of 73 items and seven categories, and the reliability coefficient of Cronbach's alpha ranges from 0.79 to 0.91.[34]

Discussion

This review attempts to determine the concept of operating room nursing competency, the factors that influence competence, and the instruments used in its assessment. The study found that the domains

Table 2. Description of the Analysed Studies

Authors, Year, Country	Sample Size/ Sample Group	Aim	Research Design and Type/Data Collection Method	Operating Room Nursing Competency Areas	Competency Influencing Factors	Assessment Instruments	Quality Assessment Instrument and Score
Gillespie et al.,[45] (2006)	N = 27	To identify the elements of culture that impact nurses' flexibility in the operating room environment.	Qualitative	- Expert knowledge and experience	- Operating room experience		JBI Critical Appraisal Checklist for Qualitative Research-2017
Australia	20 operating room nurses		Ethnographic	- Team play			8
	6 Surgeons		Field notes	- Peer support			
	1 operating room assistant		Formal-Informal individual interview	- Priority competency			
Sevdalis et al.,[49] 2009	N = 22	To develop an observation instrument that encompasses the technical skills of operating room nurses that can be used for assessment and training and provide a preliminary evaluation of this instrument's applicability, reliability, and validity.	Methodological	- Wearing shirts and gloves		Imperial College Assessment of Technical Skills for Nurses (ICATS-N)	MMAT 2011
England	20 Trainees		Observation	- Material preparation			100%
	2 Trainer operating room nurses		Survey	- Sterile area preparation			
				- Maintaining the sterile area			
Nicholson et al.,[50] 2009	N = 40	To determine the reliability and psychometric properties of the analytic observation form in determining the variable level of clinical performance of operating room nurses.	Methodological	- Surgical hand washing		- Analytical observation form	MMAT 2011
Australia	Operating room nurse		Observation	- Wearing sterile clothing and gloves		- Holistic performance level evaluation chart	100%
			Observation form	- Risk management		- Holistic competency evaluation chart	
				- Preparation of materials			
				- Sterile area			

Table 2. Description of the Analysed Studies (Continued)

Authors, Year, Country	Sample Size/ Sample Group	Aim	Research Design and Type/Data Collection Method	Operating Room Nursing Competency Areas	Competency Influencing Factors	Assessment Instruments	Quality Assessment Instrument and Score
				- Patient position - Surgical count - Preparation and registry - Standard and additional measures - Surgical team interventions - Prosthesis and implants - Environmental control			
Gillespie et al.,[46] 2009 Australia	N = 27 Operating room nurse	To investigate the perceptions of operating room nurses about competency elements.	Qualitative Focus group interview	- Integration of theoretical, practical, situational, and aesthetic knowledge - Communication skills - Management and coordination of the operation list	- Operating room experience - Team support		JBI Critical Appraisal Checklist for Qualitative Research-2017 8
Gillispie et al.,[15] 2011 Australia	N = 134 Operating room nurse	To measure the competence of operating room nurses, identify differences in operating room experience and specialized training, and examine their contributions to competence.	Methodological Cross-sectional Survey	- Professional knowledge - Technical and procedural knowledge - Practical knowledge - Aesthetic knowledge - Teamwork - Communication	- Operating room experience - Operating room specialization training	- Perceived Perioperative Competence Scale-Revised (PPCS-R)	MMAT 2011 100%

Table 2. Description of the Analysed Studies (Continued)

Authors, Year, Country	Sample Size/ Sample Group	Aim	Research Design and Type/Data Collection Method	Operating Room Nursing Competency Areas	Competency Influencing Factors	Assessment Instruments	Quality Assessment Instrument and Score
				- Coordination			
				- Clinical leadership			
Mitchell et al.,[23] l2011	N = 34	To identify the non-technical skills required for the safe and effective performance of the operating room nurse during surgery through interviews with experienced operating room nurses and consulting surgeons.	Qualitative	- Cognitive skills	- Operating room experience		JBI Critical Appraisal Checklist for Qualitative Research-2017
Scotland	25 Scrub nurses		Semi-Structured Interview	- Social/ interpersonal skills			9
	9 surgeons			- Task management skills			
				- Stress and fatigue management skills			
Mitchell et al.,[14] 2012	N = 34	To test the validity and reliability of the Scrub Practitioners' List of Intraoperative Non-Technical Skills (SPLINTS) behavioral rating system.	Methodological	- Situational awarenes	- Operating room experience	- Scrub Practitioners' List of Intraoperative Non-Technical Skills (SPLINTS)	MMAT 2011
Scotland	Scrub nurse		Observation	- Communication and teamwork			90%
			Survey	- Task management			
Gillespie et al.,[22] 2012	N = 1205	To identify critical dimensions of competence perceived by operating room nurses to develop an instrument that accurately and reliably represents these dimensions.	Methodological	- Fundamental knowledge and skills	- Operating room experience	- Perceived Perioperative Competence Scale-Revised (PPCS-R)	MMAT 2011
Australia	Operating Room Nurse		Survey	- Leadership	- Operating room specialization training		85%
				- Cooperation			
				- Competence			
				- Empathy			

Table 2. Description of the Analysed Studies (Continued)

Authors, Year, Country	Sample Size/ Sample Group	Aim	Research Design and Type/Data Collection Method	Operating Room Nursing Competency Areas	Competency Influencing Factors	Assessment Instruments	Quality Assessment Instrument and Score
				- Professional development			
Gillespie et al.,[26] 2012	N = 310	To understand the differences between countries in the educational preparation levels of Canadian and Australian nurses, the migration of nurses, identify the areas of difference and analyze these differences.	Quantitative	- Fundamental knowledge and skills	- Age	- Perceived Perioperative Competence Scale-Revised (PPCS-R)	CLEAR
Australia	Australia 176 Operating room nurses		Cross-sectional	- Leadership	- Gender		The criteria are appropriate.
	Canada 134 Operating room nurses		Survey	- Cooperation	- Operating room experience		
				- Competence	- Operating room specialization training		
				- Empathy	- Job title		
				- Professional Development	- Country		
Meretoja ve Koponen,[34] 2012,	N = 24	To develop a model to compare nurses' optimal and actual competencies in the perioperative setting.	Mixed-Method/Three systematic steps	- Help role	- Operating room experience	- Nurse Competency Scale (NCS)	MMAT 2011
Finland	3 Surgeons		Qualitative – Quantitative-Qualitative	- Teaching and coaching			80%
	3 Anesthesiologists		Open-Ended Question	- Diagnostic functions			
	3 Nursing directors		Survey	- Manage situations			
	5 Executive nurse		Focus group interview	- Therapeutic interventions			
	7 Operating Rooms and			- Ensuring quality			
				- Job role			
	3 Trainer Nurses						

Table 2. Description of the Analysed Studies (Continued)

Authors, Year, Country	Sample Size/ Sample Group	Aim	Research Design and Type/Data Collection Method	Operating Room Nursing Competency Areas	Competency Influencing Factors	Assessment Instruments	Quality Assessment Instrument and Score
Nicholson et al.,[51] 2013,	N = 32	To assess the validity and reliability of the Performance-based assessment of the analytic and holistic observation questionnaire developed following the Standards for Scrub Nurses.	Methodological	- Surgical scrub		- Analytical observation form	MMAT 2011
Australia	Observational evaluation of 32 Scrub nurses		Observation	- Clothes and gloves		- Performance-based scoring	80%
			Observation form	- Risk management		Table	
			Scoring chart	- Preparing materials		-Holistic competence evaluation chart	
				- Sterile area			
				- Patient position			
				- Surgical count			
				- Preparation and registry			
				- Standard and additional measures			
				- Surgical team interventions			
				- Prosthesis and implants			
				- Environmental control			
Gillespie et al.,[19] 2013	N = 1044	To examine the extent to which demographic and personal characteristics influence operating room nurses' perceived competency and job responsibilities.	Quantitative	- Fundamental Knowledge and Skills	- Age	- Perceived Perioperative Competence Scale-Revised (PPCS-R)	CLEAR
Australia	Operating room nurse		Correlational	- Leadership	- Gender		The criteria are appropriate.
			Research	- Cooperation	- Job title		
			Survey	- Competence	- Operating room specialization training		

Table 2. Description of the Analysed Studies (Continued)

Authors, Year, Country	Sample Size/ Sample Group	Aim	Research Design and Type/Data Collection Method	Operating Room Nursing Competency Areas	Competency Influencing Factors	Assessment Instruments	Quality Assessment Instrument and Score
				- Empathy	- Operating room experience		
				- Professional Development			
Gillespie ve Pearson,[18] 2013	N = 214	To compare the levels of self-efficacy perceived by operating room nurses and technicians.	Quantitative	- Fundamental Knowledge and Skills	- Gender	- Perceived Perioperative Competence Scale-Revised (PPCS-R)	CLEAR
Scotland	94 operating room nurses		Cross-sectional	- Leadership	- Profession		The criteria are appropriate.
	116 operating room		Survey	- Cooperation			
	technicians			- Competence			
				- Empathy			
				- Professional Development			
Mitchell et al.,[24] 2013	N = 16	To develop a prototype behaviour rating system to teach scrub nurses non-technical skills and help provide formative assessment.	Qualitative	- Situational awareness	- Operating room experience		
	JBI Critical Appraisal Checklist for Qualitative Research-2017						
Scotland	Scrub nurse		Focus group interview	- Communication and teamwork			8
				- Task management			
Kang et al.,[48] 2015	N = 182	To identify the non-technical skills of Scrub nurses and to identify the factors affecting them.	Quantitative	- Situational awareness	- ASA scoring	- Scrub Practitioners' List of Intraoperative Non-Technical Skills (SPLINTS)	CLEAR
Australia	182 surgical observations by 2 observer nurses		Prospective observational	- Communication and teamwork	- Team familiarity		The criteria are appropriate.

Table 2. Description of the Analysed Studies (Continued)

Authors, Year, Country	Sample Size/ Sample Group	Aim	Research Design and Type/Data Collection Method	Operating Room Nursing Competency Areas	Competency Influencing Factors	Assessment Instruments	Quality Assessment Instrument and Score
			Survey-Observation	- Task management	- Scrub nurse exchange	- Non-Technical Skills for Surgeons (NOTSS)	
Wang et al.,[32] 2016	N = 30	To develop a scientifically sound and meaningful index system for competency assessment in selecting, training, and evaluating operating room nurses.	Mixed	- Expertise knowledge	- Operating room experience		MMAT 2011
China	19 Operating room nurses		Personal interview	- Professional talent			80%
	6 Anesthesiologists		Delphi and the Analytic Hierarchy Process (AHP)	- Personality			
	5 Surgeons		Semi-structured interview questions	- Self-motivation			
			Delphi Survey				
Jaensson et al.,[25] 2018	N = 1013	To test the psychometric properties of the Revised Perceived Perioperative Competence Scale (PPCS-R) and the competence of nurse anesthetists and operating room nurses in a Swedish context.					
	Methodological	- Fundamental Knowledge and Skills	- Age	- Perceived Perioperative Competence Scale-Revised (PPCS-R)	MMAT 2011		
Sweden	505 Operating room nurse						
		Cross-sectional	- Leadership	- Gender		75%	
	508 Anesthesia nurses		Survey	- Cooperation	- Operating room experience		
				- Competence	-Education Level (Undergraduate, Postgraduate)		
				- Empathy			

Table 2. Description of the Analysed Studies (Continued)

Authors, Year, Country	Sample Size/ Sample Group	Aim	Research Design and Type/Data Collection Method	Operating Room Nursing Competency Areas	Competency Influencing Factors	Assessment Instruments	Quality Assessment Instrument and Score
				- Professional Development			
Gillespie et al.,[21] 2018	N = 768 operating room nurses	To describe perceptions of operating room nurses' competence in four countries and to examine the influence of specialist training and OR experience by country.	Quantitative	- Fundamental Knowledge and Skills	- Country	- Perceived Perioperative Competence Scale-Revised (PPCS-R)	CLEAR
Australia	Australia 175		Cross-sectional				
Survey	- Leadership	- Operating room experience		The criteria are appropriate.			
	Canada 132			- Cooperation	- Operating room specialization training		
	Scotland 212			- Competence			
	Sweden 249			- Empathy			
				- Professional Development			
Redaelli,[47] 2018	N = 27	It is planned to describe the non-technical skills of circulating nurses.	Qualitative	- Leadership	- Operating room experience		JBI Critical Appraisal Checklist for Qualitative Research-2017
Italy	26 Circulating nurses		Ethnographic	- Situational awareness			8
	1 Executive nurse		Observation	- Task management			
			ANALYSIS	- Communication			
			Semi-Structured Interview	- Teamwork			

of operating room nursing competency were identified, the factors that influence them were examined, and assessment instruments were developed.

In the studies included in the review, it was found that the competencies of operating room nurses who are at the centre of surgical care consist of technical and non-technical areas, with technical skills defined as the basis of competency. In the studies reviewed, non-technical competencies composed of cognitive, affective, and psychosocial domains are assessed as a complementary whole along with technical skills. Effective communication skills, teamwork, and empathy skills, which are among the non-technical competencies of nurses, are considered fundamental and complementary components of competency in seven research included in the study. The competencies of operating room nurses were examined in six components in a study conducted by Blomberg et al. in Sweden: direct clinical practice, professional development, ethical decision making, clinical leadership, teamwork and counselling, and critical thinking.[17] Another study highlights the importance of having adequate knowledge and abilities in medical knowledge, surgical intervention, equipment, and the patient's general condition for safe nursing care and teamwork.[52] In our country, there is a need for comprehensive and detailed studies to define nursing competency in the operating room.

In the studies we reviewed, operating room nurses' communication and coordination skills are shown to improve stress management and collaboration among multidisciplinary team members, enhance performance, facilitate the management of the surgical process, and provide for prediction and resolution of incompatibilities. Surgical team members, consisting of many and diverse disciplines, must work together and in harmony.[53] Factors such as various, complex procedures and the severity of the patient's condition also cause stressful work for these team members. Therefore, communication between team members is an essential factor in providing safe surgical care. Weldon et al. claim in a systematic review that includes observational research that harmonious and prosperous work of surgical team members cannot be achieved without effective communication skills.[54] Another observational study highlights that the communication skills of surgical team members are effective in managing events in the intraoperative process.[55] In our study, empathic ability, which is one of the non-technical competencies of the operating room nurse, was found to be integrative in ensuring coordination with team members, stress management, patient advocacy, and accountability. Thus, operating room nurses with competent professional performance form the basis of the surgical team to provide safe and quality care.

In the studies in the review, the factors identified as influencing competence were the country, age, gender, experience, job title, and specialized training in the operating room. Women were found to have higher perceptions of competence than men in basic knowledge and skills, empathy, professional development, and leadership. With women making up the majority of the nursing workforce, gender inequalities should be closely investigated.

In the two studies, we examined, aging nurses are shown to positively affect the acquisition of cooperation, empathy, and competencies in other domains. Because increasing age comes gain in professional experience, the experienced should be taken into account in the training of prospective nurses.

In this study, it was found that the specialty training and the operating room experience of the operating room nurses played an essential role in developing competence, with the operating room experience making a stronger contribution than the training. The experience was found to be a significant predictor, and the perception of competence of less experienced nurses was higher than that of experienced nurses. In the same study, it is found that nurses' knowledge and skills in different and complex surgical fields are essential determinants.[15] In another study, nurses with 10-20 years of experience rated their perception of competence in clinical leadership as lower than nurses with less than 10 years of experience. It is emphasized that nurses with less than 10 years of experience in master's degrees are effective in this difference.[17] In the study by Gillespie et al., it is emphasized that training is seen as a fundamental factor in developing surgical teamwork and effective communication.[56] In the competency processes of operating room nurses, it is critical to consider experience, education, and exposure to various surgical specialties combined and the structuring of educational programs.

In another study we examined, it was found that nurses' operating room experience may vary by country. Furthermore, despite educational differences between countries, it was found that the perception of competence of nurses who received operating room training was higher than those who did not. Thus, when evaluated at the international level, the importance of operating room nursing education programs and the differences between countries stand out.

In a study in our review paper, it was found that the leadership competencies of the operating room nurses working in the senior position and the leadership and professional development competencies of those working in the instructor position improved positively. Therefore, it should be examined whether positions or personal talents effectively develop leadership and professional competence.

The challenging and ever-changing conditions of the operating room environment,[18,57] the insufficient number of nurses, the fact that experienced nurses begin with the role of a novice when they enter the operating room,[18] operating room nursing requires specialized training and skills it is lengthy. Costly to train, and[5,52–54] it is not a routine part of undergraduate curricula, should be emphasized in gaining competence. It is crucial to prepare training programs and evaluate the impact of education, experience, work in different surgical specialties, age, gender, and job titles to raise competent operating room nurses with current negatives.

The studies in our review show that five instruments have been developed to measure and assess competencies. In the studies, it is noteworthy that the measurement and assessment of competence of operating room nurses apply technical and non-technical skills in two different directions and a holistic approach. Therefore, finding reliable instruments for assessing competence and measuring competence with these instruments is vital both in terms of objectivity and providing a common language.[24] Assessment of operating room nurse competency and development of national assessment instruments are critical requirements in our country.

In the three studies included in the review, it is considered essential and necessary to conduct assessments of colleagues, managers, and experts in addition to self-assessment of competencies. Multiple assessments are crucial to reflect the reality of professional practice. It is emphasized that determining the differences between real and optimal competencies is essential for professionalism, continuous improvement, identifying and solving difficulties in the educational process.[34] According to the research, measuring and evaluating competency presents a variety of challenges. In theory, known as the "iceberg model,"[58] competence consists of overt competencies above water and implicit competencies below water. It is seen that this theory is based on the study of Wang et al. Explicit competence in

subject knowledge and professional skills in study domains, character, and self-motivation constitute implicit competence.[32] Explicit competence in subject knowledge and professional skills in the domains of research, personality, and self-motivation constitute implicit competence. Instruments that enable assessment of competence and competence in all domains in operating room nursing are essential for professional development, quality of patient care, and effective use of nursing resources. The ability to measure competence is vital for education, professional development, patient care, and effective nursing resources.

Limitations

The heterogeneity of technology can be seen as a limitation in synthesizing online-based evidence. Limitations include excluding research written in languages other than English and Turkish and the failure to search the grey literature. Due to the limited literature on instruments for assessing the competency of operating room nurses, all available types of research are included in the scope. Because most of the studies included in the scope compilation are based on observations, interviews, and questionnaires, it should be noted that individuals' experiences may be subject to bias and should be interpreted cautiously. Despite its existing limits, the concept of competence in operating room nurses is a valuable resource for individual, professional, and institutional needs in terms of content and measurement.

Conclusion

As a result of this scoping review, it was determined that competency in operating room nursing was defined in parallel with competency in nursing but was studied, and measurement instruments were developed as part of the field expertise. The technical competency domain includes knowledge and skills related to operating room nursing, and the non-technical domain has cognitive, affective, and psychosocial skills. Age, education, experience, gender, country, and job titles were investigated as factors influencing competency. Studies on personality and self-motivation domains described as implicit competence are limited. Some instruments assess competency in technical and non-technical areas separately and together in operating room nursing. Based on these findings, it is essential to examine in detail the competencies and influencing factors that encompass both technical and non-technical areas in operating room nursing. When examining the influencing factors, it is essential to evaluate implicit competence with all its domains. A comprehensive study of operating room nursing competency and the factors that influence it will guide the improvement of the operating room environment, the design of training programs, and national competency assessment instruments. In resolving this process, academics, competent operating room nurses, managers, team members, and individual nurses have essential roles and responsibilities. Observation instruments should be developed, and self-assessment instruments in monitoring, measuring, and evaluating the development process, and national and international standards should be established.

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