Competence assessment instruments in perianesthesia nursing care: a scoping review of the literature

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Author contribution

Yunsuk Jeon contributed to the conceptions and design of the study, data collection and analysis, drafting, and writing of the manuscript.

Riitta-Liisa Lakanmaa contributed to data collection, data analysis, and drafting of the manuscript.

Riitta Meretoja and Helena Leino-Kilpi contributed to the study conception, design, drafting of the manuscript and overall supervision.

All authors contributed to the critical revision of the manuscripts. The final version of the manuscript has been accepted by all authors. The authors have no conflict of interests.

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Ethical approval

In this study, formal ethical approval or consents were not sought since literature reviews and the use of routinely available data with open access do not normally require ethical approval. However, all steps for literature review have met the ethical guidelines for the systematic review.

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ABSTRACT

Purpose: To identify competence assessment instruments in perianesthesia nursing care and to describe the validity and reliability of the instruments.

Design: A scoping review in a systematic manner.

Methods: A search in CINAHL, MEDLINE, and ERIC was carried out to identify empirical studies from 1994 to 2015. A narrative synthesis approach was undertaken to analyze the data.

Findings: Nine competence assessment instruments in perianesthesia nursing care were identified. The instruments used three types of data collection methods: self-report, observation, and written exams. The most commonly reported validity method was content validity involving expert panels and reliability tests for internal consistency and inter-rater's consistency.

Conclusion: Integrating more than one data collection method may give support to overcoming some of the limitations, such as, lack of objectivity and misinterpretation of the assessment results. In ever-changing environment, perianesthesia nursing competence requires constant re-assessment from the perspective of content validity, scoring methods, and reliability.

Keywords: competence assessment instrument, perianesthesia nursing care, literature review

Perianesthesia nursing care is commonly regarded as a nursing specialty concerned with providing nursing care to patients undergoing or recovering from anesthesia. Internationally, in a large umbrella of the perianesthesia specialty, perianesthesia nursing includes planning and caring for pre, intra, and post-anesthesia until the patient is discharged into a ward setting or home.[1, 2] Furthermore, perianesthesia nursing care can be expanded from the operating theater environment to various clinical settings such as diagnostic, therapeutic, obstetrical procedures, as well as pain management.[1, 2] In various environments, perianesthesia nurses are expected to be experts, to be able to make flawless and rapid judgments, and to deal professionally with the ethical issues.[2-4] Therefore, they require a set of specialized knowledge and skills to satisfy the complicated needs of a patient in perianesthesia care.[1,5]

International council of nurses defined competence as "*the effective application of a combination of knowledge, skill and judgment demonstrated by an individual in daily practice or job performance.*[6]" In the

case of the United States of America (USA), nurses in perianesthesia care periodically take a certain number of supplementary courses, continuing education credits, or web-based learning in order to maintain their certification.[3,7,8] In Europe, there is no specific regulation for recertification of nurses in perianesthesia care and nursing training varies a great deal both nationally and internationally.[9] Therefore it is essential to provide a more accurate assurance when evaluating whether a professional has achieved an acceptable level of knowledge and skills.[10]

In order to provide safe care for patients as well as maintain the credibility of nurses by providing the capabilities to correspond to dynamic circumstances, a system of competence assessment in perianesthesia care is demanded. However, the competence assessment instruments currently used in perianesthesia nursing education and practice may lack validity or reliability, or both. A competence assessment instrument developed by a valid and reliable process would be beneficial for a more rigorous evaluation of the competence of nurses and enable the identification of deficiencies in professional development and educational needs.[11-14]

To date, little information is available as regards what competence assessment instruments exist in perianesthesia nursing care, and how valid and reliable they are. Thus, comprehensive research focusing on competence assessment in perianesthesia nursing care as well as the validity and reliability of the assessment instruments is necessary. For this purpose, a scoping review methodology has been conducted to provide an overview of the current literature related to competence assessment in perianesthesia nursing care.

Purpose

The purpose of this review is to describe how competence in perianesthesia nursing care has been assessed. The review aimed to identify competence assessment instruments in perianesthesia nursing care and to describe the validity and reliability of the instruments.

Methods

A scoping review refers to a process of mapping or summarizing the existing literature in order to understand the range of the field.[15-19] In this study, a scoping literature review methodology based on the framework (five stages) outlined by Arksey & O'Malley[20] was undertaken to identify the literature available in the field of perianesthesia nursing care.

Stage 1. Identifying the research questions

A scoping review was carried out to answer following questions:

1. What instruments were used to assess competence in perianesthesia nursing care?
2. How were the validity and reliability of the assessment instruments reported in the literature?

Stage 2. Identifying relevant studies

A literature search was carried out through the electronic databases, CINAHL, MEDLINE (Ovid) and ERIC in September, 2015. Single and combined search terms included**: competen*, assess*, scale*, tool*, evaluat*, measure*, nurs*, perian(a)esth*, prean(a)esth*, intraan(a)esth*, postan(a)esth*, an(a)esthe*, PACU, perioperati*, preoperati*, intraoperati*, postoperati*, recovery, valid* and reliab***. To uncover any additional publications or grey areas of the literature, hand searching of reference lists of key papers and a search using a general internet browser (Google Scholar) was undertaken. The search covered all countries, but only the English language over the last two decades (1994-2015). During this period, nursing education has been under reform in Europe and research concerning competence in nursing has increased.[21]

Stage 3. Study selection

For the study selection, the scoping review adopted similar methods to a systematic review. References were included if they measured **any** aspect of the scoping in relation to nurses' competence in perianesthesia care on the basis of the inclusion criteria (Table 1). In the search, perianesthesia nursing care was operationally defined as nursing care related to patients undergoing procedures requiring sedation, analgesia, and anesthesia in operating unit, anesthesia procedural areas, or PACUs.

Table 1 Inclusion and exclusion criteria

	Inclusion criteria	Exclusion criteria
Participants	Perianesthesia nurse, Anesthesia nurse/nurse anesthetist, anesthesiology nurse, anesthesia care team, OR nurse, student nurse anesthetist, recovery room nurse, post anesthesia care unit(PACU) nurse, perioperative nurse	OR nurses without anesthesia nurses (e.g. focus only scrub nurses and/or circulation nurses) Anesthesia care team without anesthesia nurses (e.g. focus only physicians), air force nurse anesthetists
Interest	Perianesthesia nurse's competence assessment instrument	Assessment instrument for other purposes (e.g. competence of preceptors or competence based education)
Study design	Original empirical studies and mixed method, Instrument validation studies	Literature reviews, editorial, discussion papers, guideline, standards, qualitative study

The initial search generated 232 research papers. Two researchers (YJ & RL) independently reviewed and applied the selection criteria to all titles and abstracts. During the title and abstract screening process, references were marked as either 'include', 'unclear' or 'excluded', and the former two categories marked on the abstract screening were included for the full-text review. After the titles (Deletion of 132 references which did not meet the inclusion criteria based on the title) and abstracts (Deletion of 71 references which did not meet the inclusion criteria based on the abstracts) of the papers were scrutinized, 19 papers remained for the full-text review. Additionally, 18 references identified by manual searches were included for full-text review in order to determine their study eligibility. In all, 37 articles were assessed as relevant based on the inclusion criteria. After reviewing the full-text, 24 references were excluded because: their participants did

not comprise perianesthesia nurses (n=4), they were evaluations of teaching methods or orientation programs (n=9), they were not empirical studies but guidelines or standards (n=5), and they did not evaluate competence in perianesthesia nursing (n=6). Finally, 13 articles met the selection criteria and were included in the analysis (Figure 1).
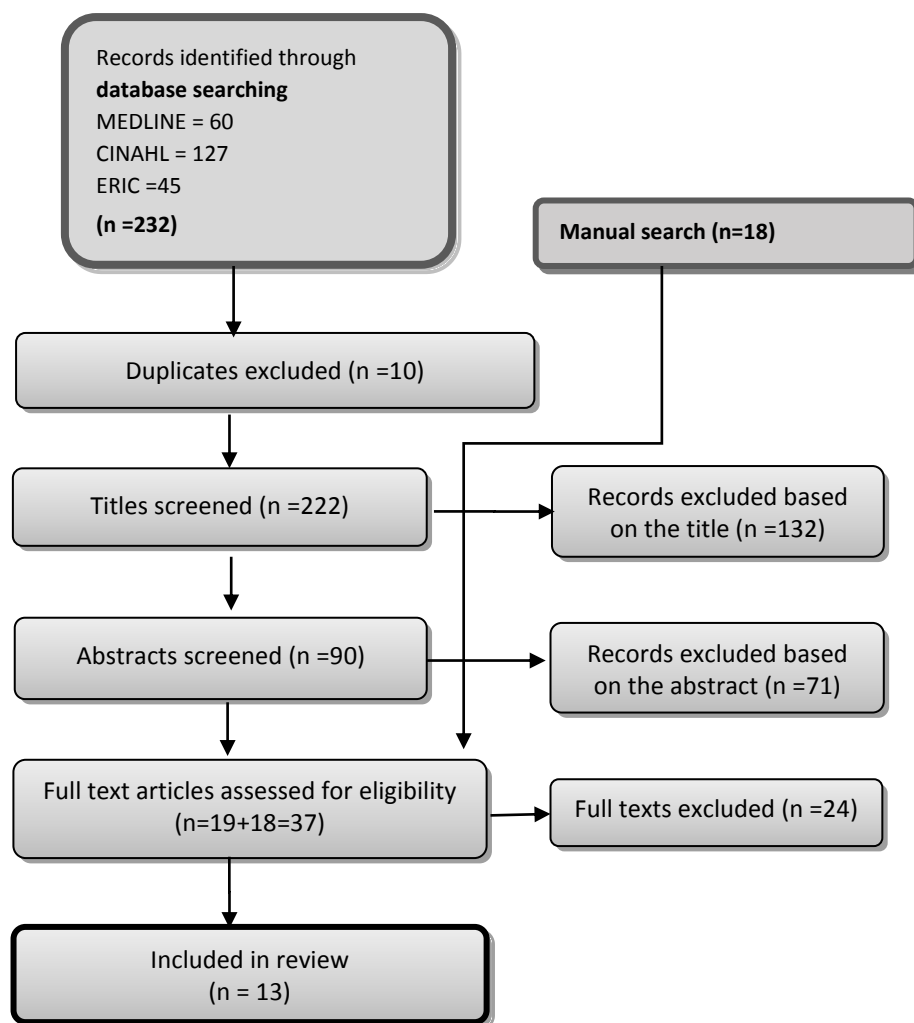
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┌─────────────────────────────┐
│ Records identified through  │
│ database searching          │
│ MEDLINE = 60                │
│ CINAHL = 127                │       ┌──────────────────────────┐
│ ERIC =45                    │       │ Manual search (n=18)     │
│ (n =232)                    │       └──────────────────────────┘
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│ Duplicates excluded (n =10) │
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│ Titles screened (n =222)    │───────▶│ Records excluded based   │
└─────────────────────────────┘        │ on the title (n =132)    │
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│ Abstracts screened (n =90)  │───────▶│ Records excluded based   │
└─────────────────────────────┘        │ on the abstract (n =71)  │
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│ Full text articles assessed │───────▶│ Full texts excluded      │
│ for eligibility             │        │ (n =24)                  │
│ (n=19+18=37)                │        └──────────────────────────┘
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┌─────────────────────────────┐
│ Included in review          │
│ (n = 13)                    │
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Figure 1 Flowchart of the search and selection process

Stage 4. Charting the data

The charting of the studies provided an overview of the existing literature. A spreadsheet was created to chart relevant data based on the focus of the scoping question (YJ). In order to identify the range of the study, 13 articles were summarized by the author as regards year of publication, country, purpose of study, design/sample/participant/ethics, instrument, and key findings. Based on the summary of the data,

competence assessment instruments were identified and charted specifically by a data collection method, the domain/category (item), a scale/scoring, and the validity and reliability of the instruments.

A scoping study tends to present broader themes for which the various types of study might be applicable and is less likely to seek to assess the quality of the studies included.[20] As a scoping study, this review did not conduct a quality appraisal process. Instead of a quality appraisal of the studies included, this review focused on describing the quality of the instruments identified in order to find the answers to the research questions.

Stage 5. Collating, summarizing and reporting of the results

On the basis of the charting, commonalities, themes, and gaps in the literature were identified. A narrative synthesis approach was undertaken to analyze the data. In order to summarize the validities and reliabilities of the instruments, the "Guidelines reporting the psychometric soundness of instruments" were used.[22] One (YJ) of the researchers charted the data, collated and summarized the commonalities, themes, and gaps. The consistency and accuracy of the summary were checked by other researchers (RL, RM & HL). Any changes were discussed by all the researchers and a final decision arrived at through consensus.

Results

Thirteen relevant articles were reviewed (Table 2). Among the reviewed articles, seven articles were conducted in the USA, two in Australia, two in Finland, and two in the UK. Ten of the total 13 articles were reported within the last five years. This indicates that the concern for competence assessment in perianesthesia care has increased since 2010. One article measured the competence of post anesthesia care unit nurses. Six articles measured the competence of nurse anaesthetists or nurse anaesthetist students. Six articles focused on perioperative nurses' competence. Eleven articles reported the ethical aspects such as voluntary nature, informed consent, confidentiality, anonymity, and ethics committee's approval, while two did not clarify the ethical issues.

Table 2 A summary of the 13 included studies

Authors/year/country	Purpose	Design/sample(participant)/ethics	Instrument	Key findings
Collins & Callahan 2014 USA	To test clinical evaluation tool in terms of validity and to identify the relationship between clinical evaluation score and NCE (National Certification Examination) score.	Ex post facto cross-sectional study design · N=137 Certified Registered Nurse Anesthetist(CRNA) students · Evaluators(N=not mentioned) *Ethical issues: Not mentioned*	· **Clinical evaluation Instrument**	17 -itemed clinical evaluation tool measured only 3 underlying constructs, technical skill, patient focus concept, and manage resource. No correlation between clinical evaluation score and NCE.
Cook et al. 2013 USA	To assess recent CRNA graduate's preparation and performance for entry into practice.	Cross-sectional survey design Online survey · N=560(CRNA) · N=696(Employer) *Ethical issues: Not mentioned*	· **Professional competence**	The majority of new graduates enter into nurse anesthesia practice prepared with the required knowledge and skills to practice as safe, competent providers.
Gaba et al. 1998 USA	To assess anesthesia care provider's performance on technical skills and behavior when responding to critical events.	Quasi experimental study · N=72 (Residents, faculties, and CRNAs), · Evaluators(N=5) *Ethical issues: Anonymity & informed consent*	· **Crisis management behaviors tool** · **Technical action check-list**	Successful at implementing appropriate technical action in general performing (>80% of checklist). Crisis management behavior varied with some teams rated as minimally acceptable or poor.
Gabriel 2013 USA	To determine relationships between written examination scores, self –assessment score, and performance scores in a simulated environment.	Validation studies of three measurements · N=18 CRNA, · Evaluators(N=2) *Ethical issues: Voluntary participation & informed consent*	· **Knowledge examination** · **Mini-CEX** (Clinical Exercise) · **Technical action checklist**	Written exam 67% correct. Simulation performance 77.28 %. Negative correlation between written exam and performance scores in simulation.
Gillespie et al. 2011 Australia	To describe the influence of years of OR experience and specialty education on nurses' perioperative competence.	Cross sectional survey · N=345 Perioperative nurses *Ethical issues: Voluntary participation, anonymity, informed consent, and ethics committee*	· **PCS-R**(Perceived Competence Scale-Revised)	More experienced nurses and those with specialty education reported higher competence scores.
Gillespie et al. 2012 Australia	To describe the development and validation of the revised perioperative competence scale.	Cross sectional survey design · N=1,138 Perioperative nurses *Ethical issues: Ethics committee's approval, anonymity, voluntary nature, and informed consent*	· **PPCS-R** (Perceived Perioperative Competence scale-Revised)	40 items were grouping 6 dimensions. OR nurses have more likely to perceive high level perioperative competence (total score 174.7(Min 0 – Max200).
Gillespie & Pearson 2013 UK	To compare operating department practitioner (ODP) and operating theater (OT) nurses' perception of their perioperative competence.	Cross-sectional survey · N=214 perioperative nurse(ODP and OT) *Ethical issues: Informed consent & ethics committee's approval*	· **PPCS-R** (Perceived Perioperative Competence Scale-Revised)	Both groups reported their competence high across all subscales. There were significant difference dimension, foundational knowledge and skill, and empathy between two groups.
Greenfield et al. 2014 USA	To identify encounters with 14 topics (eg, basic life support, advanced cardiac life support) related to post-anesthesia and assess perianesthesia nurses' competence.	Cross-sectional survey design · N=54 obstetric PACU nurses and 68 surgical PACU nurses *Ethical issues: Voluntary nature, confidential, and anonymity*	· **NCS** (Nurse Competence Scale)	Surgical PACU nurses showed high encounters each topic in their practice and indicated high competency.
Henrichs et al. 2009 USA	To determine whether experienced anesthesia teams have comparable skill levels in managing acute conditions.	Prospective, randomized, single-blinded study · N=61 (Anesthesiologists and CRNAs), · Evaluators(N=2) *Ethical issues: Ethics committee's approval & informed consent*	· **Technical action checklist**	CRNA group achieved maximum scores on bronchospasm and loss of pipeline oxygen, while had difficulty in MH (Malignant Hyperthermia) and hyperkalemia.

Table 2 A summary of the 13 included studies (Continued)

Authors/year/country	Purpose	Design/sample/participant/ethics	Instrument	Key findings
Meretoja *et al.* 2004 Finland	To examine nurses' perception of competence in different university hospital work environments.	Cross-sectional survey · N=498 Perioperative nurses *Ethical issues: Informed consent, voluntary nature, anonymity, confidentiality, ethics committee's approval*	· NCS (Nurse Competence Scale)	Operation room unit nurses showed competence level in managing situations is high, while diagnostic and teaching-coaching is lower than the ward nurses'.
Meretoja & Koponen 2012 Finland	To develop a model to compare nurses' optimal and actual competencies in the clinical setting.	Qualitative and quantitative · N=24 Experts, 87 Perioperative nurses and 88 Nurse manger *Ethical issues: Informed consent, voluntary nature, hospital approval*	· NCS (Nurse Competence Scale)	Optimal competence was higher than the nurses' self-reported actual competence and nurse manager's assessed level of actual competence.
Murray *et al.* 2005 USA	To evaluate scenario content, and to provide further validation of a simulation based acute care assessment, and to compare the acute care skills of anesthesia trainees.	Validation test of a simulation based acute care assessment · N=58 (Nurse anaesthetist students and residents), · Evaluators(N=6) *Ethical issues: Ethics approval for the protocol*	· **Technical action checklist**	Most educated and experienced received high scores, providing to support the validity of simulation.
Robertson *et al.* 2014 UK	To describes and evaluate the new scale of non- technical skill of an entire operating theatre team.	Observation study in real setting · N=297 OR Cases · Evaluators(N=2) *Ethical issues: Ethics committee's approval & informed consent*	· **Oxford NOTECHS II (Non-technical skills)**	Majority of operation were performed by well-coordinated and functioning teams.

As a result of the analysis of these 13 articles, 9 competence assessment instruments were finally identified. In order to examine the nature and methodological features of the instruments, nine instruments were described by types of data collection methods, the domain/category, number of items, the scale/scoring system, validity (content, criterion and construct), and reliability (internal consistency, inter-rater, and intra-rater/test-retest) (Table 3).

Three types of data collection methods were identified: self-reporting, observation (direct or reflect), and written exams. Four assessment instruments used a self-report method, which was the most frequently conducted data collection method in this review.[7, 23-29] In addition to self-reporting, two of the four instruments used preceptors or managers' assessment by reflective observation.[27, 29] One instrument used a reflective observation method alone assessed by faculty members.[30] Two assessment instruments used a direct observation method in simulated situation[7, 31-33] and one instrument in a real clinical setting.[34] One instrument was designed as a written exam to test the knowledge of nurse anaesthetists[7] (Table 3).

Most of the instruments were composed of several competence areas called domains, categories, dimensions, or competencies. As the result of charting the domains of competence from 9 instruments, frequently measured domains were 'managing situation', 'collaboration/team work', 'knowledge', 'practice skills', and 'assessing/judgement'. The range of the number of items was between 3 and 73. The types of scales used

were the Likert scale and ordinary scale (n=6), Visual Analogue Scale (n=1), a binary scale (n=1), and multiple choice (n=1).

In the process of using competence assessment instruments, many studies have taken into account issues related to validity and reliability (Table 3). In this review, validity was described from the perspective of content, criterion, and construct validity. The most frequently reported *content validity* method was the Delphi technique (n=4).[7, 23-28, 34] Two types of c*riterion validity* were predictive validity (n=1)[30] and concurrent validity (n=1).[34] C*onstruct validity* was tested by several techniques such as exploratory factor analysis (EFA, n=1),[23-25] confirmatory factor analysis (CFA, n=2),[23-25, 30] and principal component analysis (PCA, n=1).[23-25]

For the reliability test, this review focused on internal consistency, inter-rater, and intra-rater/test-retest technique. *Internal consistency* and *inter-rater consistency* are commonly reported for reliability tests. Four instruments reported Cronbach's coefficient as the internal consistency [7, 23-27] and the direct observation instrument stressed inter-rater reliability among evaluators.[7, 31-34] Not all instruments documented validity and reliability. Two instrument used in simulated settings paid attention to reliability rather than validity. One instrument reported neither validity nor reliability tests.[29]

Table 3 The psychometric properties of the competence assessment instruments

Instrument (Data collection method)	Domain/ Category(item)	Scale/Scoring	Validity			Reliability			Articles
			Content	Criterion	Construct	Internal consistency	Inter-rater	Intra-rater test-retest	
Mini-CEX (S)	7 domains (7) : medical interviewing skills, physical examination skills, humanistic qualities/professionalism, clinical judgement, counselling skills, organization/efficiency, overall clinical competences	**9 point scale** 1-3 Unsatisfactory 4-5 Satisfactory 7-9 Superior	-	-	-	.95	-	-	Gabriel 2013
PPCS-R Perceived Perioperative Competence Scale-Revised (S)	6 domains(40) : Foundational skills and knowledge (9), Leadership (8), Collaboration (6), Empathy (5), Proficiency (6), Professional development(6)	**5 Likert** 1=never, to 5=always	√ Delphi CVI .97	-	√ PCA EFA CFA	.95-.98	-	-	Gillespie *et al*. 2011 Gillespie *et al*. 2012 Gillespie & *Pearson* 2013
NCS Nurse Competence Scale **(S + RO by managers)**	7 Competence categories (73) : Helping role(7), Teaching-coaching(16), Diagnostic function(7), Managing situations(8), Therapeutic interventions(10), Ensuring quality(6), and Work role(19)	**VAS**(0-100) 0=a very low level, 100 = very high level, Frequency of use 0=not applicable, 1= very seldom to 3=very often in my work	√ Content analysis, Delphi	Refer to previous studies	Refer to previous studies	Good	-	-	Meretoja *et al*. 2004, Meretoja & Koponen 2012, Greenfield *et al*. 2014
Professional competence (S + RO by employers)	Clinical practice, independence, knowledge, teamwork, judgment/critical thinking (17)	**5 Likert**	-	-	-	-	-	-	Cook *et al*. 2013
Clinical Evaluation Instrument **(RO by faculty members)**	Not clearly explained. Patient assessment and anaesthetic plan, didactic transfer of knowledge, perianaesthetic management, communication skills/professional role, and care and equipment(17)	**4 Likert** 1= failure, 2= below expectations, 3= meets expectations 4=above expectations	-	√ **PRE** With NCE	√ CFA	-	-	-	Collins & Callahan 2014

Data collection method: (S)=Self-report, (RO)=Reflective observation, (DO)=Direct observation, (W)=Written examination.

CON=Concurrent validity, PRE=Predictive validity, EFA=Exploratory Factor Analysis, CFA=Confirmatory Factor Analysis, PCA=Principal Component analysis

Table 3 The psychometric properties of competence assessment instruments (Continued)

Instrument (Data collection method)	Domains/ Categories (items)	Scale/Scoring	Validity			Reliability			Articles
			Content	Criterion	Construct	Internal consistency	Inter-rater	Intra-rater /test-retest	
Crisis management behaviors tool **(DO in simulation)**	10 domains (12): orientation to case, inquiry/assertion, communication, feedback, leadership, group climate, anticipation/planning, work load distribution, vigilance, and re-evaluation	5 point ordinary scale 1=poor, 2=minimally acceptable, 3=standard, 4= good, and 5=outstanding	-	-	-	-	Satis factory	-	Gaba *et al.* 1998
NOTECHS II (Non-Technical Skills) **(DO)**	4 domains(16) : Leadership and management, teamwork and cooperation, problem solving and decision-making, situation awareness	8 point scale	√ Delphi	√ **CON**	√	-	Good	-	Robertson *et al.* 2014
Technical action checklist **(DO in Simulation)**	Items depend on the scenarios (3-7): E.g. Bronchospasm (5) Acute Hemorrhage(6) Hyperkalemia(6)	Binary Scale 0=absence, 1=present	-	-	-	-	Good .80 .85 -	- Moderately reliable	Gaba *et al.* 1998 Henrichs *et al.* 2009 Gabriel 2013 Murray *et al.* 2005
Knowledge examination (W)	Airway management, clinical pharmacology, physiology and anaesthesia technology (30)	Multiple choice	√ Delphi	-	-	.60	-	√	Gabriel 2013

Data collection method: (S)=Self-report, (RO)=Reflective observation, (DO)=Direct observation, (W)=Written examination.

CON=Concurrent validity, PRE=Predictive validity, EFA=Exploratory Factor Analysis, CFA=Confirmatory Factor Analysis, PCA=Principal Component analysis

Discussion

A scoping review was undertaken to describe what competence assessment instruments exist in perianesthesia nursing care, and how valid and reliable they are. In the review, three assessment instruments, nurse competence scale (NCS) and perceived perioperative competence scale (PPCR-R), non-technical skills (NOTECHS II) are considered as psychometrically sound since they clarified the issues of validity and reliability sufficiently (Table 3). Since these assessment instruments vary in content, purpose, and data measurement method, the results of the narrative synthesis showed that perianesthesia nursing care still requires sound competence assessment instruments from the perspective of validity and reliability.

Competence assessment instruments in perianesthesia nursing

The nurse competence scale (NCS) measured the competence of operating room nurses.[26] Since NCS was originally developed to measure the generic competence of practicing nurse in different phases of their career and in a variety of clinical settings, it might be an appropriate instrument to compare competence of perianesthesia nursing with those of other fields of nursing. Gillespie et al [23-25] benchmarked the minimum standards of clinical performance from generic competence assessments and developed a self-assessment tool, the perceived perioperative competence scale (PPCS-R) which enables the special contexts in perioperative care to be depicted. Perioperative nursing is a complex field where perianesthesia nurses strive to cover surgical intervention, anesthesiology and post anesthetic care. In addition, perianesthesia nurses practice in collaboration with other health professionals such as other OR nurses, surgeons, and anesthesiologists. Therefore, the PPCS-R is a likely instrument to assess competence in nature of perioperative care consisting of not only foundational knowledge and skills but also collaboration, empathy, and leadership. However, further validation tests are needed in order to increase the accuracy of the instruments to measure core competence in perianaesthesia nursing.

Self-directed assessment has a weakness due to the fact that there is little public accountability.[35] In response to this weakness, and as an alternative to self-reporting, non-technical skills (NOTECHS II) used direct observation to evaluate teamwork and cooperation, leadership and management, problem solving, decision-making, and situation awareness in real clinical setting.[34] Critical incidents caused by insufficient competence in non-technical skills have been paid attention increasingly. 'NOTECHS II' reported validity and reliability appropriately, and it can be used as an important instrument to measure non-technical skills in perianesthesia nursing.

In addition to real clinical setting, there are two instruments (Crisis Management Behaviors Tool and Technical Action Checklist) used direct observation to assess nurses' performance as regards their technical skills and behavior in a simulated environment.[7, 31-33] In a simulated setting, observers or examiners evaluate nurse's performance as an outcome of nurse's competence in a simulated conditions.[36] One of the advantages of a simulated environment is that it enables assessment of a nurse's skills and behavior in recognizing and responding to crucial changes such as patients in critical conditions, problem solving, and communication management.[7] However, the simulated setting is not natural and a nurse may not perform in the same way as they would in real situation.[37] Furthermore, perianesthesia professionals have an integrated ability as regards knowledge, skills, and roles that encompasses the pre-operative phases to the post-operative phases, where they work together as a team with other health professionals. When considering competence assessment in a simulated environment, therefore, examiners need to plan carefully how well the use of simulation can be controlled and how well the assessment outcome matches the real perianesthesia nursing practice. Since the subject of a competence assessment study using a direct observation method is human, it is important to conduct studies with ethically accepted methods and to clarify the ethical issues such as recruiting participants, consent, approval process, recoding, and storing data. All of the studies considered that used the direct observation method did take into account such ethical issues and described them in detail. [7, 31-34]

In the nursing context, there is a tendency to consider that knowledge is equal to competence; Nurses who have a high score in written tests were treated as being competent and having met the approved standards despite no measurement being made of their actual performance. Researches pointed out that the correlation between written exams and performance scores is low.[38, 39] Gabriel[7] supported this finding by showing a low to moderate correlation between written exam scores and performance scores in competence measurement. This is evidence that competence assessment requires multiple assessment methods in order to reduce the possibility of misinterpreting the result and to increase the validity of the measurement tool. However, combined approaches need more time and resources, and compound-errors might occur when analyzing the results.[36]

Validity and Reliability of competence assessment instrument

One of the essential issues in evaluating the quality of an assessment instrument is validity; the ability to which an instrument measures what it is intended to measure.[22] In this review, content, criterion, and construct- related validity were considered to describe the validity of the instruments. Content validity involves the processes of pooling instrument items through the searching literature, seeking expert' opinions (Delphi method), pilot testing, or qualitative research.[22] The most commonly reported content validity was 'seeking expert opinion (Delphi method). However, it noted that the Delphi method used in this study were not explained clearly in terms of the process of reduction of items and the agreement among expert panel's opinion. Clarifying the Delphi method with objective measures such as content validity ratio (CVR) or content validity index (CVI) is recommended in reporting content validity (eg, CVI=.97).[24]

The criterion validity is divided into two types of validity; concurrent validity and predictive validity. Concurrent validity indicates a measure of how one test correlates with another test that measures the same variable.[40] Predictive validity indicates a measure of how one test predicts an outcome based on information from other test.[40] For instance, Collins & Callahan[30] tested whether student nurse anesthetist's clinical scores measured by the 'Clinical Evaluation Instrument' were predictive of National Certification Examination (NCE). It found that the instrument did not significantly correlate with the NCE scores, and a further test may be needed.

Construct validity is known as one of most difficult processes since it focuses on the theoretical meanings of measurements, the logical relationship between one concept and other concepts, and the link of theory with the empirical world.[41] Collin & Callahan[30] showed the importance of construct validity tests. They conducted factor analysis for a 'clinical evaluation instrument' used to measure clinical performance of student nurse anaesthetists in six competence areas, and revealed that it actually measured only three competence areas. They suggested not only a redefinition of key concepts but also a revision of the instrument through further validation tests. If a certain clinical evaluation tool is used as evidence to decide a student's success or failure, ensuring the instrument's validity is critical. The gap between scores obtained from an evaluation tool and the true values should be minimal.[30]

The second issue was reliability. Cronbach's alpha coefficient was the most frequently used reliability tests in this review. A coefficient alpha of .70 is regarded as an acceptable level for new scales and the number of items is recommended to be shorten if the alpha coefficient value is over .90.[42] For example, the 'PPCS-R Cronbach's alpha coefficient was .95-98. It seems that some redundancy remains and the reliability might be optimized (between .70 and .90), and the feasibility might be increased by reducing the quantity of items.

One important issue in the direct observation method is the reliability of evaluators. All observation studies having multi-evaluators demonstrated inter-rater reliability. Most researchers were well - aware of the reliability of inter-raters (Satisfactory to good).[7, 31, 33, 34] However, the assessment results might fluctuate by the consistency within an evaluator (intra-raters' reliability). The consistencies of the intra-rater reliability was tested by one study.[32]

It was noted that four instruments (4 of 9) did not address either the validity or reliability or both. Other literature review studies concerning assessment had the same difficulty of a lack of information on validity and reliability.[40, 42] The clarification as to how develop and test the instruments in terms of validity and reliability is essential information to determine the quality of the instruments. In order to minimize the probability of missing information and to clarify the instrument's validity and reliability systematically, the use of structured reporting framework such as Guidelines Reporting the Psychometric Soundness[23] or consensus-based standards for the selection of health measurement instruments (COSMIN)[43] is recommended.

In the review, some researchers treated an instrument as a valid and reliable tool when it had been tested in other studies, and used it without further psychometric tests. Because it is not possible to use the instrument in exactly the same setting as those for which it was developed, psychometric properties such as validity, reliability, cultural difference, language translation, and feasibility for the participants should be tested again.

Limitations

On selection process, the inclusion and exclusion criteria may have influenced the outcomes of this research. This is especially due to the fact that the search was limited to the English language. In perianesthesia nursing practice, most countries tend to develop instruments in their own languages. This can be one explanation why the quantity of studies conducted in USA is high.

Nursing practices in perianaesthesia care vary among countries. In order to increase the possibility of capturing perianaesthesia nursing competence instruments, nurses caring patients undergoing or recovering from anesthesia such as perianesthesia nurses, PACU nurses, nurse anaesthetist, anaesthesia nurse, and perioperative nurses were included as inclusion criteria. These various professional groups might cause issues with the validity in this search result.

This scoping review did not conduct a quality appraisal process of the studies included. This might cause a bias in the interpretation of the research results. However, the psychometric properties of instruments discussed by the recommendations of DeVon et al [23] can be partial evidence of a quality appraisal of this review. Some instrument psychometrics have been reported in previous studies but they have not been included in this review process.

CONCLUSION

This scoping review found that at least nine assessment instruments have been used to assess perianesthesia nurses' competence by means of self-report, observation, and written exam methods. This review concluded that perianesthesia nursing care is still lacking in sound instruments. Integrating more than one data collection method is recommended to overcome the limitations such as the lack of objectivity and to provide more comprehensive view of the competence measurement.

This review provides valuable information for nurse educators who are developing evaluation methods for student nurses, nurse managers who are helping nurses to identify professional development and educational needs, and perianesthesia nursing organizations who are planning continuing education programs in order to improve nursing competence. In particular, nurses in perianesthesia care have a primary responsibility for providing safe care through continuous professional development. This review may be used to support nurses when reflecting on their practices to identify areas of strength and weakness.

Future research should focus on the development of more valid assessment instruments for perianesthesia nursing care. For perianesthesia nursing care, competence assessment studies need to be replicated in order to improve psychometric properties of the assessment tool; this can be done through re-exploring content validity, scoring methods, and reliability. Since perianesthesia nursing care is always evolving, there is a need for a study of the future competence covering health information competence, ethical competence, and cultural competence in perianesthesia nursing.

AUTHOR CONTRIBUTIONS

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