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Designing and Determining the Psychometric Properties of the Clinical Skills Questionnaire for Operating Room Nursing Students

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Abstract

Background: Clinical education is a major component of nursing programs, and nurses' failure to acquire the necessary clinical skills during their studies compromises the provision of high - quality nursing services in their occupational future. The present study was conducted to design and determine the psychometric properties of the clinical skills questionnaire for operating room nursing students.

Methods: The present methodological research designed and determined the psychometric properties of the questionnaire in four steps, including defining the concept of clinical skill in nursing students using a book and literature review, designing the questionnaire's items using the available resources in Iran and other countries, assessing face and content validity of the questionnaire by 10 university students and experts, and examining the internal consistency of the questionnaire using Cronbach's alpha.

Results: The final version of the clinical skills questionnaire, which included 38 items, generated four subscales, including responsibilities of scrub nurse, responsibilities of circulating nurse, recovery room care of patients, and sterilization and infection control. In terms of psychometric properties, we observed a content validity ratio of 0.90, a content validity index of 0.95, and internal consistency showing a Cronbach's alpha of 0.86.The findings confirmed the validity and reliability of the clinical skills questionnaire for operating room nursing students.

Conclusions: The 38 - item questionnaire has appropriate psychometric properties and can be used in Iran's educational and health systems by educational caregivers. Other validity indices, including construct validity, are recommended to be measured to determine the validity of the questionnaire subscales.

Keywords: Questionnaire, Psychometric Properties, Nursing Students, Operating Room, Clinical Skill

1. Background

The nursing education framework consists of theoretical, practical, and clinical processes. Clinical education is an essential part of professional nursing education (1). In this educational step, lessons learnt are put into practice, skills are taught, existing facts in the workplace are emphasized, and measurable changes in performing clinical care occur (2, 3). Clinical education is a vital job in terms of training competent professional nurses and developing their ability to function independently in different situations (4).

Proper relationships between the educational and clinical sections of nursing require mutual cooperation and coordination between these two sides: theoretical lessons should be taught based on clinical settings, and in return, nurses' practice in the ward should be based on theoretical nursing knowledge. This mutual relationship guarantees principled nursing practice and professional development. Taking measures to align the theoretical subjects of nursing knowledge with clinical experiences and realities is crucial (5). In correct clinical education, students are taught the concept of teamwork, and they are encouraged to develop a sense of innovation and creativity, and problem - solving skills are fostered. The learners also learn how to coordinate and adapt knowledge and skills when caring for patients. Correct clinical education ultimately improves the judgment and decision-making ability among students (6).

The operating room is an important place where patients undergoing surgery are treated. The quality of the nursing care provided in this ward directly affects the effectiveness of patient treatment. The operating room is a complex system involving coordinating the nurse, technology, and patients in a physical setting to achieve desired patient outcomes (7), and it is a high - risk environment

for patients. Some problems owing to lack of experience of the operating room staff are likely to affect patients after surgery. Although these cases are infrequent, they may cause patient death (8). Due to the increased likelihood of patient harm, improving the performance of operating room staff is necessary through improving their clinical knowledge and skills (9).

Learning and adapting to different types of skills and roles in the operating room is difficult, as the students should learn many interventions before, during, and after surgeries. The extensive scope of activities in the operating room suggests the need to have adequate skills and knowledge, as students should be able to coordinate information with their activities in different operating room circumstances (7). Studies suggest that graduates lack the necessary skills for performing clinical tasks, and that 56% of managers at different levels of nursing services evaluate the clinical skills of graduates as lower than expected (10).

Given that a major part of the educational process is to evaluate the academic achievement and learning of students, applying proper measurement tools is crucial and lays the groundwork for clinical interventions (11). Evaluation of academic achievement is defined as measuring the performance of learners and comparing the obtained results with predefined educational goals to decide whether the educational activities have achieved the desired outcomes and whether the desired goals have been realized and to what extent (11). Evaluation has been defined as collecting and applying information to decide on a training program (12). The match and adaptation between evaluation methods and specific targets of learning should be ensured.

The method of holding ordinary clinical examinations is currently considered objectionable because of the high number of participants, the short time assigned to evaluation, and the assessments being non - objective (13). A study reported dissatisfaction with the current evaluation method in 46% of medical students, who reported a lack of consistency between the end - of - term score and acquired abilities (14). Clinical instructors have indicated their dissatisfaction with evaluations in some cases; for instance, 20% of instructors felt dissatisfied with the evaluation of nursing clinical skills in Indonesia, and 21% reported feel-ing upset when students' failure on end - of - term exams is caused by their judgments, and 52% even stated that they felt responsible when students fail (15). Numerous meth-ods have been proposed for investigating clinical compe-tence, including the objective structured clinical examina-tion (OSCE) and Portfolio (16). The clinical skills of the med-ical students are often measured using the OSCE (17).

Regardless of the method for measuring clinical qualifications, the criteria of a fair test should be emphasized, including validity, reliability, and objectivity. According to the definition, a test is valid if it is appropriate for measuring what it is intended to measure, and reliability suggests that the tool provides similar results at different times under the same conditions (18). Pazargadi et al. designed a tool for the general evaluation of nursing students in clinical settings and reported it to be an appropriate tool for assessing students (19). Aliasgharpoor et al. reviewed a tool for assessing the clinical skills of nursing students in the dialysis unit and proposed a new valid and reliable prioritization scale based on experts' and students' comments (20). Moattari and Ramezani investigated the validity and reliability of the OSCE in the clinical skills evaluation of nursing students and recommended its use for evaluating students' clinical skills (21). Finally, Esmaeili et al. examined the psychometric properties and validity of a tool for evaluating the performance of nursing students and confirmed the validity and reliability of this tool (22).

The absence of objective goals and proper objective tools reduces the likelihood of performing a systematic and valid evaluation of students at the time of their studies, and also makes it impossible to design intervention programs for improving performance after graduation. The present research was therefore conducted to design and determine the psychometric properties of the clinical skills questionnaire for operating room nursing students.

2. Methods

The present methodological study was conducted in 2016 to design and determine the psychometric properties of the clinical skills questionnaire for operating room nursing students of Shohadaye Khalije Fars Hospital in Bushehr, Iran. Census was used to select the subjects, and all 45 nursing students were included.

The Waltz method was used to develop the desired tool. The first step was to identify the dimensions and items and to determine theoretical definitions and a clear function of the desired concept. Clinical evaluation refers to evaluating students in the desired environment in terms of different targets, which students are expected to achieve by the end of an educational program. As a result, students should be evaluated in different aspects during their education (23).

To achieve a theoretical definition of the desired concept, expert comments and a review of the literature were applied using different databases, including ProQuest, Embase, ScienceDirect, PubMed, and Blackwell, as well as evaluation programs and tools in different schools and articles associated with the evaluation tool in Iran and books published within a 10 - year period from 2005 to 2014.

This search was performed using keywords such as medical education, clinical education, medical education evaluation, clinical evaluation, clinical evaluation tools for nurses, nursing students' evaluation, and operating room nursing. After developing the initial items of the questionnaire and before determining the psychometric properties, a meeting was held with the teachers and skilled staff of the operating room to review the items. The questionnaires were then distributed to 10 students to investigate face validity. Face validity determines whether the designed tool is appropriate for evaluating the desired goal in terms of its appearance (24, 25).

Qualitative and quantitative methods were used to determine face validity. Item difficulty, the appropriateness of items for the desired dimension, and their ambiguity were investigated by student panel members to qualitatively determine face validity (26). Ambiguous items or those with inappropriate content were edited in terms of writing or content. In the next step, the quantitative method of item impact score was used to reduce and eliminate inappropriate items and determine the importance of every item (27). Equation 1 was used to calculate this index.

$$\text{Item Impact Score} = \text{Importance} \times \text{Frequency}(\%) \quad (1)$$

In this equation, frequency refers to the percentage of participants who answered each item and importance refers to the mean response rate to the items associated with the importance of each item. The items of this tool were first scored on a 5 - point Likert scale ranging from 1 (not important) to 5 (very important). After calculating item impact, the item was retained if the score obtained was at least equal to 1.5 (27). The content validity of the tool was then measured. Content validity refers to the extent the items cover the dimensions investigated by the tool. Qualitative and quantitative methods were used to investigate content validity. To qualitatively investigate content validity, 10 operating room faculty members who were well informed and experienced in terms of the study objectives and content, were asked to scrutinize the tool and investigate the questionnaire items in terms of content and degree of coverage of the desired dimensions (28).

The model proposed by Lawshe was used to quantitatively examine content validity (29). The panel members were given the questionnaire and asked to add their comments about each item to the scale. In this process, quantitative validity was calculated by using the content validity ratio (CVR) and content validity index (CVI) (30-33). To determine CVR, 10 of the expert group members were first asked to score every item of the questionnaire on a 3 - point scale, with the options "unnecessary", "useful but unnecessary", and "necessary". Equation 2 was then used to calculate CVR.

$$CVR = [ne - (N/2)] / (N/2) \quad (2)$$

According to the Lawshe formula, items with a CVR higher than 0.62 were retained (29).

To investigate CVI, indices including appropriateness, transparency, and comprehensiveness were used and completed by the experts. Appropriateness refers to the degree to which a proposed item is related to the measured content (27). To estimate the appropriateness of each item as well as the overall appropriateness of the tool, 10 faculty members were asked to score the questionnaire items on a 4 - point scale with the options 1 (undesirable), 2 (rather desirable), 3 (desirable), and 4 (quite desirable). Transparency refers to the appropriateness of the selected items in term of writing, concept, and scaling (26). A similar scale was also used to estimate transparency. To estimate the appropriateness and transparency of every item, the total number of experts who identified the transparency, and appropriateness of the item as desirable and quite desirable was divided by the total number of experts (27), resulting in a number between 0 and 1. The CVI value of every item was a guideline for deciding on eliminating, modifying, or replacing the item. To calculate the overall appropriateness and transparency of the tool, the total number of items whose appropriateness and transparency were reported as desirable was divided by the total number of items (26). The minimum desirable appropriateness and transparency for a new tool has been reported to be 80% (26-28).

Cronbach's alpha was utilized to investigate the internal consistency reliability of the tool. Ethical principles were observed in the present study and the samples were briefed on its objectives. All the participants were also ensured of their right to withdraw from the study at any stage. The collected data were analyzed in SPSS18 (SPSS Inc., Chicago, IL).

3. Results

Clinical evaluation refers to evaluating students in terms of their acquisition of general and specialized skills based on educational targets. The initial version of the questionnaire contained 38 items and four subscales, including sterilization and infection control (7 items), responsibilities of scrub nurse (14 items), responsibilities of circulating nurse (9 items), and recovery room care of patients (8 items), which were scored on a 4 - point Likert scale. The items received a score of 4 (very good in case of providing a full explanation or performing the correct clinical behavior), 3 (good in case of failing to provide a full

explanation or failing to follow one section of the procedure), 2 (moderate in case the explanation or the clinical behavior was relatively good), and 1 (poor in case of failing to respond or presenting the behavior). The results for face validity were obtained using qualitative and quantitative approaches.

Items whose CVR was higher than 0.62 were retained, and the remaining items were eliminated. The calculated CVR was higher than 0.8 for every item and 0.9 for the entire questionnaire. The calculated CVI was also higher than 0.8 for every item and 0.95 for the whole questionnaire (Table 1). For internal consistency reliability, Cronbach's alpha was 0.77 - 0.67 for the subscales and 0.85 for the entire scale, which confirmed the questionnaire's reliability (Table 2).

4. Discussion

The present study was conducted to design and determine the psychometric properties of the clinical skills questionnaire for operating room nursing students. The final version of the questionnaire contained 38 items and four specific subscales, including sterilization and infection control (7 items), responsibilities of scrub nurse (14 items), responsibilities of circulating nurse (9 items), and recovery room care of patients (8 items). Every dimension of this valid and reliable questionnaire measured part of responsibilities of nursing students under operating room internship.

Mohammadi and Roshanzadeh developed and measured the validity and reliability of a tool for the clinical evaluation of operating room students. The final tool consisted of 62 items on seven subscales, including professional characteristics, communication, examining the patient, training patients and families, submitting reports, clients' safety, and clinical competence. The CVI of the entire questionnaire was 0.84 and the CVR for each item was reported to be 0.62. With a sample of 28 students, Cronbach's alpha was 0.82 for the whole questionnaire (34). Comparing the cited questionnaire (34) and the present study scale shows that both questionnaires have acceptable validity and reliability. The strengths of the present research include the briefness of the items despite considering all responsibilities of nurses in the operating room, which makes it possible for both students and teachers to achieve the evaluation goals as fast as possible. Furthermore, the present questionnaire focuses only on specialized dimensions of clinical skills for operating room nursing students and neglects general evaluation features, which are common across all units and internship practices, while Mohammadi and Roshanzadeh (34) measured general characteristics.

Although professional characteristics and clinical competence can overlap in the questionnaire developed by Mohammadi and Roshanzadeh, construct validity measurement clarified these ambiguities (34). Holmboe investigated the comments of faculty members on the problems and opportunities of clinical skills and showed that different factors contribute to evaluating clinical skills, including item clarity, investigation of unnecessary items, prioritization of items, the power of items in measuring targets, and student and teacher satisfaction (35). Langford et al. emphasized the importance of simplicity and applicability of the questionnaire and the ability to use the evaluation tool. They also stated that the tool used for student evaluation, especially clinical evaluation, should be simple yet fair enough and incorporate five basic rules, including paying attention to students' knowledge level and the ability to practically use this knowledge, the power of thought and action in emergency and critical situations, students' self - learning, their professional evaluation, and effective communication and teamwork (36). Items 7, 8, 17, 18 and 20 therefore constitute the strengths of the present questionnaire, as they not only address clinical skills in the operating room, but also focus on the role of communication.

In the present survey and with regard to specific items, items such as scientific and practical improvements during internship, establishing a practical relation between theoretical and practical knowledge, and students' attempts to develop during internship received the highest priority. A methodological study was conducted by Pazargadi et al. in Tehran, Iran to design a tool for evaluating the general performance of nursing students in universities of medical sciences affiliated with the Iranian Ministry of Health and Medical Education. The designed tool included dimensions such as professional behaviors, communication, nursing process, training the client/family, submitting reports, client safety, infection prevention, medication, client nutrition, client disposal, client hospitalization, and client discharge. CVI was calculated to be at least 0.80 for each item and 0.94 for the whole tool. The internal consistency of the tool was confirmed by a Cronbach's alpha of 0.99 for the entire tool, which was also calculated for each dimension separately (19). Although the questionnaire developed by Pazargadi et al. (19) is valid and reliable, as is the case for the present questionnaire, it fails to apply to the clinical evaluation of operating room students owing to its differences in the principles of explaining the concept of students' clinical skills in different sections (19).

The evaluation tool developed at the University of Manitoba contains two main dimensions, 12 subscales, and 55 items. In contrast to the present study, which focuses

Table 1. CVR and CVI of the Items of the Clinical Skills Questionnaire for Nursing Students in Bushehr University of Medical Sciences

Dimension	Item	Item Impact	CVR	CVI
Responsibilities of scrub nurse	Necessary information about preparing the operating room	5	1	1
	Correctly wearing the mask and hat	5	0.8	0.9
	Correct surgical hand scrub	5	1	1
	Correct hand drying	5	0.9	0.8
	Correctly wearing the gown	5	0.8	1
	Gloving in a closed fashion	4	0.9	0.9
	Dressing other members of the sterile team in gowns	4	0.8	0.9
	Dressing other members of the sterile team in gloves	5	1	1
	Correctly taking off the gown, gloves, and mask	5	0.9	0.9
	Helping with preparing the surgical table	4	1	1
	Correctly connecting the surgical scalpel's blade to the handle	4	0.8	0.9
	Correctly counting the amount of gauze, sponge lobes, needles, and clamps in collaboration with the circulating nurse	5	1	0.9
	Explaining important sterile points during the operation	5	0.8	1
	Explaining the types of dressing	5	0.9	1
Responsibilities of circulating nurse	Having the necessary information about the correct admission of patients along with preparing their profiles	5	1	0.9
	Having the necessary information about the transfer of patients to surgical tables	5	0.9	1
	Explaining the patient's privacy in the operating room	4	0.8	0.9
	Helping the circulating nurse with correctly positioning the patient	5	1	0.8
	Controlling the electrical appliances in the operating room, including suction and cautery instruments	5	0.8	1
	Helping the circulating nurse with preparing the operating room	4	0.8	0.9
	Identifying and applying different types of suture	5	1	1
	Having the necessary information about correctly counting the amount of gauze and sponge lobes in collaboration with the scrub nurse	5	0.8	0.9
	Having the necessary information about how to complete pathological samples forms	5	1	1
Recovery room care of patients	Correctly admitting the patient into the recovery room from the operating room	4	0.8	0.9
	Controlling patient airway in the recovery room	4	1	0.9
	Nursing care of the patient after the operation by the type of anesthesia, including spinal, general, and local	5	0.8	1
	Evaluating the dressing and patient drainage in the recovery room	5	0.8	0.9
	Explaining the conditions of discharging the patient from the recovery room	5	0.8	0.8
	Explaining the correct relationship with the patient in the recovery room	3	1	0.9
	Evaluating vital signs and level of consciousness of the patient in the recovery room	5	0.8	1
	Correctly intervening to soothe pain and alleviate the patient's nausea in the recovery room	4	0.9	0.8
Sterilization and infection control	Explaining the rules associated with different regions of the operating room, namely free/protective zone, clean zone, disposal zone, and sterile zone	5	1	1
	Explaining the transmission chain of infection and nosocomial infection	5	0.9	1
	Explaining and applying sterilization methods	4	0.8	0.9
	Explaining the aseptic (disinfection) technique	4	0.9	1
	Observing the packaging and sterilization principles	4	1	0.8
	Controlling the sterile status and expiry dates of packs and sets	5	0.9	1
	Maintaining the distance between sterile and non-sterile staff	5	1	0.9
Overall		4/62	0.9	0.95

Table 2. Reliability Coefficients of the Four Subscales of the Clinical Skills Questionnaire for Nursing Students in Bushehr University of Medical Sciences

Subscale	Frequency and Number of Items	Reliability Coefficient (Cronbach's Alpha)
Responsibilities of scrub nurse	14items (14 - 1)	0.668
Responsibilities of circulating nurse	9items (23 - 15)	0.732
Responsibilities of the recovery room nurse	8items (31 - 24)	0.784
Sterilization and infection control	7items (38 - 32)	0.750
Entire scale	38items	0.858

more on specific and specialized characteristics in clinical settings, the general characteristics constitutes one of the main dimensions and includes three subscales and 22 items (37). Extracting specific items associated with the clinical skills of operating room nursing students is an important finding of the present study, as few studies have scientifically explained the concept of clinical skills in nursing students in a specialized fashion (38).

The provision of quality nursing care is realized through acquiring clinical skills. Given the complexity of measuring students' clinical skills and the fact that students' behavioral changes are associated with awareness and that skills can be learnt in clinical settings by students over time and through gaining experience, the present study sought to design a valid and reliable tool for evaluating clinical skills in operating room nursing students and help solve the problems cited and take a step towards promoting methods for evaluating clinical skills in nursing students. Despite the importance of the subject and the strengths of the present research, this survey had weaknesses and limitations, including the high number of questionnaire items, which can make it difficult for instructors to evaluate every student. In addition, although evaluation of construct validity is typically required, this was not performed given that the researcher was a student and had time constraints. Construct validity measurements should be conducted with a greater sample size to improve validity.

4.1. Conclusion

The present results indicated that the developed tool is valid and reliable, and its application showed the effective criteria required for acquiring clinical skills and competence in nursing students. This tool can also be used to evaluate nursing students in the clinical setting of the operating room.

Supplementary Material

Supplementary material(s) is available here [To read supplementary materials, please refer to the journal website and open PDF/HTML].

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