Original Article

Competency assessment of the operating room staff and some related factors: A multi-center cross-sectional study

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Abstract

Background: Operating Rooms (ORs) are complicated environments that necessitate the improvement of OR staff's knowledge and skills to remain clinically competent and secure patient safety. The aim of this study was to assess clinical competence of OR staff in accordance with some related factors. **Materials and Methods:** This descriptive analytical cross-sectional study was conducted on 227 OR staff in nine academic hospitals. Sampling was performed from the beginning to the end of May 2019 and the samples were selected by quota sampling. Data were collected using a researcher-made questionnaire encompassing six dimensions of competency including general knowledge, specialized knowledge, general practical skills, specific practical skills, personality, and motivation. Data analysis was performed using descriptive and interpretive statistics. **Results:** The mean (SD) total score of competence was 80.99, which was optimal (11.28). The lowest score was related to the dimension of general practical skills with the mean (SD) score of 53.32 (10.26). The mean score of specialized practical skills was significantly higher in single-specialty ORs ($F = 21.53$, $p < 0.001$). Based on multiple linear regression test, it was possible to predict clinical competency through the age and work experience (R-squared = 0.96, beta = 0.31, $p = 0.022$). **Conclusions:** Specialized training has overshadowed the general practical skills that are related to the observation of basic principles of patient safety apart from surgical specialization. Strengthening of competence in general practical skills need to be prioritized in empowerment programs. We need a fixed and permanent space for the continuation of educational programs designed to promote perioperative general practical skills.

Keywords: *Competence, nursing, operating rooms, patient safety*

Introduction

Clinical competence is an integral aspect of medical, nursing, and paramedical education. In fact, clinical competence is the ultimate efficiency of any educational system that encompasses various learning dimensions.[1] Clinical competence is defined as the skill and ability to perform safely and effectively without the need for supervision of others.[2] Furthermore, the clinical competence of nurses is described as the ability of nurses to use knowledge, skills, attitude, values, and beliefs to perform their duties in various situations.[3,4] Rapid change in health monitoring systems, the necessity of providing safe and cost-effective services, heightening awareness of health-related topics, and increased expectations to receive care services with an acceptable quality along with the willingness of organizations to provide health services to employ skilled workers have led to more attentions to the issue of clinical competence.[5] Workload, speed and precision of action, variety of procedures and rapid turn out of patients bring heavy responsibilities and increase competency expectations for nursing staff in Operating Room (OR).[6] ORs can also be dangerous places for patients, and some post-operative problems may be due to the lack of clinical competence, leading to patient mortality and damage.[7] Moreover, ORs are complicated environments with advanced technologies, which necessitate the improvement of OR staff's knowledge and skills.[8,9] In this regard, coordination with surgeons can help design ideal care plans and determine needs and other care aspects of patients.[10,11]

Assessment of clinical competence plays a vital role in managing the process of care provision. This assessment is extremely important to identify areas that require an

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upgrade, determine the training needs of nursing staff, and ensure the optimal provision of care as the most important responsibility of nursing managers in the clinical environment.[12,13] For instance, the staff of an eye OR, which is a specialized field, must have sufficient competence to deal with Toxic Anterior Segment Syndrome (TASS) that is a kind of noninfectious eye inflammation caused by the lack of competence in cleaning and decontamination of the eye surgery tools. Adequate knowledge of this syndrome and proper performance of the staff to prevent such conditions play a crucial role in maintaining patient safety in the OR.[14] Investigating the effect of contextual factors on clinical competence of the nursing staff, some studies have indicated that clinical competence can be affected by aging and work experience.[15] In this regard, in Sweden and Australia, the staff with 1–5 years of working experience had more competency than those with 6–10 years and more working experience. However, in Canada and Scotland, aging and work experience increased competence.[16]

As correct implementation of tasks is essential for OR staff, periodical determmination of their clinical competenc is nessesary. In addition, the knowledge of the OR managers of the clinical competence of the staff provides valuable information for the better management of the human resources. In Iran, few studies have been conducted on OR nursing staff and most studies have been on other nursing staff. This study aimed to determine the score of OR staff's clinical competence in six dimensions and some related factors with emphasis on three areas of knowledge, performance, and attitude[4] of the OR staff. Furthermore, almost all specialized fields of surgery were assessed to determine clinical competence.

Materials and Methods

This descriptive cross-sectional, multi-center study was part of a larger study. In the main research, first, a tool was designed to measure perioperative clinical competence and, then, psychometrically validated using confirmatory factor analysis method. In this research, we tried to use the tool in practical settings. All data were collected from the beginning to the end of May 2019.

The research population consisted of all OR staff in nine training health centers. In total, 227 subjects were selected by quota sampling, which is a non-probability sampling method, in which a quota is considered for each of the classes or subgroups of the community under study. The non-probability method selects samples from available individuals proportioned to the number of each class or group encompassing the statistical population. We considered 95% confidence interval, the maximum error of estimate of 0.1S ('S' is estimation of standard deviation for clinical competency score), population number of almost 500 subjects and 10% estimation for missing data. The inclusion criteria were 1 year of work experience, no sudden bad incident in previous 6 months, and willingness to participate in the study. The exclusion criterion was incomplete questionnaires. Participation in the study was voluntary and informed consent was obtained from all participants and they were ensured that their personal information would remain confidential.

We used a researcher-made questionnaire, which contained two parts; the first part was related to demographic characteristics including age, sex, level of education, clinical work experience, and the class of OR based on the specialty. The ORs of nine educational medical centers were classified into three classes of single-specialty (included five centers with surgery specialties only in one branch of gynecology, pediatrics, urology, ophthalmology, or cardiology); double-specialty (included two centers with surgery specialties of orthopedics-neurosurgery or burn-reconstructive/plastic); and multi-specialty (included two centers with all surgery specialties, except ophthalmology and cardiology).

The second part was related to the dimensions of clinical competence including: 1) general knowledge (11 items); 2) specialized knowledge (13 items); 3) general practical skills (18 items); 4) specific practical skills in the fields of ophthalmology (12 items), gynecology (9 items), orthopedics (13 items), urology (14 items), cardiology (12 items), thorax (10 items), pediatrics (12 items), plastic and reconstructive surgery (11 items), Ear, Nose and Throat (ENT) (12 items), general surgery (12 items), neurology (8 items); 5) personality (13 items); and 6) motivation (6 items). Each item was scored based on a five-point Likert scale. The responses in the general and specialized knowledge sections were "completely aware," "aware," "no comment," "not fully aware," and "unaware." In the practical skills section, the responses were "I do completely," "I usually do," "no comment," "I sometimes do," "I do not do." In the personality and motivation part, the responses were "completely agree," "agree," "no comment," "disagree," and "completely disagree." One score was given to each item of the questionnaire. The total score was reported from 100 in three categories as follows: 1) favorable clinical competence: >75; 2) relatively favorable clinical competence: 50–75; 3) unfavorable clinical competence: <50. With regard to the scoring of a specialized field that was different in each person, after calculating the score of the related specialized field, the obtained score was added to the total score of the other five dimensions and, finally, the score was calculated from 100. The questionnaire's items in each dimension were selected based on the opinions of experts and through reviewing related texts, books, and websites in the area of OR competence care of the patient in surgery. During the process, we used the opinions of faculty members, heads of departments of other universities in the country, and some key staff working in ORs. These individuals were selected based on the level of education and work experience in various fields of the ORs. The validity of the

questionnaire was confirmed quantitatively by calculating the relative coefficients of Content Validity Ratio (CVR) and Content Validity Index (CVI). To this end, the questionnaire was provided to seven faculty members with more than 20 years of experience in education of perioperative nursing and surgical technology in several different cities to share their opinions about each item in a determined scale.[17] The indexes of "it is necessary, it is beneficial, and it is not necessary" were considered in the estimation of CVR. All items with the content validity of ≥0.99% were kept and the rest were removed. In total, 138 out of 210 items met the criteria and the rest were eliminated from the study. Furthermore, the indexes of "simplicity, clarity, and relevance" were considered in CVI assessment. In this regard, the items with a score above 0.79% were considered suitable and kept in the study. In CVI calculation, first, the validity index was calculated for all items and then for the whole instrument (S-CVI). Meanwhile, the minimum score of the items was 0.80%, and the total credit content index of the instrument was 0.88%. In this research, the high number of items and variables under study led to the use of confirmative factor analysis method. According to the results, all phrases were placed in a group with a correlation coefficient above 60%, which is an acceptable amount of correlation in the factor analysis method. The full information on the use of factor analysis will be detailed in another article. Additionally, the instrument's reliability was determined using Cronbach's alpha and the retest technique. The test–retest method was performed by presenting two tests to 22 subjects at a time interval of 2 weeks, with a correlation coefficient of r = 0.90%. In a 20-sample population, the Cronbach's alpha was estimated to be 0.89%. In addition, the Cronbach's alpha was estimated to be 0.88%, 0.91%, 0.85%, 0.96%, 0.88%, and 0.88% for the dimensions of general knowledge, specialized knowledge, general practical skills, specific practical skills, personality, and motivation, respectively.

The staff were asked to fill in the questionnaire at the beginning of the morning shift and then give it back to the researcher. The researcher was present during filling of the questionnaire so that no data would be missed. Some of the staff had no information about a few of the items at all; the researcher first allowed them to fill the questionnaire and took it from them, and then provided the necessary explanations. As mentioned earlier, in the specific practical skills dimension, we assessed 11 separate fields of surgery each of which assessed one surgical specialty in a separate form. In single-specialty and double-specialty centers, we asked the staff to fill one of them according to their special working area in OR. In multi-specialty centers, as some staff may have worked in different surgical specialties in different days, we asked them to fill one related area they mostly worked in during a week. The completion of each questionnaire took 30 min.

Data analysis was performed in SPSS version 21 (SPSS Inc., Chicago, IL, USA). Means and standard deviations were calculated for scoring clinical competency. T-test, one-way analysis of variance with post-hoc Scheffe test and Pearson's correlation coefficient with multiple linear regression were computed to examine the association between demographic characteristics and clinical competency. Partial eta-squared and Cohen's d were also calculated for effect size (0.01 = small, 0.06 = medium, 0.14 = large and 0.20 = small, 0.50 = medium, 0.80 = large, respectively). p values of < 0.05 were considered significant.

Ethical considerations

This study was approved by the Ethics Committee of Isfahan University of Medical Sciences (Project number IR.MUI.REC.1397.3.772). Before participating in the study, all the participants were given sufficient explanation about the aim and method of the study. In addition, a written informed consent was obtained from all the participants. The participants were also assured that the data was confidential and that they could leave the study at any time.

Results

Demographic characteristics, general clinical competence, and clinical competence based on its dimensions

The mean age of OR staff was 33.52 (6.74) years and the mean work experience was 10.89 (6.79) years. Generally, 179 subjects (80.30%) were females and 48 (19.70%) were males. In terms of the level of education, the participants were divided into four subgroups of OR technicians with associate degree (n = 60, 25.90%), OR technologists and OR nurses with bachelor's degree (n = 148, 65.60%) and (n = 16, 7.10%), and OR graduates with master's degree (n = 3, 1.30%). Regarding the environment of ORs, 72 subjects (32.90%) were working in single-specialty, whereas 63 (28.80%) and 84 (38.40%) subjects were working in two-specialty and multi-specialty, respectively. The mean and standard deviation of the total score of clinical competence and frequency distribution of the total score of clinical competence based on six dimensions are presented in Table 1.

Relationship between clinical competence and demographic characteristics

Pearson's correlation coefficient respectively showed a poor and a borderline positive significant relationship between the variable of work experience and general knowledge (p = 0.020), specific knowledge (p = 0.050), and general practical skills (p = 0.050) [Table 2]. The variable of specific practical skills was also significantly correlated with age and work experience (p = 0.007, $p < 0.001$), which is shown in Table 3. Multiple linear regression test showed the possibility to predict clinical competency through the

Table 1: Descriptive indicators of clinical competence score based on the dimensions

Variable	Mean (SD)	Min	Max	Unfavorable *n* (%)	Relatively favorable *n* (%)	Favorable *n* (%)
Personality	90.96 (10.16)	27.78	100	1 (0.40)	22 (9.70)	204 (89.90)
Motivation	13.24	36.11	100	5 (2.20)	42 (18.50)	180 (79.30)
General knowledge	87.23 (11.44)	39.29	100	1 (0.40)	44 (19.60)	180 (80)
Specialized knowledge	83.44 (14.21)	25.00	100	7 (3.10)	57 (25.30)	161 (71.60)
General practical skills	53.32 (10.26)	11.11	65.28	86 (38.20)	139 (61.80)	0 (0)
Specific practical skills	85.51 (16.87)	18.18	100	7 (3.30)	40 (18.70)	167 (78)
Total score of clinical competence	80.99 (11.28)	39.30	96.74	5 (2.20)	45 (19.80)	177 (78)

Table 2: The relationship among general knowledge, specific knowledge, general practical skill, and quantitative demographic variables

Variable	Mean* (SD)	*r***	*p*	Mean*** (SD)	*r*	*p*	Mean**** (SD)	*r*	*p*
Age	87.23 (11.44)	0.12	0.06	83.44 (14.21)	0.10	0.13	53.32 (10.26)	0.10	0.13
Work experience	87.23 (11.44)	0.15	0.02*****	83.44 (14.21)	0.13	0.05	53.32 (10.26)	0.13	0.05

*Mean general knowledge. **Pearson's correlation coefficient. ***Mean specific knowledge. ****Mean general practical skill. *****significant (*P*)

age and work experience (R-squared = 0.96, beta = 0.31, $p = 0.022$). According to the results of the independent t-test and analysis of variance, no significant correlation was observed between general and specific knowledge and also between general practical skills and gender and level of education.

Relationship between clinical competence and the classes of OR (Single, double, or multi-specialty)

According to the results of analysis of variance, general and specialized knowledge and general practical skills were not significantly correlated with the variable of the classes of ORs (single, double, or multi-specialty). Specific practical skills score and emotion score were significantly correlated with the classes of ORs ($F = 21.53$, $p < 0.001$) ($F = 4.49$, $p = 0.010$) [Tables 4 and 5]. The post-hoc Scheffe test revealed that the mean score of specific practical skills and the mean score of emotion in single-specialty ORs were significantly higher than double- and multi-specialty ones. The effect size for each dimension was very small (<0.20).

Discussion

The total mean score of the clinical competence of the participants was optimal. In this regard, our findings are in line with the results obtained by Sykes *et al*.[18] with regard to the dimension of specific practical skills. However, the mentioned researchers defined clinical competence differently, and the OR staff who, according to the self-report form, could perform at least 60–80% of the duties of scrub as well as the circular staff in surgical procedures, were considered to be competent.

According to the results of the present study, the highest scores were given to the personality and motivation dimensions of clinical competence. In this respect, our findings are inconsistent with the results obtained by Wang *et al*.[19] in China. Clinical competence was evaluated in four dimensions in the mentioned study, and the highest scores were given to the dimensions of specialized knowledge (40%) and personality and motivation (30%), whereas the lowest scores in the present study in the dimensions of personality and motivation were 89% and 79%, respectively. This means that, in this study, the lowest scores in the dimensions of personality and motivation were still higher than the highest scores in the study of Wang *et al*.[19] In addition, Lim and Yi[20] compared the staff of two ORs and general surgery wards in terms of the dimensions of communication and interpersonal communication ability of clinical competence. According to their results, OR was a relatively more complicated and specialized environment, compared to the general surgery ward, and required competent staff to establish interpersonal relationships. However, the clinical competence of the OR staff was lower than the general surgery wards. Meyer *et al*.,[21] Breedt and Labuschagne[22] reported personality as an important factor for skill training in the workplace, which can affect the OR staff's clinical competence and learning. They introduced the OR staff as perfectionist people who were quick, swift, accountable, and accurate when present there. Moreover, Hasandoost *et al*.[23] introduced personality traits as one of the effective areas in improving the clinical competence of nurses.

In the present study, the lowest score belonged to the dimension of general practical skills, and the clinical competence of the samples was unfavorable in this regard. Based on the results of Wang *et al*.,[19] the lowest score was obtained for the dimension of 'practical function,' which was similar to the dimension of general practical skills in the current research. In another study that assessed the clinical competence of staff in various wards, the OR staff had an undesirable status in terms of practical and functional skills.[24] The low score of the general practical skills in the present study might be due

Table 3: The relationship between specific practical skills and quantitative demographic variables

Variable	Mean (SD)	Mean* (SD)	*r***	*p*
Age	33.52 (6.74)	85.51 (16.87)	0.185	0.007***
Work experience	10.89 (6.79)	85.51 (16.87)	0.246	<0.001***

*Mean specific practical skills. **Pearson's correlation coefficient. ***Significant (*p*)

Table 4: The relationship between specific practical skills and the class of operating rooms

Variable	Mean* (SD)	*F***	*p*
The class of operating rooms			
Single-specialty	95 (9.34)	21.53	<0.001***
Double-specialty	84.11 (14.81)		
Multi-specialty	78.67 (19.64)		

*Mean specific practical skills score. ** *F* for ANOVA. ***significant (*P*)

Table 5: The relationship between emotion score and the class of operating rooms

Variable	Mean* (SD)	*F***	*p*
The class of operating rooms			
Single-specialty	91.43 (9.64)	4.49	0.01***
Double-specialty	85.84 (15.85)		
Multi-specialty	85.78 (13.23)		

*Mean emotion score. **F for ANOVA. ***significant (*p*)

to the defects in continuing education programs and also inadequate educational content during the study at the university. While the topic of patient safety is frequently emphasized in continuous education and retraining programs in our healthcare centers, important measures such as "final announcement" (as a part of the 'Time-out' procedure) before surgery have always been forgotten, and even some persons in this study did not remember the exact meaning of 'Time-out' as an item in the clinical competence questionnaire. However, improving the content of university courses might be one of the most important factors for training competent OR nurses.[16] In this regard, Lim and Yi[20] argued that while work experience increased the clinical competence of the staff, it was skill training and proper functioning of the academic course that more improved the clinical competence of nurses.

In a study on OR nursing students and anesthesia nursing students, the instructor was introduced as the most important factor affecting the quality of clinical education.[25] In this respect, given the unpredictable and stressful nature of the OR environment, the training is not properly offered by the instructor in the OR. Therefore, learning opportunities are not always supported in this environment. Moreover, OR staff perform their tasks quickly and have no time to explain these tasks to the students. Nevertheless, clinical skills can be improved by the mentoring role of experienced and competent staff, and instructors play a considerable role especially in increasing general functional skills.[26]

In the present research, the items of 'Sign-out (measures taken before the transfer of the patient from the surgery room to the post-anesthesia care unit) and Time-out (measures taken before a surgical incision)' were among the dimensions of general practical skills. Indeed, 'Sign-out and Time-out' are safety checklist components used to maintain the patient's safety and health immediately before and after surgery.[10,27] Among the items of 'Time-out' stage, the highest percentage of responding "I completely do" was related to the item of "tool sterility check," whereas the lowest percentage of responding "I completely do" was related to the item of "confirming the correctness of the surgical site just before the incision is made." With regard to the 'Sign-out' stage, the highest percentage of responding "I completely do" was related to the item of "observing the correct principles of storage and collection of samples and biopsy in the role of scrub and circular", whereas the lowest percentage of the mentioned response belonged to the item of "measures before transition of the patient to the recovery room by the circular person" in the dimension of general practical skills. In this regard, our findings were in line with the results obtained by Weiser and Haynes[28] where they reported lack of adherence to WHO safe surgery checklist in some items. This is while one-third of postoperative mortality and lethal complications have decreased by a complete adherence to 'Sign-out and Time-out.'[10]

In this study, we found that while 'specific knowledge' and 'general practical skills' were insignificantly correlated with work experience (p = 0.05), they were significantly correlated with the variable of the age; moreover, 'specific practical skills' was significantly correlated with work experience and age. By contrast, Farzi *et al.*[29] and Faraji *et al.*[15] found a direct relationship between age and applying theoretical and practical knowledge. Similarly, a positive relationship was observed between age and spiritual and emotional intelligence in the study of Shabani *et al.*[30] Although aging itself is often related to more work experience, there was no relationship between age and all competence dimensions in this study (r = 0.12, *p* = 0.06 and r = 0.10, *p* = 0.13). Thus, this question may be raised: does age and work experience increase the competence and abilities of the staff? In a comparative study on OR staff in four countries of Australia, Sweden, Canada, and Scotland, the participants were divided into three categories (1–5, 6–10, and >10 years) based on their work experience in the OR. The results showed that the clinical competence of the staff with a work experience of 1–5 years in Sweden and Australia was higher than those with a work experience of 6–10 and more. However, competence improved by aging and higher work experience in Canada and Scotland.[16] Therefore, the effect of age and work experience on clinical

competence is not sustainable and varies in different contexts. Accordingly, we need to separate age and work experience from each other as there are older staff with lower work experiences. Despite the positive relationship between these two variables in some countries like Sweden and Australia, it is not common in our country.

In the present study, there was no significant relationship between academic degree and clinical competence. According to Farzi *et al*.,[29] academic degree was correlated with the clinical competence of the subjects. In addition, the comparative study performed in four countries of Australia, Sweden, Canada, and Scotland also demonstrated a significant association among level of education, clinical judgment, and patient care.[16] This difference might be due to the minimum variance in academic degrees in current study compared to the two other mentioned studies, as most subjects had bachelor's degree.

In this study, gender was not significantly correlated with general and specialized knowledge and also with general and specialized skills, which is consistent with the results obtained by Karimi-Moonghi *et al.*,[31] Healey *et al.,*[32] and Faraji *et al*.[15] Nevertheless, in a study on master intensive care nursing students, female nurses enjoyed higher clinical competence than male ones in all items (e.g. practical skills, individual management, care management, and patient-centered care).[33] Moreover, in the study of Gillespie *et al*.,[16] the female staff in all four countries of Australia, Sweden, Canada, and Scotland had a higher clinical competence than the male staff. Accordingly, we finally can conclude that gender is a considerable variable in relation to clinical competency.

In the present research, the mean score of clinical competence in the dimension of specialized practical skills was higher in single-specialty ORs than multi-specialty ORs. Given the fact that OR is a specialized environment, it is necessary for the staff to have a set of specialized knowledge and skills with regard to their field of study and the type of OR environment.[26] In a research conducted in Iran, the researchers compared the clinical competence of the staff in various wards including the OR, CCU, ICU, emergency department, and inpatient wards. It was indicated that the staff working in CCUs and the ICUs were clinically more competent than those working in the emergency departments and ORs.[24] As the samples of this study had been selected only from non-specialized ORs, where specialized, super-specialized, and minimally invasive surgeries would not be performed, this study would not be representative of all OR environments. Furthermore, in our country staff working in CCUs and ICUs have more educational facilities and more opportunity to enhance their learning and are also supervised more. However, the relationship between working in a specialized environment and the clinical competence score, like that of age and work experience variables, is highly context-dependent. Thus, in a research conducted in South Korea, the competence and performance of OR nurses increased in relation to age and work experience in both non-specialized and specialized ORs.[34]

Although self-expression is a common way of examining the clinical competence of medical staff, the limitation is that it is possible to obtain unrealistic findings especially in examining the dimensions of personality and motivation in comparison to other dimensions of clinical competence. Therefore, the researcher attempted to use a combination of negative and positive items to reduce the possibility of unrealistic responses in these dimensions. Another limitation is that although we used quota sampling method, in each quota entrance of people were convenient than self-selection bias having occurred (e.g., an occasional interest in selecting staff according to sincerity), diminishing generalizability of the findings to the entire population of interest. Nevertheless, we tried to measure clinical competence through a validated tool considering all surgical fields separately and based on our context.

Conclusion

The empowerment of medical staff has been one of the most important concerns of managers, especially in recent years. The findings of the present study showed that strengthening clinical competence in general practical skills dimension needs to be prioritized in empowerment programs of OR staff. Our findings provided the information required for making educational planning to improve clinical competence in this dimension. An overview shows that most in-service training programs in the ORs of our country include specialized training. This has overshadowed the dimension of general practical skills that are related to the observation of basic principles of patient safety apart from surgical specialization. As such, it is recommended that this dimension be improved by sustainable education. Healthcare centers need to allocate a fixed and permanent space to sustainable educational programs for training perioperative general practical skills.

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Conflicts of interest

Nothing to declare.

References

1. Gehart D. The core competencies and MFT education: Practical aspects of transitioning to a learning centered, outcome-based pedagogy. J Marital Fam Ther 2011;37:344-54.
2. Agius S, Lewis B, Kirk B, Hayden J. The perceived benefits of a two-year period of extended specialty training in general practice: The trainees' perspective. Educ Prim Care 2014;25:26-35.
3. Brown RA, Crookes PA. What are the necessary skills for a newly graduating RN? Results of an Australian survey. BMC Nurs 2016;15:23.
4. Cox JA, Whiteside D, Stobinsky JX. Competency assessment in the operative and invasive procedure setting. Available fr om: https://www.ortoday.com/wp-content /uploads/2016/11/CA-Whitepaper.pdf. [La st accessed 2018 Dec 01].
5. Dehghani Z, Abaszadeh A, Moattari M, Bahreini M. Effective reflection on clinical competency of nursing students in Shiraz University. Interdicip J Virtual Learn Med Sci 2011;2:12-8.
6. Zardosht R, Moonaghi HK. Operating room culture to develop students' clinical education in Iran: Hierarchical or collaborative. JNMS 2020;7:136-7.
7. Ruesseler M, Schill A, Stibane T, Damanakis A, Schleicher I, Menzler S, *et al*. Practical clinical competence- A joint programme to improve training in surgery. Zentralbl Chir 2013;138:663-8.
8. Kieft RA, De-Brouwer B, Francke AL, Delnoij DM. How nurses and their work environment affect patient experiences of the quality of care: A qualitative study. BMC Health Serv Res 2014;14:249.
9. Landers R. Reducing surgical errors: Implementing a three-hinge approach to success. AORN J 2015;101:657-65.
10. Phillips NM. Administration of Perioperative Care Services in Berry & Kohn's Operating Room Technique. 13th ed. Elsevier eBook on vital source; 2017. p. 89.
11. EORNA. Framework for perioperative nurse competencies. Available from: https://eorna.eu/wp-content/uploads/2019 /05/Competencies-brochure-final.pdf. [Last accessed 2019 Jun 13].
12. Soheilipour K, Farajzadeh Z. Evaluating the clinical competence of junior nursing staff based on self-assessment in Valiasr hospital of Birjand. Mod Care J 2016;13:e10089.
13. Alquwez N, Cruz J, Alshammari F, Felemban EM, Almazan JU, Tumala RB, *et al*. A multi-university assessment of patient safety competence during clinical training among baccalaureate nursing students: A cross-sectional study. J Clin Nurs 2019;28:1771-81.
14. Rothrock JC. Chapter 17, Ophthalmic surgery. Alexander's Care of the Patient in Surgery. 13th ed. Elsevier; 2015. p. 90.
15. Faraji A, Karimi M, Azizi SM, Janatolmakan M, Khatony A. Evaluation of clinical competence and its related factors among ICU nurses in Kermanshah-Iran: A cross-sectional study. Int J Nurs Sci 2019;6:241-5.
16. Gillespie BM, Harbeck E, Falk-Brynhildsen K, Nilsson U, Jaensson M. Perceptions of perioperative nursing competence: A cross-country comparison. BMC Nurs 2018;17:12.
17. Polit DF, Beck CT. Nursing Research: Generating and Assessing Evidence for Nursing Practice. 10th ed. Philadelphia: Wolters Kluwer Health; 2017. p. 189.
18. Sykes M, Gillespie B, Chaboyer W, Kang E. Surgical team mapping: Implications for staff allocation and coordination. AORN J 2015;101:238-48.
19. Wang YM, Xiong LJ, Ma Y, Gao XL. Construction of competency evaluation measures for operating room nurses. Chin Nurs Res 2016;3:181-4.
20. Lim EJ, Yi YJ. Comparison of operating room nurses and general ward nurses on communicative competence and interpersonal relationship ability within the medical team. J Korean Acad Nurs Adm 2014;20:313-21.
21. Meyer R, Van-Schalkwyk SC, Prakaschandra R. The operating room as a clinical learning environment: An exploratory study. Nurse Educ Pract 2016;18:60-72.
22. Breedt S, Labuschagne MJ. Preparation of nursing students for operating room exposure: A South African perspective. Afr J Health Professions Educ 2019;11:22-6.
23. Hasandoost F, Ghanbari-Khanghah A, Salamikohan K, Kazemnezhad L, Norouzi-Pareshkouh N. Prioritization of general clinical competence indicators from nurses' view employed in emergency wards. J Holistic Nurs Midwifery 2015;25:53-63.
24. Afshar M, Sadeghi-Gandomani H, Masoudi-Alavi N. A study on improving nursing clinical competencies in a surgical department: A participatory action research. Nursing Open 2020;7:1052-9.
25. Ghorbanian A, Bahadori M, Nejati M. The relationship between managers' leadership styles and emergency medical technicians' job satisfaction. Australas Med J 2012;5:1-7.
26. Liebenberg M. Practical nurses' perceptions of their role as mentors for novice nurses in the operating room. Doctoral dissertation. Stellenbosch: Stellenbosch University. 2018.
27. AORN. Comprehensive surgical checklist. Available from: https://www.aorn.org/surgicalchecklist. [Last accessed 2018 Feb 15].
28. Weiser TG, Haynes AB. Ten years of the surgical safety checklist. Br J Surg 2018;105:927-9.
29. Farzi S, Shahriari M, Farzi SE. Exploring the challenges of clinical education in nursing and sterategies to improve it: A qualitative study. J Educ Health Promot 2018;7:115.
30. Shabani J, Hassan S, Ahmad A, Baba M. Age as moderated influence on the link of spiritual and emotional intelligence with mental health in high school students. J Am Sci 2010;6:394-400.
31. Karimi-Moonghi H, Gazrani A, Vaghee S, Gholami H, Saleh-Moghaddam A, Gharibnavaz R. Relationship between spiritual Intelligence and clinical competency of nurses in Iran. Iran J Nurs Midwifery Res 2015;20:665-9.
32. Healey T, El-Othmani M, Healey J, Peterson T, Saleh K. Improving operating room efficiency, part 1: General managerial and preoperative strategies. JBJS Rev 2015;3:e3.
33. Ebadi A, Yousefi Sh, Khaghanizade M, Saeid Y. Assessment competency of nurses in biological incidents. Trauma Mon 2015;20:e25607.
34. Jung JH, Kim HJ, Kim JS. Comparison of nursing performance competencies and practical education needs based on clinical careers of operating room nurses: A cross-sectional study. Healthcare 2020;8:136.