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Research Article

Clinical Competency in Anesthesia Nursing Education: A Descriptive Cross-Sectional Study at Jundishapur University of Medical Sciences

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ABSTRACT

Background: Clinical competence is an essential attribute for anesthesia nurses, as it directly influences patient safety, minimizes medical errors, and enhances surgical outcomes. In Iran, ensuring the clinical competence of anesthesia nurses is vital to addressing the growing demands of modern healthcare. However, evidence suggests a persistent gap between academic education and clinical practice, potentially undermining the readiness of graduates to meet professional expectations. This study aimed to evaluate the clinical competence of anesthesia students at Jundishapur University of Medical Sciences in 2023, identifying areas of strength and weakness to inform improvements in educational programs and foster clinical preparedness.

Methods: This descriptive cross-sectional study included 62 anesthesia students, selected through a census method, who were enrolled in the third and fifth terms of their academic program. A common clinical assessment tool was used to evaluate students' competencies. Statistical analysis was performed using SPSS version 26.

Results: This study demonstrated that most students exhibited strong competence in patient safety and anesthesia care, with a mean score of 19.79 (SD = 3.26, range: 12–24) and an overall clinical competence score of 70.83 (SD = 11.34, range: 44–88). Additionally, GPA significantly influenced clinical competence scores, with higher GPAs associated with better clinical outcomes (P value = 0.015). However, students showed lower competence in professional communication and collaboration. Only one student was classified as "Not applicable," while 40.32% were categorized as "Competent and proficient to enter practice."

Conclusion: The findings highlight the importance of academic performance in enhancing clinical competency. While most students demonstrated readiness for clinical practice, improvements are needed in areas such as professional communication and teamwork. Future research should focus on long-term evaluations and interventions to enhance these competencies, ensuring better preparation for clinical practice.

Introduction

Universal health is a primary concern for countries, which is achieved through investment in surgery and providing access to safe and affordable surgical services [1]. This access not only requires more human resources, including surgeons, nurses, and technicians, but also highlights the role of anesthesia nurses, who, due to their critical role in surgeries, are seen as an important solution to the shortage of access to these services [2-3]. Research has shown that globally, anesthesia services are primarily provided by nurses, even though this responsibility has

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traditionally been assigned to physicians [4]. Anesthesia nurses, due to the complex needs of patients and the expansion of anesthesia care, require a high level of knowledge and competence in the field [5]. Competence, defined as "the ability to perform a task successfully" [6], is a fundamental characteristic for anesthesia nurses and is described as a combination of knowledge, attitudes, values, and skills necessary to provide care to patients during the pre-anesthesia, intra-anesthesia, and post-anesthesia phases [7].

Global anesthesia nursing education is designed to train specialists capable of delivering safe and effective anesthesia care [4]. This education, with a competency-based approach, focuses on developing graduates' abilities in clinical judgment, application of knowledge, technical skills, and effective communication to provide the highest level of patient care [8], as the competency level of anesthesia nurses directly impacts improving patient outcomes, reducing complications, and minimizing medical errors [9]. In Iran, anesthesia nurses, in collaboration with medical teams and using advanced equipment, are responsible for providing anesthesia care during surgeries [5]. To perform these tasks, they must possess essential competencies, including technical skills such as mastering equipment and patient monitoring, as well as non-technical skills like effective communication with the healthcare team and patients and the ability to conduct research [5, 10]. Therefore, the primary aim of anesthesia nursing education is to train specialists who, by mastering these components, can effectively address clinical complexities and ensure patient safety during anesthesia [10].

However, reports from some countries indicate a low level of clinical competency among new graduates, pointing to a gap between education and performance in anesthesia care [10-11]. This situation, particularly given the increasing societal expectations of anesthesia nurses to provide high-quality services, highlights the need for continuous assessment and updating of clinical competency enhancement programs [12]. One of the main responsibilities of medical universities is to establish effective links between research, education, and clinical competency so that this gap is addressed and students acquire the competencies and readiness necessary to work independently before graduation [13]. To this end, continuous evaluations based on standardized tools can help identify students' weaknesses and correct them before graduation. Additionally, these evaluations can serve as a foundation for future research or planning to improve or enhance students' competencies in medical university programs. In this context, the present study aimed to examine the clinical competency of anesthesia students at Jundishapur University of Medical Sciences in 2023.

Methods

This descriptive cross-sectional study was conducted on anesthesia undergraduate students at Jundishapur University of Medical Sciences. A total of 62 participants were selected through a census method from all third- and fifth-term anesthesia students who met the inclusion criteria. Initially, after obtaining the necessary permits from the Ethics Committee (IR.AJUMS.REC.1402.261) and receiving approvals from the Research Vice Presidency of Jundishapur University of Medical Sciences, all eligible participants were informed about the nature, stages, and voluntary participation of the study. Informed written consent was obtained from those willing to participate. The research was then carried out at the affiliated teaching hospitals of AJUMS during the anesthesia nursing internship program.

Data Collection Tools

The data collection tools for this study consisted of two parts: a questionnaire to collect demographic information, including marital status, gender, age, academic term, and GPA, and a common clinical assessment tool used to evaluate the clinical competency of anesthesia students before entering the clinical environment. This tool was designed by the American Association of Nurse Anesthesia Accreditation Council in 2019 and includes four main competency areas and 22 subscales: patient safety and anesthesia care (6 competencies), knowledge and critical thinking (6 competencies), professional communication and collaboration (4 competencies), and professionalism (6 competencies). Each of these areas was evaluated on a five-level scale, from "unacceptable" to "competent for clinical entry" [14]. The tool was first translated by two translators proficient in both Persian and English. The research team then reviewed and modified the translations for clarity and semantic alignment. Subsequently, one of the translators, in collaboration with the research team, merged the initial translations and produced the final Persian version. Finally, the Persian version was back-translated into English by a faculty member from the Department of Anesthesia at Jundishapur University, who was fluent in English. The new version was compared with the original and approved by the research team.

For content validity, the tool was assessed using the four criteria of simplicity, clarity, specificity, and relevance based on a 4-point Likert scale, according to the content validity index (CVI) and content validity ratio (CVR) measures. The tool's validity was confirmed by its original developers with a CVI of 83%, which was recalculated and confirmed in this study (CVR = 0.83, CVI = 0.79). For reliability, the intra-class correlation coefficient (ICC = 0.824) was calculated by evaluating

the activities of ten students by two evaluators simultaneously.

In this study, the minimum passing score was set at 50% of the total score. Clinical competency scores of the students were categorized into five levels: Not applicable (0–44), safety concern (45–55), novice (56–66), advanced beginner (67–77), and competent and proficient to enter practice (78–88). Using the common clinical assessment tool, clinical competency was evaluated by three evaluators with a master's degree in anesthesia education throughout one academic term. Data were analyzed using SPSS software version 26. Quantitative variables were reported as mean, standard deviation, minimum, and maximum, while qualitative variables were reported as frequencies. The normality of continuous variables was assessed using the Shapiro-Wilk test. For comparing mean competency scores between different groups, the non-parametric Mann-Whitney test was used, and for examining the relationship between demographic variables and clinical competency scores, the Spearman correlation coefficient was applied. A multiple linear regression model was used to assess the effect of demographic variables on clinical competency scores.

Results

In this study, 62 anesthesia students were evaluated. The majority of participants were female (74.6%) and unmarried (90.3%). The mean age of the participants was 22.58 ± 4.41 years. Additionally, 61.3% of the participants were in their fifth academic term, and 59.7% had at least four terms of clinical internship experience before the study. Detailed demographic information is provided in (Table 1).

The results showed that, among the demographic variables, only GPA had a significant impact on the intervention outcomes; students with higher GPAs achieved better clinical competency scores (P value = 0.015). Other demographic factors, such as age, gender, marital status, and clinical experience, did not significantly affect the results. In this study, one participant (1.61%) was classified as "Not applicable," six participants (9.68%) were in the "safety concern" category, 17 participants (27.42%) were identified as "Novice," 13 participants (20.97%) were "Advanced beginner," and 25 participants (40.32%) were rated as "Competent and proficient to enter practice." The highest mean competency scores were observed in the domains of patient safety and anesthesia care, while the lowest scores were recorded in professional communication and collaboration (Table 2).

The results of the correlation analysis between the variables and clinical competency scores showed that only GPA and clinical experience were significantly correlated with clinical competency scores. A multiple linear regression model was used to examine the effect of these variables on the mean clinical competency score. The results indicated that GPA was significantly associated with competency scores. Specifically, for each one-unit increase in GPA, the clinical competency score increased by 2.57 units (P value = 0.008, 95% Confidence Interval: 0.71 to 4.43). Other variables, including age, gender, marital status, and clinical experience, did not show a significant effect in the model (Table 3).

Table 1- Demographic characteristics of participants in the intervention and control groups.

Characteristics	Mean (SD†, range) Clinical Competency Score	Frequency	Statistics	P value
Age; y				
>23	66.90 (12.89, 47-82)	11 (17.7)	-0.47	0.249
<23	71.68 (10.93, 44-88)	51 (82.3)		
GPA; y				
<17	66.04 (12.57, 44-84)	38 (61.3)	0.08	0.015
>17	73.86 (9.31, 55-88)	24 (38.7)		
Gender; n (%)				
Male	66.05 (13.65, 44-83)	17 (27.4)	0.24	0.085
Female	72.64 (9.91, 54-88)	45 (72.6)		
Marital status; n (%)				
Single	70.30 (11.68, 44-88)	56 (90.3)	0.64	0.340
Married	75.83 (5.94, 65-81)	6 (9.7)		
Internship Experience; n (%)				
Three years	67.84 (10.08, 44-82)	25 (40.3)	0.39	0.085
Two years	72.84 (11.82, 47-88)	37 (59.7)		

†SD, Standard deviation.

Table 2- Descriptive statistics of clinical competence in the study participants

Variables	Mean (SD†, range)
Patient safety and anesthesia care	19.79 (3.26, 12-24)
Knowledge and critical thinking	18.46 (3.78, 9-24)
Professional communication and collaboration	13.29 (2.05, 9-16)

Professional role	19.29 (3.12, 13-24)
Overall clinical competence score	70.83 (11.34, 44-88)

†SD, Standard deviation.

Table 3- Regression analysis results of participants' clinical competence based on demographic variables

Variables	Coef	Std. Error	95% Confidence Interval	T-value	P-value
Constant	18.29	15.53	-12.81, 49.39	1.178	0.244
Age	-0.48	0.41	-1.31, 0.34	-1.172	0.246
GPA	2.57	0.93	0.71, 4.43	2.773	0.008
Gender	4.61	3.02	-1.44, 10.67	1.527	0.132
Marital status	5.69	6.08	-6.49, 17.88	0.936	0.353
Internship Experience	1.76	1.36	-0.97, 4.49	1.291	0.202

Discussion

The demographic results of this study indicate that GPA significantly affects the clinical competency of anesthesia students. Students with higher GPAs achieved better clinical competency scores. These findings highlight the importance of education and mastery of specialized content in clinical fields as a key factor in enhancing clinical competency levels. Furthermore, these results align with previous research, which demonstrates a positive correlation between academic performance and job performance [15].

The evaluation of the clinical education program in the anesthesia department at Jundishapur University of Medical Sciences shows that a significant portion of students have achieved adequate clinical competency and are either ready to enter the clinical environment or are on track to do so. With further education and experience, these students are likely to reach a desirable level of competency. However, some students still require additional attention and educational programs to improve their clinical skills.

Furthermore, the results of this study indicated that when all competencies are observable and assessable, it becomes possible to evaluate the students' competencies and determine whether they have demonstrated the necessary skills for safe entry into the workforce [16]. In this regard, the majority of anesthesia students at Jundishapur University of Medical Sciences had achieved a high level of clinical competency prior to graduation in 2023, positioning them well for entry into the clinical profession.

Continuous evaluation and revision of competencies in clinical professions must be conducted regularly to ensure alignment with current and future needs, aiding nurses in delivering high-quality care [17]. This approach should particularly be pursued and implemented during the education of students in universities, with the development of competencies structured to establish appropriate educational standards for preparing specialized nurses for clinical environments [8]. This includes tailoring specific competencies to various nursing levels and the requirements of healthcare settings [18]. Integrating competencies into the student curriculum and shifting toward competency-based education can strengthen the skills and knowledge essential for safe practice in the workplace. Over time, students gradually enhance their foundational knowledge [17].

The results of this study showed that students achieved the highest competency scores in the domains of patient safety and peri-anesthesia care, knowledge and critical thinking, and professionalism. However, they scored lower in the domain of professional communication and collaboration. Considering that teamwork among anesthesia team members and even communication with patients play a critical role in preventing medical errors and ensuring safe anesthesia, the low competency levels of anesthesia students in this area call for a revision of the educational approach. This deficiency in students' competencies can be explored in light of factors mentioned in other studies [10].

In many studies, teamwork-related competencies in nursing groups often received the highest scores [19]. Some of these studies attributed discrepancies in results to the lack of teamwork training and practice, as well as insufficient managerial support for teamwork among nursing staff [20]. Additionally, differences in staff perceptions of teamwork and variations in the working environments between anesthesia and nursing personnel could be other potential reasons for these differences in outcomes [5]. Addressing these factors in the educational curriculum could potentially lead to improved results in the future.

Given the findings of this study highlighting weaknesses in professional communication and collaboration competencies, conducting further research to investigate the causes and ways to improve teamwork in nursing education could be beneficial. Such studies could focus on educational strategies and group-based programs designed to foster teamwork. However, it is recommended that future studies specifically examine the long-term effects of these strategies on improving students' teamwork skills. This study was conducted over the course of one academic term, and there may be a need for longitudinal assessments (e.g., over several academic terms) to observe changes in clinical competencies over

time. Therefore, it is suggested that a study incorporating continuous evaluations over two or three academic terms be conducted to track changes in clinical competencies and teamwork skills.

Conclusion

This study highlights the importance of continuous and comprehensive evaluations in clinical education to ensure that students are adequately prepared for safe practice in the clinical setting. The results suggest that focusing on improving professional communication and collaboration competencies, as well as incorporating strategies for teamwork and interpersonal communication, will enhance the overall clinical competency of anesthesia students. Long-term studies and consistent monitoring will further contribute to the development of a more effective clinical education program in the future.

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