Original Article

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Simulation-based Interprofessional Education (IPE) for Enhanced Attitude and Teamwork of Anesthesiology Residents and Nurse Anesthesia Students in Iran

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Abstract

Introduction: Simulation-based interprofessional education (IPE) provides the basis for the necessary competencies for interprofessional collaboration. This study aimed to examine the effects of this educational approach on anesthesia students' attitude and teamwork.

Methods: This quasi-experimental study was performed on 72 anesthesiology residents and nurse anesthesia students consisting of 36 participants in the intervention and 36 in the control group. The intervention group participated in a simulation-based interprofessional season, including three scenarios in the induction phase of anesthesia. The control group received routine education. We used the Readiness for Interprofessional Learning Scale (RIPLS) to measure attitude and the KidSIM Team Performance Scale to assess teamwork. The data were analyzed by Analysis of Covariance, paired T-test, Chi-square, and Fischer's exact test in SPSS software, version 22.

Results: Comparing post-test scores by ANCOVA showed a significant difference between groups (P=0.001) because there was a significant positive change in the overall attitude score in the intervention group after receiving simulation-based IPE. Regarding the quality of teamwork, the intervention group's scores in all three sub-scales changed significantly after intervention (P<0.05).

Conclusions: The simulation-based IPE is recommended to promote a teamwork culture and train empowered anesthesia professionals.

Keywords: Anesthesia, Interprofessional relations, Education, Simulation

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Introduction

Interprofessional Collaboration (IPC) is the mainstay of today's healthcare. IPC occurs when health care professionals with different backgrounds work together to ensure that the highest quality of patient care is provided (1). In clinical settings, the absence of cooperation leads to adverse effects on the treatment and care of patients, which will, in turn, lead to reduced job satisfaction among caregivers and a waste of resources (2).

In the operating room (OR), as a unit where coordination, speed, and quality of services are of paramount importance, special attention should be paid to teamwork (3). Meanwhile, anesthesia teams consisting of anesthesiologists and nurse

anesthetists often experience hazardous events. They need rapid decision-making in response to the physiological reactions of patients and unexpected surgical events (4). Minor differences in duties may also have significant consequences for coordination, including the problems that are easy to identify and require prompt action (e.g., cardiac arrest). However, diagnosing problems (e.g., malignant hyperthermia) requires more coordination of information. The results of studies show that during the management of simulated malignant hyperthermia, anesthesia teams are better at assessing the condition and dividing duties had a better performance (5).

The World Health Organization (WHO) (1973) announced that graduates of medical sciences are not able to provide effective team care (6). IPE was introduced as the most effective strategy for team care training to solve this problem. IPE aims to encourage healthcare professionals to learn about, from, and with each other to promote effective collaboration to ensure the safety and quality of patient care (7). Various studies have shown that students participating in IPE have a positive attitude towards interprofessional learning, and their collaborative skills are improved accordingly (8).

There has been an unprecedented rise in the use of simulation in IPE. Simulation-based education allows for safe, stress-free care practice in a real clinical environment (9). The results of Graham et al.'s study on nursing students have shown that simulation-based interprofessional education improves communication skills, enables coordination, and improves self-confidence in collaborative situations (10).

Put in a nutshell, it seems that interprofessional learning and practice can improve the quality of patient care by learning each other's roles, fostering communication, and promoting collaboration and teamwork among healthcare team members. Although successful efforts have been made to promote interprofessional learning and practice, there are still few opportunities to bring together faculty members and interns from different disciplines for this very purpose. Health care is still practiced as a single profession in many countries, including Iran, where the prerequisite for graduation is often to develop a deep theoretical knowledge solely. Also, despite the growing awareness of the importance of simulation-based IPE and the related studies admitting it, there has been a paucity of research addressing simulation-based IPE for anesthesiology residents and nurse anesthesia students who play a key role in anesthesia teams in the OR and have enormous interprofessional interaction with each other. Therefore, this study was conducted to analyze the effect of simulation-based IPE on the attitude and teamwork of anesthesiology residents and nurse anesthesia students in Iran.

Methods

Design

A quasi-experimental pre-test/post-test study was conducted in October and November 2021.

Setting

The research site was the general OR of Imam Khomeini Hospital of Ahvaz, Iran.

Participants

The research participants included 72 senior anesthesiology residents and nurse anesthesia students of Ahvaz Jundishapur University of Medical Sciences who had the clinical experience communicating with patients and colleagues in the OR. They were divided into 36 participants in the intervention and 36 in the control group. The anesthesiology residents were selected by census method due to their limited number, while nurse anesthesia students were chosen by convenience method from students who met the inclusion criteria. Inclusion criteria were: 1) being senior, 2) willingness to participate in research; and 3) active participation throughout the sessions of simulation-based IPE. The exclusion criteria were 1) previous participation in simulation-based IPE programs, 2) participation in a parallel workshop, and 3) inadequate questionnaire completion. The participants were first divided into groups of three (trios) consisting of an anesthesiology resident and two nurse anesthesia students. Then, after performing the pre-test stage, the trios were assigned into intervention or control groups.

Instruments

The data collection tool in this research included three parts:

1. Demographic characteristics: The first section collected demographic information, including age, gender, academic program, and academic year.

2. The Readiness for Interprofessional Learning Scale (RIPLS): A valid self-report questionnaire measured attitudes toward interprofessional teams and readiness for IPE. This tool consists of 19 items in 4 sub-scales: Teamwork and collaboration, Negative professional identity, Positive professional identity, and Roles and responsibilities. The scoring system is based on a 5-point Likert scale (1=strongly disagree, 5=strongly agree). Positive

answers to questions 1-9 and 13-16 and negative responses to questions 10-12 and 17-19 are associated with a positive attitude towards IPE. Its face and content validity was confirmed by an expert panel (N=10), and it was shown to have excellent reliability by obtaining a Cronbach's alpha of 0.92 (11).

3. Sigalet et al.'s KidSIM Team Performance Scale: In this study, the quality of teamwork was measured using a scale developed by Sigalet et al. This checklist contains 12 items organized into three sub-scales: Roles and responsibilities, Communication, and patient-centered care. A five-point Likert scale was used according to a behavior description pattern to distinguish each item's success level. It was a valid tool with the internal consistency of this instrument by a Cronbach's alpha of 0.90. Inter-rater reliability was also acceptable by the Intraclass Correlation Coefficient above 0.8 (12).

Procedure

Stage 1: The Ethics Committee of Ahvaz Jundishapur University of Medical Sciences approved the study (no: IR.AJUMS.REC.1400.379), and sampling began. The researcher answered possible questions the students might have had. Each student was then allowed to discuss the study with others and had at least one day to reflect consciously before signing the written informed consent letter. After obtaining the consent letter, the participants were divided into groups of three consisting of one anesthesiology resident and two nurse anesthesia students.

Stage 2: In this step, two raters with a history of continuous clinical activity for more than two years in the center and familiarity with the conditions and staff of the OR were selected and trained to complete the checklist of Sigalet et al. Before the pre-test, each rater received a comprehensive explanation about the method of using the checklist by the researcher during a 2-hour session.

Stage 3 (pre-test): After sampling, the pre-test was performed in two sections: observation and a questionnaire. Two raters observed participants in the actual environment and at the bedside of patients under general anesthesia. Then, the participants completed the RIPLS questionnaire and were divided into intervention and control groups.

Stage 4 (the intervention): After the pre-test, the intervention group participated in one simulation-based interprofessional session, designed by the research team with the help of professors from the anesthesiology department. An experienced nurse anesthesia instructor held the session. The program included three scenarios in the induction phase of anesthesia. The first scenario involved the induction of a 27-year-old woman with a humerus fracture. She had no significant past medical history, allergy, or family history of anesthesia problems. The results of physical examinations and tests were also insignificant, but her recent meal was a source of concern. The second scenario involved inducing anesthesia in a 16-year-old boy candidate for open femur fracture repair surgery. The patient arrived at the hospital after a car accident. His past medical history included childhood asthma and a one-time visit to the emergency room due to an asthma attack the year before (a history of albuterol inhalation and steroid use up to one month after visiting the emergency room). His recent meal was a source of concern too. The third scenario revolved around a 53-year-old obese and short man who is a candidate for colon resection surgery. He had asthma and the possibility of difficult intubation. The program was implemented separately for four days, and the three trios performed the three scenarios daily. The simulation was done on an Electronic Airway Management Mannequin in one of the ORs used daily but inactive during the sessions. This was done to make reviewing the scenarios close to the future work environment, and to have the anesthesia tools and equipment available. This simulation consisted of five steps (Table 1).

In the first step, the researcher explained the goals, process, and concepts of teamwork (leadership, roles and responsibilities, awareness of the situation, use of resources, and patient-centered care). In addition, a simulation scenario template was provided to each trio so that they could examine learning objectives, patient information, and scenario guidance. In the second step, the participants developed a design for simulation,

Table 1: Five steps of simulation-based interprofessional session

Simulation step	Content
Pre-briefing	Introduction program objectives and operational processes
Pre-scenario activities	Situation analysis, coping plan, role sharing, and necessary task determination
Task training	Required task practice
Simulation	Scenario performance
Debriefing	Share thoughts on interprofessional experience

including analysis and role determination based on a specific scenario model. In the third step, the participants performed the necessary tasks for the simulation practice, which included checking the mannequins and equipment in the simulation room. In the fourth step (simulation), the participants did the intervention on the mannequin for 20 minutes based on the planned actions. The team members communicated and cooperated based on the concepts of teamwork that they had already learned. Finally, the participants could reflect on their performance, presenting as a debriefing for 30 minutes at the end of each scenario. Debriefing focused on the facilitator (researcher) and students' observations of the tasks and teamwork that could lead to favorable or unfavorable effects on teamwork and patient health. In addition, after the simulation session, the group's performance was reviewed by a faculty anesthesiologist for 30 minutes. On the other hand, the control group received routine education.

Stage 5 (post-test): The post-test stage was performed approximately one week after the intervention. At this stage, all participants completed the RIPLS. Also, at this stage, both groups were observed by raters based on Sigalet et al.'s (12) checklist in actual working conditions in the patients' beds. The raters were blind to group allocation. Figure 1 provides a summary of the study.

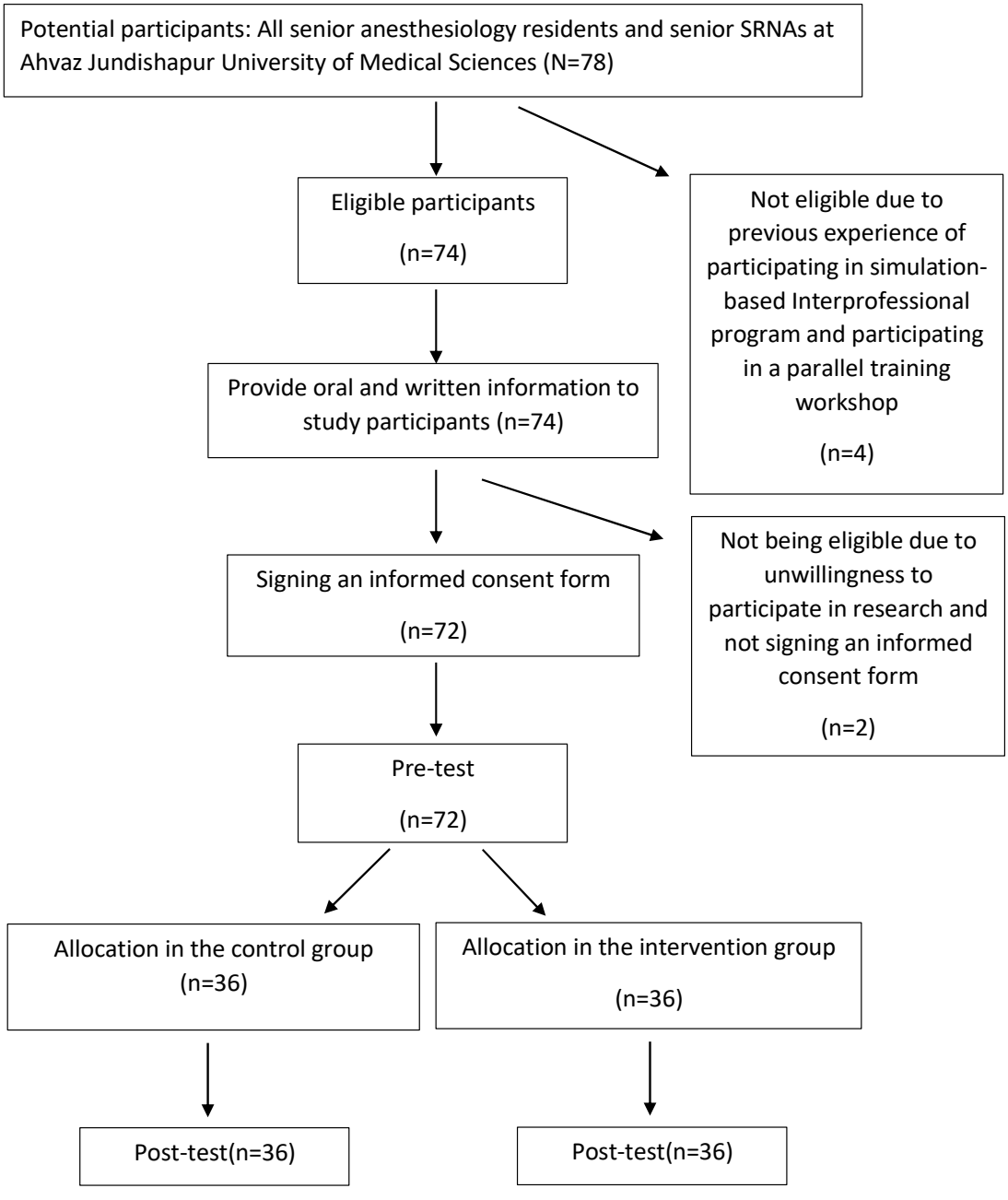

Figure 1: Flowchart of the study process

Data Analysis

The data were analyzed by descriptive statistics, including mean, standard deviation, frequency, and percentage. The Kolmogorov-Smirnov test checked the normality of the data. In the case of normally distributed quantitative variables, the data were analyzed by ANCOVA and paired T-test. Chi-square and Fischer's exact test were used to analyze qualitative data. All statistical analyses were performed using SPSS software version 22. The significant level was equal to 0.05.

Ethics Approval and consent to participate

This study was extracted from a research project approved by Ahvaz Jundishapur University of Medical Sciences (Ref. ID: IR.AJUMS.REC.1400.379). Study participants completed an informed consent before beginning the survey. Confidentiality was assured in the consent forms and the participants remained the right to withdraw their participations at any phase of research process.

Results

Out of 78 students enrolled in the study, the data obtained from 72 students (36 in the intervention group and 36 in the control group) were analyzed.

Participants' Demographic Characteristics

The mean age of the participants in the intervention and control groups were 27.06 (8.79), and 28.44 (9.09), respectively, which show no statistically significant difference between the groups in terms of their age (P=0.644). The participants' demographic characteristics, including gender, academic program, and academic year, are reported in Table 2 (frequency, percentage, and chi-square test results). About 78% of the participants were women, and nearly 67% were nurse anesthesia students. According to Table 2, the intervention and control groups had no statistically significant difference in the distribution of their demographic variables.

Change in Attitudes Toward Interprofessional Learning

Table 3 compares the scores of students' attitudes toward interprofessional cooperation and learning before and after the intervention in the study groups. There was a statistically significant difference between pre-test and post-test scores in the intervention group (P=0.011), but no such difference was observed in the control group (P=0.113). Comparing post-test scores by ANCOVA showed a significant difference between groups (P=0.001).

Change in Teamwork

Data from 24 trios, including 12 in the intervention and 12 in the control group, were analyzed. Results showed no statistically significant difference between pre-test and post-test scores of different sub-scales of the questionnaire in the control group (P>0/05).

Table 2: Demographic characteristics of participants in study groups

Variable		Group		P-value
		Control	Intervention	
Gender (%)	Male	12(33.3%)	4(11.1%)	0.114
	Female	24(66.7%)	32(88.9%)	
Academic program (%)	Resident	12(33.3%)	12(33.3%)	1.00*
	Nurse	24(66.7%)	24(66.7%)	
Academic years (%)	2	2(5.6%)	2(5.6%)	1.00**
	3	16(44.4%)	16(44.4%)	
	4	16(44.4%)	16(44.4%)	
	5	2(5.6%)	2(5.6%)	

*chi-square test; ** Fischer's exact test

Table 3: Comparison of mean (SD) student's attitude scores during pre- and post-test intervals

Variable		Time of assessment		P-value
		Pre-test	Post-test	
Group	Control	65.33±9.20	67.22±8.30	0.113 *
	Intervention	67.50±4.11	69.94±3.65	0.011 *
P-value		0.001**		
Grade	Residency student	66.25±5.54	68.33±4.96	0.054*
	Nursing student	66.50±7.89	68.70±7.20	0.028*
P-value		0.001**		

*: Paired sample t-test; **:ANCOVA

Table 4: Comparison of questionnaire subscale scores (mean±SD) between pre-test and post-test conditions in "control" and "intervention" groups

Subscale	Group	Time of assessment		P-value*
		Pre-test	Post-test	
Roles and Responsibilities	Control	18.5±5.01	17.33±2.94	0.476
	Intervention	17.17±2.93	21.0±2.76	0.022
Communication	Control	15.0±4.15	13.5±2.774	0.122
	Intervention	14.67±3.98	22.83±3.97	0.003
Patient Centered Care	Control	2.83±1.17	3.0±1.09	0.363
	Intervention	2.0±1.26	3.33±1.51	0.043

*Paired t-test

Changes before and after the intervention in all three subscales were statistically significant (P<0.05) (Table 4).

Discussion

According to the present study, simulation-based IPE positively promotes teamwork and the attitude of anesthesia students towards interprofessional cooperation and learning in the OR. Every profession, even among undergraduate students, has distinct subcultures based on shared profession-specific attitudes, beliefs, and values (13). Previous studies examining students at the outset of their studies found that first-year medical and dental students considered themselves more essential caregivers than professionals in other fields. Such stereotypes among health professionals can negatively affect teamwork and patient care. Therefore, it is imperative to create opportunities to change the dangerous misconceptions in any profession playing a role in the OR (14). Improved attitudes toward teamwork and collaboration in the present study were the primary fruit, which may help reduce individualism in the OR.

These results support previous studies on simulation-based IPE experiences. Saraswathy et al. (2021), for instance, showed the effectiveness of interprofessional collaboration in improving health professionals' knowledge, attitude, and practice in the field of hospital-acquired infection control (15). Kleib et al. (2021) reported improved teamwork and communication between respiratory and nursing students as the consequences of interprofessional collaboration (16). In a review study, Coyle et al. (2020) examined the effect of simulation-based IPE on managing the difficult airway. They showed that simulation-based IPE had many advantages for training clinical and rare airway emergencies. Practiced responses to emergency algorithms were critical and significantly reduced the patient's adverse outcomes (17).

In the present study, we found that after the intervention, the attitude score of nursing students increased significantly more than that of the residents. Yu et al. (2020) showed that nursing students had a more positive attitude toward interprofessional practice than medical students (18), which supports the findings of this study. In contrast, Friedrich et al.'s (2021) results showed that after the intervention, students' attitude scores in both medical and nursing students increased significantly, and the two medical and nursing groups had no significant difference in terms of scores in the pre-test and post-test. The reason for this could be that the interprofessional training session was held by nurse anesthesia instructors, and nurse anesthesia students may be more familiar with the teaching style of the relevant instructor than anesthesiology residents.

Interprofessional collaboration is one of the most important aspects of modern medical care. However, most current training models focus on routine education rather than IPE. Therefore, using interprofessional models needs new and innovative approaches (19). Unjustified IPE side effects include negative perceptions and feelings about other professions (1). Given that in the present study, students' attitudes improved, it seems that negative perceptions of other professions decreased in the present study. In the sessions, the learners were passively resistant to IPE in the first phase of cooperation. This resistance not only did not increase during the workshop but also changed into active cooperation in some cases.

Strengths and Limitations

The strengths of our study: It allowed anesthesiology residents and nurse anesthesia students to interact through joint simulation practice and to learn specific communication skills in a safe environment. Unlike most other studies (18, 20), we had a control group and compared the results in the two groups. Also, in addition to examining the change in attitude, we measured the change in the students' teamwork.

Besides, the present study had some limitations. Holding simulation-based IPE sessions requires a suitable time and place and

specific equipment. A well-equipped simulation center is the best place for this purpose. However, in the absence of such a center, simulation was done on electronic mannequins in an OR. Teams should be allowed to go through several sessions of joint practice periodically and then conduct analyses based on the accumulated data to analyze the effects of IPE in more detail (21). However, due to the heavy workload of anesthesia residents and the difficulty of gathering students from two disciplines, this study couldn't hold more than one session for this purpose.

Conclusion

The results indicated that the teamwork and students' attitudes toward IPE improved significantly. Due to the importance of teamwork and interprofessional cooperation in providing care and treatment, it is necessary. Failure to pay attention to this essential ability for students can have many negative consequences on health care. Managers and policy-makers should consider designing and implementing IPE in the education system from now on to train anesthesia personnel capable of meeting the health needs of the current and future generations. It is also suggested to study the effect of IPE in retraining courses with a larger sample size.

Authors' Contribution

A.Kh: Conceptualization, Methodology, Formal analysis, Writing - Review & Editing, Project administration; N.S.S: Conceptualization, Methodology, Data curation, Formal analysis, Software, Investigation, Writing-Original Draft; R.A: Conceptualization, Methodology, Formal analysis, Writing - Review & Editing, Supervision. All authors contributed to the discussion, read, and approved the manuscript and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Conflict of Interest: None Declared.

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