Shiraz E-Med J. 2018 April; 19(4):e61079. doi: 10.5812/semj.61079.

Published online 2018 March 11. **Research Article**

Effect of Training on the Attitude and Knowledge of Teamwork Among Anesthesia and Operating Room Nursing Students: A Quasi-Experimental Study

Zahra Khademian,[1,*] Zahra Pishgar,[2] and Camellia Torabizadeh[3]

[1]Assistant Professor, PhD in Nursing, Community-Based Psychiatric Care Research Center, Department of Nursing, School of Nursing and Midwifery, Shiraz University of Medical Sciences, Shiraz, Iran
[2]MSC in Nursing, Department of Nursing, School of Nursing and Midwifery, Shiraz University of Medical Sciences, Shiraz, Iran
[3]Associate Professor, PhD in Nursing, Department of Nursing, School of Nursing and Midwifery, Shiraz University of Medical Sciences, Shiraz, Iran

[*]*Corresponding author*: Zahra Khademian, School of Nursing and Midwifery, Namazi Sq, Shiraz, Iran. Tel: +98-7136474254, E-mail: zahrakhademian@yahoo.com

Received 2017 August 30; **Revised** 2017 October 14; **Accepted** 2017 November 08.

Abstract

Background: Teamwork in operating room is necessary to ensure patient's safety and medical practices outcomes. Owing to the importance of teamwork training to nursing students, the current study aimed at investigating the effect of training on the attitude and knowledge of anesthesia and operating room nursing students to teamwork.

Methods: The current quasi-experimental study was conducted from March to October 2015 in Jahrom University of Medical Sciences, Iran. Forty-five anesthesia and 15 operating room nursing students with a mean age of 22.26 $\pm$ 0.88 years were divided equally into the experimental and control groups. Data were collected before and 2 months after the intervention, using the Persian version of TeamSTEPPS teamwork attitude questionnaire and a researcher made teamwork knowledge test (each with 30 items). The intervention was a 2-session training workshop on teamwork and its strategies, each lasting for 4 hours. The training was performed by lecture, scenarios and videos, and group discussion. Data were analyzed with SPSS version 16 using descriptive statistics, paired t test, independent t test, and chi-square.

Results: The total mean score of the experimental group on teamwork attitude significantly differed after the intervention (117.5 $\pm$ 7.01) compared with those of the pre-intervention (111.83 $\pm$ 7.22) and control group (109.5 $\pm$ 9.6) ($P < 0.001$). Furthermore, a significant difference was also observed in the mean scores of all attitude domains, except for mutual support. The mean score of teamwork knowledge increased significantly after the intervention (19.8 $\pm$ 3.44), when compared with those of pre-intervention (14.5 $\pm$ 3.33) and control group (14.53 $\pm$ 3) ($P < 0.001$).

Conclusions: Training improved participants' overall teamwork attitude in 4 out of its 5 domains (but not in mutual support) and the knowledge about teamwork. Therefore, nursing training should mostly focus on the improvement of supportive behaviors among students in clinical settings.

Keywords: Attitude, Knowledge, Operating Room, Teamwork, Interprofessional Care

1. Background

Teamwork is a dynamic process in healthcare settings and involves healthcare professionals with common purposes and complementary skills (1). Institute of Medicine (IOM) recommended that all of the healthcare professionals should be trained to work as members of an interdisciplinary team (2). Teamwork and effective communication among healthcare professionals are necessary to provide high-quality care and safety for the patients (3). It is reported that performing teamwork training resulted in the improved communication, increased patient and staff satisfaction, and decreased hospital stay and adverse events (4).

Operating room is an area in which teamwork is essential. Coordinated actions and accurate surgical planning need the cooperation among professionals. The optimum performance of the team can recognize surgery errors quickly and avoid stressful situations (5). In a study by Forse et al., teamwork training in operating room staff resulted in the reduction of death from 2.7% to 1%, and surgical complications from 20.2% to 11% (6). In addition, poor communication is one of the main reasons of medical errors in the operating practices (7); therefore, poor communication and cooperation among operating room team members may result in the increased risk of death and complications (8).

The results of a study showed that nursing students needed to improve their communication skills (9). Various efforts are made to acquaint the medical society with teamwork concept and skills as the leading technique to improve the quality of healthcare services among healthcare professionals (10). Training is an important intervention to improve teamwork in clinical settings. The teamwork skills training in healthcare settings basically is a program developed by the agency for healthcare research and quality (AHRQ). This program is called team strategies and tools to enhance performance and patient safety (TeamSTEPPS®). TeamSTEPPS is a complex of knowledge, skills, and attitudes. It includes team structure and 4 skills: communication, leadership, situation monitoring, and mutual support. This program, focusing on team skills, introduces tools and strategies to team members in order to achieve team purposes (11).

Operating room is a unit in which teamwork is essential; therefore, the optimum performance of surgery team can identify surgery errors and avoid stressful situations (5). In addition, review of literature showed that in spite of the significance of teamwork skills training, there are few studies on students working in operating rooms. Hence, according to the importance of teamwork in operating room, the current study aimed at investigating the effect of teamwork skills training on the attitude and knowledge of the operating room and anesthesia nursing students toward teamwork.

2. Methods

2.1. Sample and Sampling Method

The current quasi-experimental study was conducted in Jahrom University of Medical Sciences, Iran, from March to October 2015. All of the eligible anesthesia and operating room nursing students were selected using the census method. Accordingly, a total of 70 students were divided into the 2 groups of control and experimental. Ten participants were excluded due to unwillingness to participate and absence from educational sessions. Finally, there were 30 subjects in each group (45 anesthesia and 15 operating room nursing students).

The students were admitted to a 4-year Bachelor of Science graduate program in anesthesia or operating room nursing. The inclusion criteria were willingness to participate, 3rd and 4th year student in the field of anesthesia or operating room, and lack of participation in similar studies. The exclusion criteria included unwillingness to participate in the study, transitional and guest student, not completing the questionnaire, and not participating in the training workshops.

2.2. Instruments

Data collection instruments were the Persian version of TeamSTEPPS teamwork attitude questionnaire (T-TAQ), teamwork knowledge test, and a part of demographic information including gender, age, marital status, field of study, and mean academic scores.

T-TAQ was developed by Baker et al., and includes 30 items. Scores are given based on a 5-option Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). This tool includes 5 parts of team structure, leadership, communication, situation monitoring, and mutual support each of which with 6 items (12). The content and face validity of the Persian version tool was confirmed (13). To evaluate teamwork knowledge, a test with 30 multiple-choice questions was developed based on the TeamSTEPPS training program and tools. Correct answers are given 1 point and the false answers none. The highest total score is 30 and the lowest 0. The scores ranging 15 and 30 are considered good and the scores ranging 0 and 14 are poor. Content and face validity of this tool were confirmed by 10 teamwork experts. The construct validity of the knowledge test was determined by the Guttman split-half reliability coefficient of 0.75. To ensure reliability of the tools, they were completed by 20 anesthesia and operating room nursing students in a pilot study. The reliability was confirmed by 0.77 Cronbach's alpha coefficients for T-TAQ and the Kuder-Richardson formula 20 (KR20) of 0.682 for the knowledge test. All of the participants completed the questionnaires before and 2 months after the intervention.

2.3. Intervention

Experimental group was divided into 5 groups of 6 persons. All of the experimental groups participated in 2 sessions of 4-hour training workshop conducted through lecture, scenarios and videos, and group discussion. In the 1st session, the important role of teamwork and its impact on patient safety was discussed. Then, history of the TeamSTEPPS and its 5 main key concepts including the team structure and the 4 skills of leadership, situation monitoring, mutual support, and communication were introduced. In the team structure, the components of a multiteam system and the important dimensions of patients and families involvement as the part of the team were explained. In the communication topic, strategies and tools to exchange important patient information between team members in critical situations, ensure the closed loop communication, and ensure patients' safety during shift changes and patient handovers, etc. were presented. In the leadership topic, the significance of the team leader's role and positive leadership strategies to share care plan were

introduced in order to clarify team goals and team members' roles, monitor and modify the plan, review of actions taken at the end to provide feedback, and improve the team effectiveness. In the situation monitoring topic, the important role of actively self-monitoring in safety practices and the behaviors, as well as actions of other individuals in the field, situation, and environment was introduced. In the mutual support topic, the importance of the accurate knowledge about responsibilities and workload of other team members and the ability to predict their needs and support them were emphasized. In this context, strategies of task assistance, feedback, and advocacy and assertion were taught. In the 2nd session, videos about TeamSTEPPS® strategies and tools were played. Then, 3 scenarios were presented and discussed. The control group received no training.

2.4. Data Analysis

Data were analyzed with SPSS version 16. The paired samples t test was used to study score changes in pre- and post-intervention. Furthermore, the independent samples t test and chi-square were used for the intergroup comparisons of quantitative and qualitative variables, respectively. The level of significance was considered 5%.

2.5. Ethical Confirmation

The current study was approved by ethics committee of Shiraz University of Medical Sciences (No. 94-7466) and was registered in the Iranian registry of clinical trials (IRCT) (registration code: IRCT2015030421339N1). All of the participants were given necessary information about the objectives and the method of the study, and they signed the written informed consent. They were assured that unwillingness to cooperate with or withdraw from the study had no negative impacts on their educational assessments.

3. Results

The mean age of the students was 22.26 $\pm$ 0.88 years. The mean age in the control and experimental groups was 22.36 $\pm$ 0.88 and 22.16 $\pm$ 0.87 years, respectively (P = 0.384). The majority of students were female (n = 45, 75%), single (n = 54, 90%), and the anesthesia nursing student (n = 45, 75%). The mean academic scores in the control and experimental groups were 16.70 $\pm$ 1.10 and 17.01 $\pm$ 1.01, respectively (P = 0.260). The 2 groups did not have significant statistical differences in terms of gender, marital status, and the field of study (P > 0.05) (Table 1).

In the beginning of the study, the total mean scores of the groups in teamwork attitudes and knowledge had no significant differences (P > 0.05), but after the intervention, the total mean scores were significantly different between the groups (P < 0.001). The effect size for intergroup post-test differences was calculated for knowledge score (1.63), total attitude score (0.95), communication (1.10), team structure (0.73), situation monitoring (0.74), leadership (1.01), and mutual support (0.15). In addition, there were significant statistical differences in the total score (P < 0.001) and 4 domains of teamwork attitude (P $\leq$ 0.01), before and after the intervention in the experimental group (Table 2).

4. Discussion

The results of the study showed that the mean score of teamwork attitude increased significantly in the experimental group after the intervention, compared with those of before intervention and the control group. Furthermore, these significant differences were observed in the mean scores of attitude domains except for mutual support in which the difference was not significant.

The current study findings showed that training improved the attitude toward teamwork with a large effect size. The current study finding was in accordance with that of the study conducted on the students of nursing and medicine in Atlanta (14). Improvement of teamwork attitude after training was also reported in other studies (15, 16). Unlike these findings, in a study conducted on medical assistants, nurses, and respiratory therapists, no improvement was observed in teamwork attitude (17).

The results of the current study showed that training improved teamwork attitude in 4 domains of communication, leadership, team structure, and situation monitoring with fairly large effect sizes. In addition, communication domain was one of the relatively good domains of teamwork. Its score was the highest compared with those of the other domains after intervention in the experimental group. According to the significant role of communication in promoting patient safety (9), training methods of the current study can be applied to improve students' communicative skills.

These findings were in accordance with the results of a study conducted to determine the effect of a training program through workshops and modules in order to improve teamwork in operating room. Teamwork domains of that study included communication, co-ordination, collaboration, leadership, and situation awareness. Before implementing the program, the performance of people was mediocre in teams, but after the intervention all of the domains improved, especially the communication domain (18). Also, the findings of the current study were in accordance with those of another interventional study con-

Table 1. The Comparison of Demographic Information Between the Control and Experimental Groups[a]

Variable	Category	Total	Control Group	Experimental Group	P Value[b]
Gender	Male	15 (25)	7 (23.3)	8 (26.7)	0.500
	Female	45 (75)	23 (76.7)	22 (73.3)	
Marital status	Single	54 (90)	27 (90)	27 (90)	0.665
	Married	6 (10)	3 (10)	3 (10)	
Field of study	Operating room	15 (25)	6 (20)	9 (30)	0.276
	Anesthesia	45 (75)	24 (80)	21 (70)	

[a]Values are expressed as No. (%).
[b]Chi-square was used.

ducted on nurses and medical assistants of a trauma center. In that study, the trauma teams improved more in 2 domains of TeamSTEPPS as communication and leadership (19).

According to the results of the current study, training improved leadership and situation monitoring. These finding were in accordance with the results of the studies conducted by Amaya-Anas et al., (18) and Capella et al. (19). In the study by Capella et al., the hypothesis of leadership and communication have more impact on teamwork utilization was approved (19). Another study showed the importance of communication and leadership for the improvement of teamwork utilization (20).

In the current study, mutual support was the weakest domain of teamwork attitude before the intervention. However, the mean score of this domain after the intervention in the experimental group did not increase significantly compared with the before intervention and control group. So, training did not have any significant impact on the mutual support domain. According to mutual support, members should help their peers in stressful situations with higher risk of human errors in order to promote the performance of the team (21). On the contrary, educational intervention improved mutual support in the other studies (18, 19, 22). In the present study, the participants were the students with no work experiences in clinical settings. However in the aforementioned studies, the participants were highly experienced. So, the differences in the findings may be due to the clinical experience of the participants (18, 19, 22).

In addition, the results of the study showed that intervention could improve the team structure domain. This domain emphasizes the contribution of patient, as the most important member of healthcare team. It also refers to the significant role of taking feedback from patients and their families in the success of healthcare teams. It also indicates that member should more concentrate on the team objectives than the personal goals (21). In order to improve teamwork utility, the need for patients' prioritization, emphasizing team purposes, and trying to resolve obstacles to team objectives was indicated in the authors' previous study (20).

Based on the findings of the current study, teamwork knowledge of the participants was weak before the intervention, which was significantly improved after the intervention in both groups. In addition, the post-intervention score in the experimental group was significantly higher than the control group with a large effect size. So, the findings showed that training improved teamwork knowledge in the students. Similarly in other studies, training and workshops significantly increased the teamwork knowledge in medical, nursing, and other healthcare-related students (14, 23).

4.1. Limitations of the Study

Since the study sample size was small and some of the students tended select their own groups, randomly allocation of the subjects into the experimental and control groups was impossible. Therefore, such complications restricted the generalizability of the findings of the study. In addition, since the experimental and control groups were from the same classes, workshops were held before the weekend in order to prevent data exchange between the groups.

4.2. Conclusion

The results of the study showed that teamwork skills training improved total score of students' knowledge and attitude toward teamwork. Furthermore, the teamwork attitude domains of team structure, communication, leadership, and situation monitoring were improved in the current study. So, the teamwork skills training is recommended to improve teamwork knowledge and attitude, particularly in communication domain, which had more increase. However, the mutual support domain did not improve significantly. So, according to the significant role of

Table 2. The Inter- and Intragroup Comparison of the Teamwork Attitude and Knowledge Between the Study Groups, Before and After the Intervention

Variables	Pre-Test	Post-Test	P Value[b,d]
Team Structure			
Experimental group (30)	23.43 (2.06)	25.1 (2.66)	< 0.001
Control group (30)	22.73 (2.19)	23.23 (2.47)	0.14
P value[c,d]	0.2	0.01	
Leadership			
Experimental group	25.16 (2.33)	26.86 (2.23)	< 0.001
Control group	24 (4.11)	23.7 (3.82)	0.22
P value[c,d]	0.18	<0.001	
Mutual support			
Experimental group	18.73 (2.06)	18.63 (2.93)	0.8
Control group	17.73 (2.28)	18.2 (2.56)	0.09
P value[c,d]	0.08	0.308	
Communication			
Experimental group	19.7 (2.18)	22.96 (1.97)	< 0.001
Control group	20.8 (2.1)	20.73 (2.08)	0.82
P value[c,d]	0.05	< 0.001	
Situation monitoring			
Experimental group	24.66 (2.15)	25.8 (2.44)	0.016
Control group	23.56 (3.5)	23.57 (3.50)	0.783
P value[c,d]	0.14	0.008	
Total attitude score			
Experimental group	11.83 (7.22)	117.50 (7.01)	< 0.001
Control group	108.83 (7.22)	109.5 (9.6)	0.471
P value[c,d]	0.215	< 0.001	
Teamwork knowledge			
Experimental group	14.5 (3.33)	19.8 (3.44)	< 0.001
Control group	12.7 (3.94)	14.53 (3)	< 0.001
P value[b,d]	0.06	< 0.001	

[a] Values are expressed as mean (SD).
[b] Paired t test was used.
[c] Independent t test was used.
[d] The level of significance is 0.05.

supportive behaviors in operating practices, other initiatives for the improvement of this domain should be investigated. In addition, it is recommended to pay more attention to supportive behaviors in clinical education programs.

Acknowledgments

The paper was extracted from the results of an MSc thesis; the study was financially supported by the Vice chancellor of research at Shiraz University of Medical Sciences, Shiraz, Iran (grant No. 94-7466). The authors acknowledge their gratitude to the officials of Shiraz University of Medical Sciences. They also thank Dr. Najaf Zare from the clinical research development center of Nemazee hospital for cooperation with the study in data analysis and Mr. Mahmood Akhondi for English translation of the manuscript.

References

1. Xyrichis A, Ream E. Teamwork: a concept analysis. *J Adv Nurs*. 2008;**61**(2):232–41. doi: 10.1111/j.1365-2648.2007.04496.x. [PubMed: 18186914].
2. Greiner A, Knebel E. *The core competencies needed for health care professionals. health professions education: A bridge to quality*. 2003. Available from: https://www.ncbi.nlm.nih.gov/books/NBK221519.
3. Manser T. Teamwork and patient safety in dynamic domains of healthcare: a review of the literature. *Acta Anaesthesiol Scand*. 2009;**53**(2):143–51. doi: 10.1111/j.1399-6576.2008.01717.x. [PubMed: 19032571].
4. Epstein NE. Multidisciplinary in-hospital teams improve patient outcomes: A review. *Surg Neurol Int*. 2014;**5**(Suppl 7):S295–303. doi: 10.4103/2152-7806.139612. [PubMed: 25289149].
5. Parker SH, Yule S, Flin R, McKinley A. Surgeons' leadership in the operating room: an observational study. *Am J Surg*. 2012;**204**(3):347–54. doi: 10.1016/j.amjsurg.2011.03.009. [PubMed: 22178486].
6. Armour Forse R, Bramble JD, McQuilan R. Team training can improve operating room performance. *Surgery*. 2011;**150**(4):771–8. doi: 10.1016/j.surg.2011.07.076. [PubMed: 22000190].
7. Ugur E, Kara S, Yildirim S, Akbal E. Medical errors and patient safety in the operating room. *J Pak Med Assoc*. 2016;**66**(5):593–7. [PubMed: 27183943].
8. Mazzocco K, Petitti DB, Fong KT, Bonacum D, Brookey J, Graham S, et al. Surgical team behaviors and patient outcomes. *Am J Surg*. 2009;**197**(5):678–85. doi: 10.1016/j.amjsurg.2008.03.002. [PubMed: 18789425].
9. Shafakhah M, Zarshenas L, Sharif F, Sabet Sarvestani R. Evaluation of nursing students' communication abilities in clinical courses in hospitals. *Glob J Health Sci*. 2015;**7**(4):323–8. doi: 10.5539/gjhs.v7n4p323.
10. Garbee DD, Paige JT, Bonanno LS, Rusnak VV, Barrier KM, Kozmenko LS. Effectiveness of teamwork and communication education using an interprofessional high-fidelity human patient simulation critical care code. *J Nurs Educ Pract*. 2013;**3**(3):1.
11. *Agency for Healthcare Research and Quality (AHRQ). About TeamSTEPPS®*. 2016. Available from: http://www.ahrq.gov/professional/education/curriculum-tools/teamstepps/about-teamstepps/index.html.
12. Baker DP, Amodeo AM, Krokos KJ, Slonim A, Herrera H. Assessing teamwork attitudes in healthcare: development of the TeamSTEPPS teamwork attitudes questionnaire. *Qual Saf Health Care*. 2010;**19**(6). e49. doi: 10.1136/qshc.2009.036129. [PubMed: 20702444].
13. Najafi M, Keshmiri F, Najafi M, Shirazi M. Assessment of validity and reliability of TeamSTEPPS teamwork attitudes questionnaire (T-TAQ) In Iran. *J Payavard Salamat*. 2014;**7**(5):389–98.
14. Robertson B, Kaplan B, Atallah H, Higgins M, Lewitt MJ, Ander DS. The use of simulation and a modified TeamSTEPPS curriculum for medical and nursing student team training. *Simul Healthc*. 2010;**5**(6):332–7. doi: 10.1097/SIH.0b013e3181f008ad. [PubMed: 21330818].
15. Lisbon D, Allin D, Cleek C, Roop L, Brimacombe M, Downes C, et al. Improved Knowledge, Attitudes, and Behaviors After Implementation of TeamSTEPPS Training in an Academic Emergency Department: A Pilot

Report. *Am J Med Qual*. 2016;**31**(1):86–90. doi: 10.1177/1062860614545123. [PubMed: 25143410].
16. McCulloch P, Rathbone J, Catchpole K. Interventions to improve teamwork and communications among healthcare staff. *Br J Surg*. 2011;**98**(4):469–79. doi: 10.1002/bjs.7434. [PubMed: 21305537].
17. DeVita MA, Schaefer J, Lutz J, Wang H, Dongilli T. Improving medical emergency team (MET) performance using a novel curriculum and a computerized human patient simulator. *Qual Saf Health Care*. 2005;**14**(5):326–31. doi: 10.1136/qshc.2004.011148. [PubMed: 16195564].
18. Carolina Amaya-Arias A, Idarraga D, Giraldo V, Gómez LM. Effectiveness of a program for improving teamwork in operanting rooms. *Colombiana J Anaesth*. 2015;**43**(1):68–75.
19. Capella J, Smith S, Philp A, Putnam T, Gilbert C, Fry W, et al. Teamwork training improves the clinical care of trauma patients. *J Surg Educ*. 2010;**67**(6):439–43. doi: 10.1016/j.jsurg.2010.06.006. [PubMed: 21156305].
20. Khademian Z, Sharif F, Tabei SZ, Bolandparvaz S, Abbaszadeh A, Abbasi HR. Teamwork improvement in emergency trauma departments. *Iran J Nurs Midwifery Res*. 2013;**18**(4):333–9. [PubMed: 24403932].
21. Rockville M. *Teamwork Attitudes Questionnaire (T-TAQ). Agency for Healthcare Research and Quality*. 2014. Available from: http://www.ahrq.gov/teamstepps/instructor/reference/teamattitude.html.
22. Bridges R, Sherwood G, Durham C. Measuring the influence of a mutual support educational intervention within a nursing team. *Int J Nurs Sci*. 2014;**1**(1):15–22. doi: 10.1016/j.ijnss.2014.02.013.
23. Cooper H, Spencer-Dawe E, McLean E. Beginning the process of teamwork: design, implementation and evaluation of an inter-professional education intervention for first year undergraduate students. *J Interprof Care*. 2005;**19**(5):492–508. doi: 10.1080/13561820500215160. [PubMed: 16308172].