Original Article

The Effect of Scenario-Based Learning on the Performance of Nurses Regarding Delirium in Cardiac Surgery Intensive Care Units: A Quasi-Experimental Study

Ahmad Jahanbazi[1], Fariba Jokar[2], Narges Kheirollahi[3]

[1]MSc Student in Critical Care Nursing, School of Nursing and Midwifery, Isfahan University of Medical Sciences, Isfahan, Iran, [2]Medical Education Research Centre, Isfahan University of Medical Sciences, Isfahan, Iran, [3]Nursing and Midwifery Care Research Center, School of Nursing and Midwifery, Isfahan University of Medical Sciences, Isfahan, Iran

Abstract

Background: Delirium is one of the most common complications of cardiac surgery, and only a small percentage of nurses are able to diagnose and manage it. The aim of this study was to determine the effect of Scenario-Based Learning (SBL) on the performance of nurses in the management of delirium in Cardiovascular Intensive Care Units (CICUs). **Materials and Methods:** A quasi-experimental research with a pretest-post-test design was conducted on 36 nurses of the cardiac surgery ICUs of Isfahan's therapeutic-educational center from October 2019 to January 2020. The SBL was held in the form of a 2-day workshop. The study data collection tools included a demographic questionnaire, researcher-made knowledge questionnaire, and performance checklist. The data were analysed using descriptive statistics (frequency, mean, and standard deviation), and inferential statistics (repeated measures one-way analysis of variance ANOVA and Fisher's Least Significant Difference (LSD post hoc test). **Results:** The mean score of performance of nurses differed significantly different between the three study stages (before the intervention, immediately, and 3 weeks after the intervention) ($F_{2,30}$ = 139.41; $p < 0.001$). LSD post hoc test showed that the mean score of performance was significantly higher immediately after the training program compared to before the intervention and 3 weeks after the SBL ($p < 0.001$). **Conclusions:** Based on the results of this study, it can be concluded that SBL improved the delirium care performance levels of nurses in the cardiac surgery ICU. Thus, it is recommended that SBL be used as a method for training nurses.

Keywords: *Delirium, intensive care unit, Nurses, simulation training, thoracic surgery*

Introduction

Delirium is defined based on the Diagnostic Statistical Manual of Mental Disorders (DSM-5) criteria as a disturbance in attention accompanied by changes in awareness and cognition occurring acutely and with a fluctuating course and can be divided into two types of hyperactive and hypoactive delirium.[1] Delirium is one of the most prevalent complications of heart surgery, which occurs in the first five days postoperation.[2] Its prevalence after open-heart surgery and in thoracotomy has been reported as 73.5% and 90%, respectively.[1,2] Delirium in these patients has a set of underlying predisposing causes such as old age, diabetes, atrial fibrillation, and serum albumin levels and a number of accelerating factors such as concomitant Coronary Artery Cypass Grafting (CABG), heart valve replacement, low cardiac output, hypothermia, hypoxia, metabolic acidosis, poor pain control, use of blood circulation outside the body, the duration of surgery, and the effect of drugs such as benzodiazepines and inotropes.[3]

Despite the high prevalence of delirium, its prevention and management in patients admitted to different wards of hospitals has been reported to be extremely deficient,[4] and physicians and nurses are only able to diagnose less than 13% of delirium cases.[5] The results of a systematic literature review by Yaghmour and Gholizadeh showed that nurses' knowledge of the diagnosis and management of delirium was generally low.[6] The results of a prospective cohort study in India also showed that delirium was only diagnosed in 12.5% of the cases in Intensive Care Units (ICUs), and this percentage was only 2.4% in cases with hyperactive delirium, which accounts for 55.7% of delirium cases.[7] The incidence

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Address for correspondence:
Mrs. Narges Kheirollahi, Hezar Jerib Street, Isfahan, Iran.
E-mail: n.kheirollahi@nm.mui.ac.ir

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of delirium in patients is usually associated with negative consequences such as prolonged mechanical ventilation, increased hospitalization duration, increased mortality, and cognitive disabilities.[8] As such, it is necessary for physicians and nurses to pay special attention to the prevention and timely diagnosis and management of delirium,[7] and receive the related training in this regard.

The results of studies have indicated that conventional training methods have not been effectively functional in increasing the knowledge and improving the practice of nurses working in ICUs.[9] Therefore, the use of active training methods that can develop critical thinking skills and problem-solving in nurses and increase their practical abilities in meeting the needs of patients seems essential.[10] One of the teaching methods with a philosophy based on inclusive learning is scenario-based learning (SBL). SBL is a structured approach based on critical thinking and problem-solving skills, which describes a situation realistically. This method has a nonlinear structure and can provide countless feedback opportunities for learners based on the decisions made at each stage of the process. SBL has been created based on the principles of situational learning theory.[11]

In this method, through careful evaluation and collection of evidence, the learners can test their hypotheses until a conclusion is reached. This training program enables learners to manage their time and resources, apply their knowledge in patient care, identify new learning needs, and move toward autonomy and self-direction in learning. Therefore, this method has a very positive effect on the thinking and clinical performance of nurses.[12]

Despite the high prevalence of delirium in cardiac surgery ICUs, daily assessment of delirium using well-known tools for the diagnosis of delirium is still not routine care in these departments, and nurses do not know much about the diagnosis and care of patients with delirium. The findings of previous studies support the argument that SBL is an effective and dynamic learning method that is easy to be conducted and will increase nurses' learning skills and abilities and bridge the gap between theory and practice.[12-14] Moreover, this training method has not been used to teach delirium in cardiac surgery ICUs in Iran. Therefore, the present study was conducted with the aim to investigate the effect of SBL on the performance of nurses in the diagnosis and management of delirium in Cardiovascular Intensive Care Units (CICUs).

Materials and Methods

This quasi-experimental study was conducted from October 2019 to January 2020 in Shahid Chamran Hospital in Isfahan, Iran. The study population consisted of all nurses working in the cardiac surgery ICU, and the participants were selected based on the inclusion criteria of having a bachelor's degree or higher, direct clinical work with patients, a minimum of 3 months of experience working in the cardiac surgery ICU,[15] and willingness to participate in the study. Absence from a training session, lack of response to five or more questions in the knowledge questionnaire, and lack of willingness to continue participating in the study were the exclusion criteria. The sample size was determined based on the type of study, similar articles,[16] and consultation with statistics experts.

z_1 has a 95% Confidence Interval (CI) of 1.96, z_2 is 80% of the test power factor of 0.84 and is the minimum difference in the mean score of knowledge and performance of nurses after the intervention compared to before the intervention, which is about 0.25, thus indicating a significant difference. In addition, d must be less than s. Based on the above formula, the sample size at 95% CI and power factor of 80% was determined to be 32 persons. Considering the probable 10% sample loss, 36 nurses were selected as the study participants. Sampling was performed using a simple random method by placing 60 pieces of paper (with the names of ICU nurses who had the inclusion criteria) in a container, and then, removing 36 pieces of paper from the container. As all the nurses working in the ward had the inclusion criteria, 60 people were entered into the lottery, and because there was only one study environment, after selecting 36 nurses as a sample due to the limited number of nurses, a control group was not considered. After completing consent forms, 36 nurses entered the study. During the course of the study, four participants (two because of not answering more than five questions in the knowledge questionnaire, one because of being transferred from the cardiac surgery ICU, and one for not attending the second day of the workshop) were excluded from the study. In general, the responses of 32 participants were analysed.

The data collection tools used included a demographic questionnaire (age, sex, work experience in the cardiac surgery ICU, history of caring for patients with delirium, history of using delirium diagnostic tools, and history of participation in training courses, and source of information on delirium), a researcher-made knowledge questionnaire, and a performance checklist. The 20-question knowledge questionnaire, with true/false answers, was designed based on scientific texts and clinical guidelines and included questions on risk factors for delirium in cardiac surgery patients, delirium diagnostic tools, and nursing interventions in patients with delirium. A score of 1 was given to the correct answer, and a score of 0 was given to the wrong answer. The maximum score was 20, and the minimum was 0. Higher total scores illustrated more knowledge. The performance checklist consisted of 15 items, covering the domains of use of diagnostic tools (5 items), nursing care for patients with delirium (5 items), and appropriate recording of nursing interventions in delirium (5 items). The items were rated on a 3-point scale (never = 0, sometimes = 1, and always = 2). The raw scores obtained from the checklist were converted to standard scores from

0 to 100 based on a formula. Mean scores were calculated for each domain as well as for the whole checklist. Higher scores indicated better performance.

The face validity of the knowledge questionnaire and performance checklist were evaluated by an expert committee including six nursing faculty members, two anaesthesiologists and intensive care physicians, and two certified nurses with the experience working in cardiac surgery ICUs. In the review of the Content Validity Ratio (CVR), the expert committee was asked to categorize each question based on a 3-point Likert scale including the items "necessary," "useful but not necessary," and "not necessary." Then, based on Lawshe′s content validity ratio formula, items with CVR <0.62 were removed.[17] In the next step, the Waltz and Bausell method was used to examine the Index Validity Content (CVI),[18] and the expert committee was asked to rate the relevance, clarity, and simplicity of each item based on a 4-point Likert scale. Finally, items with CVI <0.79 were omitted.

The reliability of the knowledge questionnaire was estimated to be 0.80 using the Kuder–Richardson formulas. In order to determine the reliability of the performance checklist, the interrater reliability method of simultaneous observation of two researchers was used. For this purpose, the performance of 10 nurses, who had the inclusion criteria, was examined by two evaluators simultaneously and in parallel. After completing the checklist and recording the performance score, the correlation coefficient of the two evaluators was calculated (r = 0.93).

Using scientific books and resources,[19,20] eight scenarios were designed each of which included delirium risk factors for patients with open heart surgery, diagnostic tools, preventive measures, and management of delirium. After two revisions, the scenarios were used by the expert committee as teaching material in the study.

The training program was held in the form of a 2-day scenario-based analysis workshop for 6 h per day. On the first day, training on delirium and delirium risk factors in cardiac surgery patientsand video-based case scenarios on hyperactive/hypoactive delirium were presented. On the second day, training were presented on the National Institute for Health and Care Excellence (NICE) recommendations on the assessment and diagnosis of delirium, and two scenarios were analysed by the training team. Then, the nurses were divided into six groups each of which included six subjects, and then, a scenario was given to each group to review and analyse in 30 min. Subsequently, each group presented the results of their scenario analysis to a group of experts [Table 1].

The knowledge of the nurses was evaluated in 3-time intervals (before, immediately after, and 3 weeks after the training program). The questionnaire was distributed among the participants in the conference hall of the hospital and was collected after 20 min at the beginning of the workshop, at the end of the second day of the workshop after the training, and 3 weeks after the intervention. Participants′performance in the ward was evaluated twice in the presence of the researcher (1 week before the intervention and 3 weeks after the intervention). In order to prevent the Hawthorne effect, and in order for the researcher to be accepted as part of the environment, he was regularly present in the ward, in different shifts for 2 months (1 month before the intervention and 1 month after the intervention). Apart from direct questions on patient evaluation based on the Richmond Agitation-Sedation Scale (RASS) and Confusion Assessment Method for the ICU (CAM-ICU), other items on the checklist were evaluated through indirect observation during the shift and studying of the nursing report at the end of shift.

SPSS for Windows (version 16.00; SPSS Inc., Chicago, IL, USA) was used for statistical analysis. Descriptive statistics were presented as numbers (n), percentages (%), and mean (standard deviation). Normality of data distribution was evaluated using the Kolmogorov–Smirnov test. A $p < 0.050$ was accepted as the indicator of statistical significance. The one-way Analysis of Variance (ANOVA) was used to compare mean knowledge and performance scores in the three study stages, and Fisher′s Least Significant Difference (LSD) post-hock test was used to compare two study stages.

Ethical considerations

At the beginning of the study, the objectives of the study were explained to the nurses, and all the participants signed a written informed consent form. The Ethical Committee of Isfahan University of Medical Sciences, Iran, approved this research (IR.MUI.RESEARCH.REC.1398.237). The nurses were assured of the confidentiality of the collected data and were informed of the right to refuse participation in the study or withdraw at any time from the study with no consequences.

Results

Among the study participants, 71.90% were women, and 84.40% had circulating shifts. The mean (SD) age of the participants was 37.47 (7.76) years. In the present study, 81.30% of the nurses were familiar with delirium, and 87.50% of them reported a history of caring for a patient with delirium; but only 18.80% of them had the ability to assess delirium risk factors in patients. Moreover, 25% of them had not received any training on delirium, 40.60% had received delirium-related information from other nurses and physicians in the ward, and only 3.1% had received this information from training workshops [Table 2].

The results of repeated measures ANOVA showed that the mean score of the nurses' knowledge differed significantly between the three stages of the study ($F_{2, 30} = 34.99$; $p < 0.001$). Based on the results of the LSD post-hoc

Table 1: Delirium workshop overview

Core	Section themes	Method of teaching
First day		
What is delirium?	Background to delirium	Lecture
	Prevalence of delirium	Questions and answers
	Symptoms of delirium	
	Types of delirium	
	Delirium vs. dementia	
	Causes of delirium	
	Environmental factors and factors associated with cardiac surgery	
Reflection on practice	Video-based case scenario on hypoactive delirium	Film showing method
	Video-based case scenario on hyperactive delirium	Film analysis
Second day		
Recognition of delirium	NICE* recommendations on assessment and diagnosis of delirium.	Lecture
Recognition of delirium detection tools	RASS**, CAM-ICU***	Questions and answers
Management of delirium	Reviewing the participants lived experience of delirium	Reflective Exercise
	Nursing management of delirium	Lecture
	Prevention of delirium	Questions and answers
Post-workshop reflective exercise	Provision of a scenario example, and then, its analysis with questions and answers	Reflective Exercise
		Lecture
	The participants were divided into six groups of six subjects, and one scenario was given to each group. They were asked to analyse their scenario in 30 min and present it in the workshop.	Questions and answers
		Practical scenario analysis practice
	Summarising the key learning points	

*NICE: The National Institute for Health and Care Excellence **RASS: Richmond Agitation-Sedation Scale; ***CAM-ICU: Confusion Assessment method for the ICU

Table 2: General characteristics of subjects (*n*=32)

Variables	Categories	*n* (%) or Mean (SD)
Age (year)		37.47 (7.76)**
Gender	Male	9 (28.10)*
	Female	23 (71.90)*
Work experience in the hospital (year)		13.47 (7.21)**
Work experience in the cardiac surgery intensive care unit (year)		7.07 (5.46)**
History of caring for patients with delirium (yes)		28 (87.50)*
History of using delirium diagnostic tools (yes)		6 (18.80)*
History of participation in training courses and source of information on delirium	No training	8 (25.00)
	Workshop	1 (3.10)*
	Books or magazines	4 (12.50)*
	University course	4 (12.50)*
	Colleagues	13 (40.60)*
	Internet	2 (6.20)*

n*(%),Mean (SD)

test, the mean scores of knowledge immediately after and 3 weeks after the training program were significantly higher than before the training program ($p < 0.001$). However, the mean score obtained 3 weeks after the implementation of the training program did not differ significantly from that obtained immediately after the training program ($p < 0.050$) [Table 3]. The mean scores of the nurses' performances in four areas and at different times are presented in Table 3. The results of repeated measures ANOVA showed that the mean score of the nurses' performance in all four areas was significantly different between the three study stages ($F_{2, 30} = 139.41$; $p < 0.001$). Based on the results of the LSD post-hoc test, the mean score of the nurses' performance in all three areas was significantly higher 3 weeks after the training program compared to before the training program and immediately after the training program.($p < 0.001$) [Table 4].

Discussion

This study showed that SBL improved nurses' knowledge and performance levels of delirium care in the cardiac surgery ICU. According to the results of the study, most participants had a history of caring for a patient with delirium in the cardiac surgery ICU, and only a small percentage of them had the ability to assess and diagnose delirium risk factors in patients. The results of the study conducted by Park and Chang in Korea showed that 62% of the hospital nurses had cared for 1 to 10 delirium patients

in the past year.[21] The results of the study conducted by Oh in 2017 also showed that 59.3% of nurses had experience in caring for delirium patients, 37% of whom were in cardiac surgery ICUs.[22] The results of both studies are in line with the results of the present study.

With regard to the level of nurses' knowledge about delirium, the mean score of their knowledge before the intervention was 11.17 which is an average score considering the total score is 20. In a study conducted by Monfared *et al*.[23] in 2015, 68.3% of nurses had moderate knowledge about delirium and only 24.6% of them had good knowledge in this area. The study of Park and Chang also showed that the mean score of the nurses' knowledge about delirium was 32.15 (4.36) out of the total number of 47.[21] In the study by Awad in Egypt, the mean knowledge score of nurses working in ICUs was 25.0 (8.6) out of 36.[24] Ribeiro *et al*.[25] also found that there was insufficient knowledge about delirium-related care among the nurses working in cardiac surgery ICUs in the United States.

The implementation of the scenario-based training program in the present study increased the knowledge of nurses significantly. The highest level of increase was observed immediately after the intervention, and despite some reduction after 3 weeks, its level was still high compared to before the intervention. The results of the study by Hsu *et al*.[11] also showed that the implementation of a scenario-based training program for nurses significantly increased their knowledge about myocardial infarction ($p < 0.001$).

In the present study, the mean score of nurses' knowledge 3 weeks after the intervention was lower than immediately after the intervention. It seems that the lack of use of standard tools for delirium assessment by nurses, as a routine care program in cardiac surgery ICUs can reduce the mean score of nurses' knowledge 3 weeks after the intervention. In this regard, Oh reported that the use of a delirium assessment scale in the patient monitoring sheets and repetition of this assessment in each shift has an important role in increasing, consolidating, and maintaining nurses' knowledge of delirium.[22] The mean score of performance in the areas of the assessment of delirium risk factors, diagnostic tools, nursing care, risk factors recording, and nursing interventions significantly increased after the intervention. In this regard, by examining the effect of scenario-based training on the performance of ICU nurses, Rahmani *et al*.[26] reported a significant difference in the performance of the nurses of the intervention group after the intervention compared to before the intervention (p <0.001). The study by Nasef *et al*.[27] showed that the use of scenario-based training increased the knowledge of nurses and improved their performance in the face of challenges. The results of the study by Hsu *et al*.[11] also indicated that scenario-based teaching methods led to the better performance of nurses participating in the intervention group.

Different studies have examined the effectiveness of SBL in different groups. This method has long been used as a learning stimulant in clinical education.[12-14] Given the fact that this teaching method is based on the principles

Table 3: Comparison of nurse's knowledge before and after scenario-based learning (range=0-20) (*n*=32)

Time	Mean (SD)	Repeated measures ANOVA*			LSD *post-hoc* test**	
		F	dF	*p*	Time	*p*
Pretest	11.17 (7.21)	34.99	2, 30	< 0.001	1 , 2***	<0.001
Posttest After the intervention	14.34 (0.78)				1 , 3	<0.001
Posttest 3 weeks after the intervention	14.06 (1.05)				2 , 3	0.240

*One-way Analysis Of Variance. **Fisher's Least Significant Difference (LSD *post- hoc* test). ***Time before the intervention (1), immediately after the intervention (2) and 3 weeks after the intervention (3)

Table 4: Comparison of nurse's performance before and after scenario-based learning (Range=0-100) (*n*=32)

Performance areas	Mean (SD)			Repeated measures ANOVA*			LSD *post-hoc* test**	
	Pretest	Post test After the intervention	Post test 3 weeks after the intervention	*F*	*dF*	*p*	Time	*p*
Mean score of total performance	51.88 (9.97)	85.83 (9.08)	73.33 (11.61)	139.41	2, 30	< 0.001	1, 2***	< 0.001
							1, 3	< 0.001
							2, 3	< 0.001
Use of diagnostic tools	0	78.13 (34.45)	48.44 (26.64)	88.36	2, 30	< 0.001	1, 2	< 0.001
							1, 3	< 0.001
							2, 3	0.002
Nursing care	69.32 (11.94)	90.63 (7.48)	83.52 (9.07)	42.12	2, 30	< 0.001	1, 2	< 0.001
							1, 3	< 0.001
							2, 3	0.002
Suitable recording of nursing interventions	7.81 (18.45)	67.19 (27.27)	42.19 (31.39)	55.53	2, 30	< 0.001	1, 2	< 0.001
							1, 3	< 0.001
							2, 3	0.003

*One-way Analysis Of Variance. **Fisher's Least Significant Difference (LSD post- hoc test). ***Time before the intervention (1), immediately after the intervention (2), and 3 weeks after the intervention (3)

of learning theory and situational learning in adults, it provides us with a learning-based opportunity for dealing with complex issues.

One of the limitations of this study was the use of the direct observation method, which could affect the behavior of nurses. We tried to control this effect to a large extent with the repetition of the observation three times and the presence of the researcher during different work shifts. However, as a limitation, it could affect the results beyond the control of the researcher.

Conclusion

The results of the present study showed that SBL led to the improvement of the knowledge and practice of nurses working in cardiac surgery ICUs regarding delirium. Therefore, the researchers recommend the use of this educational strategy for the improvement of safe nursing care in ICUs.

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Conflicts of interest

Nothing to declare.

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