The impact of critical thinking training using critical thinking cards on clinical decision-making of CCU nurses

Hamideh Jalalpour[1], Simin Jahani[2], Marziyeh Asadizaker[2], Asaad Sharhani[3], Habib Heybar[4]

[1]Student Research Committee, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, [2]Department of Medical and Surgical Nursing, School of Nursing and Midwifery, Nursing Care Research Center in Chronic Disease, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, [3]Department of Epidemiology, School of Public Health, Jundishapour University of Medical Sciences, Ahvaz, [4]Atherosclerosis Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

ABSTRACT

Introduction: Due to the complexity of the situation and rapid changes in patients' clinical status in intensive care units, it is necessary to teach decision-making skills to nurses, alongside critical thinking. The aim of this study was to evaluate critical thinking training by using critical thinking cards on clinical decision-making of nurses in cardiac care units (CCU). **Methods:** In this quasi-experimental study, 74 CCU nurses from the selected hospitals affiliated to Ahvaz and Dezful Universities of Medical Sciences were selected based on the inclusion criteria and were assigned to either the intervention or the control group by using permuted block randomization. The data were entered into SPSS V22 and analyzed. **Results:** There was no statistically significant difference between the demographic characteristics of the two groups ($P < 0.05$). The mean total score of nurses' clinical decision-making before training sessions in the intervention group was calculated to be 141.59 ± 10.76, which was lower compared to a score of 148.56 ± 10.95 in the control group ($P = 0.011$). Therefore, covariance analysis was used to modify the results. The mean total score of nurses' clinical decision-making after the training in the intervention group was calculated as 163.82 ± 8.83, indicating a significant increase compared to a score of 154.50 ± 11.25 in the control group ($P < 0.001$). **Conclusion:** The findings of the present study show that the education of critical thinking by using the critical card tool leads to improved clinical decision-making in CCU nurses.

Keywords: Cardiac care unit, clinical decision-making, critical thinking, training

Introduction

In recent years, clinical environments in nursing have undergone many changes. Many factors such as population aging, increased socio-cultural differences in communities, the

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prevalence of chronic diseases, reduced financial resources, rapid technological changes, emphasis on health improvement and home care, increased need for patient-centered care and evidence-based practice, health environments have made health-care environments more complicated.[1] Nurses, as the largest part of the professional forces at the forefront of service delivery in the health care system, have various and numerous responsibilities[2] and along with the evolving nursing perspective, there is a growing demand for the development of critical thinking skills and clinical decision-making in order to solve problems, provide care to patients and perform the nursing

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procedure.[3] This is of great importance in intensive care units, due to the complexity of the patients' clinical status and rapid changes in it, which require quick decision-making by nurses in a short period of time.[4]

In ICUs, due to the severity of the disease and its dynamic nature, as well as the pressure of time constraints, there is less room for error than there is in other wards.[5] Short-term goals often influence long-term outcomes. Patients' conditions may change within minutes, while the key information, which is continuously delivered to the treatment team, significantly puts them under pressure to make decisions. Taking risks and enduring the pressure caused by doubt complicate decision-making process. Both the afore-mentioned factors seem to depend on age, knowledge, and the type of post-graduate education.[6] However, nursing graduates are not able to think clearly and make independent and appropriate decisions while facing critical situations. This can lead to providing inappropriate care to care seekers and exposes them to life-threatening dangers.[7] It seems that nursing education programs of universities and hospitals have not been effective in improving clinical decision-making skills.[8]

The decision-making style of each individual is considered as a relatively unique feature, and is formed based on personal, environmental and psychological factors.[9] There is a significant relationship between nurses' clinical decision-making and their thinking style, including critical thinking style.[10] Thinking skills are a key prerequisite to decision-making and allow nurses to make appropriate decisions in critical situations.[11] Critical thinking is one of the essential components of the nursing quality care and professional responsibility.[12] According to Marilan, critical thinking in nursing profession is a logical and reasonable way of thinking in regard with some nursing problems (nursing diagnoses) with more than one solution, leading to appropriate decision-making where our beliefs and practices are not aligned. Critical thinking enables nurses to correctly reason and judge about patient-related problems and issues.[13] According to a study by Rostamniya *et al.* people with high critical thinking skills make better clinical decisions, and one of the effective factors on critical thinking ability is training.[14] Based on literature review, several educational approaches can be found to promote critical thinking and clinical decision-making, including problem-based learning with case studies, group discussions, role plays, think-aloud technique.[15,16] and the use of a concept map.[17] However, it is difficult to identify a common, reliable and credible tool for promoting critical thinking. An alternative solution is that each educational program defines critical thinking in its curriculum and develops appropriate teaching approaches and appropriate assessment strategies.[18]

A novel approach in the development of critical thinking is the use of *critical thinking cards*. As an educational activity, critical thinking cards are a combination of various strategies in regard with the improvement of critical thinking and clinical decision-making. Cards contain questions related to a specific clinical subject, and as an innovative active learning strategy,

help the individual make a connection between their academic knowledge and clinical practice. Active learning is a concept based on educational strategies that enables the collection and the storage of information, critical thinking and clinical decision-making. Questioning, coaching, and think-aloud are examples of active learning strategies used to stimulate critical thinking in learners. Critical thinking cards are made up of a combination of these three strategies and make a brief explanation of them.[19]

Questioning not only stimulates and develops critical thinking in an individual, but also facilitates discussion and improves learning among a group. When thought-provoking questions arise, people's participation increases. Active participation is a key aspect that promotes constant growth and helps learner process information at a higher cognitive level.[19,20] Coaching is an important tool for promoting clinical expertise and building trust. It is essential for clinical instructors to teach learners how to think critically and utilize their knowledge in clinical matters. As a result, the learner would be able to analyze complex clinical issues in a supportive environment to achieve professional growth.[21] The think-aloud approach allows the instructor to evaluate how the information is being processed and to provide guidance if needed. Using think-aloud approach in teaching critical thinking is helpful in correcting wrong reasoning and erroneous decision-making. At the beginning of the process, the instructor can teach the learner how a skilled nurse acts in a complex clinical situation and manages it. Later, learners can use this process to show the improvement of their competence in clinical decision-making.[19,22]

According to the literature review, no research has examined the impact of this educational approach on clinical decision-making. Moreover, few studies have used critical thinking cards in nursing education with the aim of assessing the theoretical teaching of anatomy and physiology, the teaching of specialized courses at bedside, and the students' opinion of their own performance. The results of these studies showed that the use of cards as a creative approach and utilizing visual, auditory and active learning styles, in addition to accomplishing social interaction, allows participants to test their knowledge and share their experiences in a peaceful and entertaining environment.[9,23] The purpose of this study is to discuss this active teaching strategy, which is cost-effective and easy to implement, does not require technical resources and clearly helps nurses and students use academic knowledge to solve clinical problems. Therefore, this study is designed to determine the impacts of critical thinking training by using critical thinking cards on the clinical decision-making of CCU nurses in Ahvaz and Dezful, in 2019.

Methods

This is a quasi-experimental, pre-post-test study with a two-group design. The research population consists of all CCU nurses Golestan Hospital, Ahvaz Imam Khomeini Hospital and Dezful Dr. Ganjavian Hospital in 2019. The proposal was approved by

the Ethics Committee of the Research Deputy Ahvaz University of Medical Sciences under the code IR.AJUMS.REC.1398.303, and the necessary permits were obtained. Then the researchers explained the objectives of the research to the participants and ensured them of the confidentiality of data and the optional nature of the research. According to the previous studies,[11] the following equation, the significance level (α) of 0.05, a power of test (1-β) of 0.80 and d = 4.7, the sample size was calculated to be 32 subjects in each group. By taking into account the dropout rate of 15%, 37 subjects were assigned to each group which made up a total sample size of 74 subjects:

$$n = \frac{\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta} \right)^2 \left(s_1^2 - s_2^2 \right)}{\left(d^2 \right)}$$

Seventy-four nurses meeting the inclusion criteria were assigned to the control and intervention groups using permuted block randomization with a block size of 4, after informed consent was obtained from them. The inclusion criteria consisted of working in CCU for at least one year and holding at least a bachelor's degree. The exclusion criteria included not completing the questionnaire and missing more than one session of the training class in the intervention group.

Data collection tools in this study consisted of two parts. The first part of the personal data consisted of age, gender, education, the type of employment, marital status, general working experience as a nurse and working experience in CCU. The second part was Jenkins' Clinical Decision-Making Questionnaire. This questionnaire was developed by Jenkins in 1983 and is the main part of this instrument which is used in pre-test and post-test. Jenkins' questionnaire included 40 items in the 4—subscales including, 1—searching for alternative or options, 2—canvassing of objectives and values, 3—evaluation and reevaluation of consequences, 4—searching for information and unbiased assimilation of new information. Each subscale has 10 items including the behaviors which nurses display while making decisions during care provision. Each item is scored on a 5-point Likert scale (always, often, sometimes, rarely, and never). As a result, each subscale will have a maximum of 50 scores, and the total score will be obtained between 40 and 200. According to Jenkins, people with higher scores have a higher level of clinical decision-making. In order to prevent bias, some items are scored positively and some others, reversely. There are 22 positive and 18 reversed items. The latter 18 items are scored reversely. The questionnaire has been previously used in the studies conducted by Lotfi, Arzani and Beigi[24-26] in Iran and its validity and reliability have been approved. Cronbach's alpha coefficient in the above studies was reported as 0.79, 0.82, and 0.82%, respectively.

Before performing the intervention, initial examinations were done on 5 subjects in order to investigate the method and any possible problems. Based on the results, in a briefing session,

the research method and the objectives were explained to nurses wishing to participate in the study. In the intervention group, training was done using critical thinking cards. Critical thinking cards are designed as a learning activity with a combination of several different strategies related to the aim of improving critical thinking and clinical decision-making. Each set of cards includes questions on a specific clinical cardiovascular topic. The questions are designed to cover the disease process and the treatment of the case in question, and involve the use of questioning, coaching, and think-aloud. Further Socratic questions such as "what if" scenarios and other ways of critical thinking are considered as a crucial part of this method. The educational content of the cards used in this study was obtained through interviews with physicians and nurses working in the CCU and was based on very common cases including anterior and inferior myocardial infarction, atrial fibrillation, heart failure, cardiopulmonary resuscitation and ventricular tachycardia which was developed according to guidelines as well as medical and nursing reference books on cardiovascular diseases. The content was approved by 10 nursing and medical education experts consisting of 5 cardiologists, 3 faculty members and 2 nurses with CCU experience. The topics were presented in six 1.5-hour group sessions on three days. The time and the place of the meetings were determined by the group. Each set of cards contained 13 to 24 questions in regard with the topic. A total of 104 questions were prepared and each question was printed on a card. Each person took a card and answered the question. According to the design of the question, the nurse should explain the process of reaching the correct answer aloud. The nurse was assisted by other experienced nurses. The researcher provided additional explanations whenever necessary, guided the discussion, led it to the next question, and made a conclusion at the end. In the control group, training was not done by the researcher and was continued through the hospital routine and the educational program. The questionnaire was completed by nurses in both groups prior to and one month after training. The analysis and the comparison between the variables were done by SPSS V22 through the statistical tests such as the analysis of covariance (ANCOVA), independent two-sample *t*-test, Mann-Whitney, paired samples *t*-test and Chi-square.

Findings

The participants in this study consisted of 74 CCU nurses. Overall, from the control group, 2 subjects were excluded from the study due to job transfer and 3 due to not completing the questionnaire; from the intervention group, 4 subjects were excluded from the study due to missing the sessions. Finally, 32 subjects were assigned to the control group and 33 to the intervention group.

Based on the findings in Table 1, no statistically significant difference were observed in terms of age ($P = 0.708$), total working experience ($P = 0.818$), working experience in CCU ($P = 0.666$), gender ($P = 0.493$), marital status ($P = 0.598$), level of education ($P = 0.492$), the hospital of employment ($P = 0.905$)

and the type of employment ($P = 0.851$) ($P > 0.05$). The mean and the standard deviation of age ($P = 0.708$), total working experience ($P = 0.818$) and working experience in CCU ($P = 0.666$) are not significantly different in the two groups ($P > 0.05$).

According to the results of Table 2, the mean score of the subscale searching for alternatives or options in clinical decision-making of the nurses under study, prior to the intervention, was significantly lower in the intervention group compared to the control group ($P = 0.029$). ANCOVA test was used to moderate the results. However, after the intervention, the score in the intervention group was higher than that of the control group and statistically significant ($P < 0.001$). The mean score of the subscale searching for information and unbiased assimilation of new information was significantly lower in the intervention group compared to the control group ($P < 0.001$) and ANCOVA test was performed for moderating the results. Although after applying the educational intervention, this value showed no statistically significant difference in the two groups ($P = 0.153$), still its increase rate was higher in the intervention group than in the control group. The mean score of the subscale Canvassing of objectives and values before the educational intervention was lower in the intervention group than in the control group and statistically significant ($P = 0.103$), and ANCOVA was performed to moderate the results. However, this value was significantly higher in the intervention group compared to the control group ($P = 0.014$). The mean score of the subscale evaluation and reevaluation of consequences was not significantly different in the two groups prior to training ($P = 0.607$), while it was significantly higher in the intervention group compared to the control group ($P = 0.002$) after the training.

According to Table 3, the mean score of the overall clinical decision-making process among the subjects was significantly lower in the intervention group compared to the control group prior to the educational intervention ($P = 0.011$). Therefore, ANCOVA was used to moderate the confounding variable. However, after training, this value was higher in the intervention group compared to the control group ($P < 0.001$). Based on the paired sample *t*-test, there was a significant increase in the mean score of the overall clinical decision-making process in both the control group ($P < 0.001$) and the intervention group ($P < 0.001$).

Discussion

The aim of the current study is to investigate the impact of critical thinking training using cards on CCU nurses' clinical decision-making. The results of this study after moderating the

Table 1: A comparison of demographic data between the control and intervention groups

Characteristics	Control group (n=32) n (%)	Intervention group (n=33) n (%)	P
Gender			
female	32 (100)	31 (93.3)	0.492
Male	0 (0)	2 (6/1)	
Marital status			
Single	9 (28.2)	12 (36.4)	0.598
Married	23 (71.9)	21 (36.4)	
Education			
BSc	30 (93.7)	33 (100)	0.492
MSc	2 (6/3)	0 (0)	
Hospital			
Ganjavian	15 (46.9)	13 (39.4)	0.905
Imam Khomeini	9 (28.1)	10 (30.3)	
Golestan	8 (25)	10 (30.3)	
Employment			
Permanent	15 (46.9)	13 (39.4)	0.851
Contractual	8 (25)	9 (27.3)	
Arbitrary	8 (25)	8 (24.2)	
Intern	1 (3.1)	3 (9.1)	
	Mean±SD	Mean±SD	
Age	36.3 (6.96)	35.61 (8.05)	0.708
work experience	12.27 (5.87)	11.91 (6.88)	0.818
work experience in ccu	7.21 (5.26)	6.64 (5.53)	0.666

Table 2: A comparison of nursing clinical decision-making subscales between the intervention and control groups

Subscales	Before the intervention Mean±SD	After the intervention Mean±SD	P**	P*
Searching for alternatives or options				
Control group	38.75±3.42	40.31±3.17	0.007	<0.001
Intervention group	37.13±2.83	43.55±2.46	<0.001	
P***	0.029	<0.001		
Searching for information and unbiased assimilation of new information				
Control group	38.22±3.60	39.37±4.00	0.039	<0.001
Intervention group	35.03±3.35	40.67±3.17	<0.001	
P***	<0.001	0.153		
Canvassing of objectives and values				
Control group	36.44±4.43	37.69±4.09	0.032	<0.001
Intervention group	34.76±3.72	40.00±3.28	<0.001	
P***	0.103	0.014		
Evaluation and reevaluation of consequences				
Control group	35.16±3.67	37.12±3.23	<0.001	_
Intervention group	34.67±3.94	39.61±2.94	<0.001	
P***	0.607	0.002		

P* Analyze of covariance (ANCOVA). P** paired sample *t* test. P*** Independent sample *t* test

Table 3: A comparison of the total score of nurses' clinical decisions in the two groups of intervention and control				
Total score of nurses' clinical decisions	Before the intervention Mean±SD	After the intervention Mean±SD	P**	P*
Control group	148.56±10.95	154.50±11.25		
Intervention group	141.59±10.76	163.82±8.83	<0.001	<0.001
P***	<0.011	<0.001	<0.001	

P* Analyze of covariance (ANCOVA). P** Paired sample *t* test. P*** Independent sample *t* test.

initial differences showed that the mean score of the subscales searching for alternatives or options, canvassing of objectives and values, evaluation and reevaluation of consequences and the total score of clinical decision-making was significantly different in the intervention and control groups. Only in the subscale searching for information and unbiased assimilation of new information, no statistically significant difference was observed between the two groups, although the increase in the score was much higher in the intervention group compared to the control group. The results indicate that critical thinking training using cards will influence nurses' clinical decision-making.

According to the literature review, the impact of different types of educational approaches on nurses' clinical decision-making, including mannequin or computer simulation, role playing, holding training workshops and concept maps. Most of the studies have acknowledged the positive impact of a variety of active teaching approaches on clinical decision-making. The study of Jodat *et al.* (2014), which examined the concept map on critical thinking and clinical decision-making of NICU nurses, showed that this method can lead to the development of clinical decision-making and critical thinking skills in nurses.[27] Furthermore, the study by Khalafi (2014)[28] and AL-Dossary (2016)[29] in both general and emergency wards showed similar results in regard with the clinical decision-making of the students and the nurses under study. The studies that used other approaches such as case studies[26] and in-service training[29] also show an improvement in clinical decision-making skills.

On the contrary, studies examining the impact of passive teaching approaches on clinical decision-making, including the use of digital software and short written assignments in the clinical environment, and evidence-based exercises, indicate that the use of these approaches causes no significant difference in the scores of subscales or the mean total score of clinical decision-making in the intervention and control groups.[30-32] According to the results of these studies, over the course of time, the students' use of such software increased. They believed that they could always find the necessary answers in these types of software and did not question them and looked for no other sources of information. However, in critical thinking training approaches, questioning the provided information makes one seek new sources of information and promote decision-making through transferring, applying and assessing one's knowledge.

In line with the current study, the study by Moghaddam *et al.* (2016) compared the impact of training applying Ottawa decision support framework on the clinical decision-making

of ICU nurses, using the interactive workshop with and without standardized patients. The results showed that learning thinking and decision-making skills can have a positive effect on nurses' clinical decision-making.[4] Moreover, the studies by Zare and Nahravanian,[33] Helsdingen,[34] Kashaninia *et al.*[35] showed that due to requiring a deeper level of interaction and understanding, critical thinking training leads to high-level thinking. For instance, by integrating critical thinking training into a learning environment, the learner needs to focus on superficial observations, as well as basic structures and situational causes, to identify more cause-and-effect relationships and provide better reasoning, eventually achieving a deeper understanding of information. As the results of the study by Ludin showed, a strong and positive relationship exists between critical thinking and the clinical decision-making of ICU nurses.[36] Providing training using critical thinking cards also allows students to identify and evaluate patients' responses, detect patterns and make alternative decisions based on the collected data, by participating in group discussions, considering various aspects of the problem, sharing information processing procedure, guiding the instructor and using theoretical knowledge in the clinical setting. Finally, it should be noted that teaching critical thinking by using cards helps nurses make a critical analysis of their own performance, thus adapting their thoughts and actions to various complex situations. As a result, this can be an effective way to develop the overall clinical decision-making process of CCU nurses.

Since the results of the present study are based on the questionnaire and the nurses' self-report and regarding the limited behaviors exhibited in the questionnaire, the answers are based on the nurses' perception and the specific circumstances under which they completed the questionnaire, rather than their actual performance in the clinical environment, which can affect the accuracy of the results. On the other hand, there were study limitations due to the time limit for the implementation of intervention, the high workload of staff and the impossibility of attending more sessions.

Conclusion

The results of the study showed that the use of critical thinking cards can develop clinical decision-making skills in CCU nurses. Therefore, nursing teachers and managers are recommended to apply this educational approach, as a student-centered, innovative and active strategy, with the aim of improving clinical decision-making in ICU nurses and nursing students. It is also suggested to conduct this study with a larger sample size on other wards, especially critical wards such as ER.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflicts of interest

There are no conflicts of interest.

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