



Development and Evaluation of Care Programs for the Delirium Management in Patients after Coronary Artery Bypass Graft Surgery (CABG)

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ABSTRACT

Delirium is one of the common problems of cognitive impairment after coronary artery bypass graft surgery (CABG) that its prevention, timely detection, and treatment require a care and management program to be controlled. The present research has studied a care program for the management of delirium in patients after coronary artery bypass graft surgery. This research was performed by action research methodology during a five-stage cycle in two groups of 50 persons (without interference and with intervention). In both groups, the patients were evaluated every 8 hours by CAM-ICU tool in hours (6, 14 and 22) for the occurrence of delirium after surgery until they were in Intensive Care Unit (ICU). In the intervention group, the developed program was implemented in three areas of delirium management before, during, and after the surgery. Then, the collected information was analyzed in two groups using descriptive and analytical statistics in SPSS 20 software. Delirium was observed at least once in 68% of patients without the intervention and 38% of patients with intervention after surgery. The ratio of delirium incidence was significantly lower in the intervention group ($P < 0.05$). In addition, the total number of delirium in ICU was significantly lower for patients in the intervention group ($P < 0.05$). The developed program for reducing the incidence of delirium in hospitalized patients after coronary artery bypass graft surgery (CABG) was confirmed. This means that its applying will lead to a reduction in delirium.

Keywords: program development, delirium management, Coronary Artery Bypass Surgery.

INTRODUCTION

Despite improving the global living standards, now a lot of people have coronary artery disease. Coronary artery bypass graft is known as a relief for pectoral angina and reducing mortality due to coronary artery disease. Advances in coronary artery bypass graft surgery (CABG) have improved the patients' results. However, delirium is a frequent complication after surgery, which is still happening [1]. According to DSM-TV-TR, delirium is a kind of "consciousness disturbance and cognitive changes that occur within a short time". Delirium is characterized by the destruction of consciousness that usually occurs with total destruction cognitive functions. Abnormalities in the mood, perception, and behavior are its common psychological symptoms and vibration, flutter movements, nystagmus, ataxia and urinary incontinence are common neurological symptoms [2]. The reported incidence of delirium after coronary artery bypass grafting (CABG) is varied from 10.5 to 50.6% [3,4]. This extensive reported amount depends on the difference in the number and characteristics of the study population, study design and methods, delirium assessment, differences in the preoperative heart function and management [5,6]. Delirium starts

in the first and second days after CABG and lasts one or two days and sometimes up to 4 days [7]. Delirium has a significant impact on health care. This complication is associated with a 15-day increase in duration of hospitalization [8], the financial impact from \$ 4 billion to \$ 16 billion per year [9], 20 to 30 percent increase in mortality [10]. Ouimet et al. stated that respiratory failure and the need for reform the sternum after open-heart surgery is higher in patients with delirium [11]. More than 40% of postoperative deaths are attributed to postoperative delirium [12].

Patients who experience delirium in the hospital are more likely to be sent to a nursing home after discharge because of an inability to perform everyday tasks [13] and it is less likely to acquire their full ability to carry out their tasks [14]. Risk Factors causing postoperative delirium include older age [2,7,16], high Euro SCORE and AF cardiac rhythm [1], comorbidities [7], taking preoperative narcotics and benzodiazepines, disorders of water and electrolytes [16,17], Hypoxia [1,18], cardiopulmonary bypass more than 120 minutes, aortic cross-clamping more than 75 minutes, temperature drop in body during pumping [18], postoperative pain [17] and surgical stress [17, 20], poor quality of sleep [17, 19], blood transfusion with large amount [7, 21]. Milisen et al. in Belgium discovered the nurse's role in prevention, diagnosis, and management of delirium [22]. Medicinal and non-medicinal methods are used to manage delirium. Haloperidol was studied for the prevention and treatment of patients in Intensive Care Unit (ICU), but the results were not inconclusive [23]. One of the effective non-pharmaceutical interventions in delirium can be mobility [24, 25], reorientation [26, 27], training nurses [26, 28], and music therapy [28, 29]. Some researchers have recommended multifactorial interventions [30, 31]. The ideal protocol is not yet formulated. A starting point will be identified for the known risk factors for delirium and targeting interventions to patients who will have these risk factors [23]. Given that many of the protocols used in the studies can be easily included in daily nursing for any patient, regardless of risk factors for delirium. This study was conducted in the form of an action research study as a team (surgeon, anesthesiologist, nurses) with the aim of formulating and evaluating care program for the management of delirium after coronary artery bypass graft surgery (CABG).

MATERIALS AND METHODS

This study was performed in an action research form during 6 months on 100 patients who underwent elective CABG hospital of Shahid Chamran, Isfahan (linked to Isfahan University of Medical Sciences). In this research, sampling was done purposeful and it continued until saturation when no variable was found to control the delirium. The inclusion criteria can be elective CABG surgery, lack of blindness and deafness, no history of mental illness, CVA and kidney failure for the ages more than 18 years and speaking and understanding the Persian language. The exclusion criteria included the lack of patient's unwillingness to cooperate, returning to the surgery room, having a pump balloon, and dying. In this study, Richmond Agitation- Sedation Scale (RASS) was used to determine the excitability and CAM-ICU tool was used to determine the state of delirium. Richmond Agitation- Sedation Scale is a 10-point continuum from -5 to +4 with three levels, in which 5 negative scores are dedicated to assess the level of sedation, zero for normal levels and 4 positive scores are dedicated to assess the agitation. The validity of Richmond Agitation- Sedation Scale was reported by Ely et al (32) to assess the level of agitation and restlessness. Its reliability was reported by Elie in a study of 96 patients with measurements by different people, such as nurses, doctors specializing in ICU and neurologist at 95% confidence level. The Cronbach's alpha from 0.79 to 0.91.

CAM-ICU tool has four main items: 1. Acute change in mental status, 2. Inattention, 3. Thought disorder, 4. Change the level of consciousness. Delirium becomes positive with this tool when Criterion 1 to be associated with Criterion 2, 3, or 4. In the study of Wei et al. [33], the sensitivity of the CAM-ICU was 94% and its specificity was 89%. This questionnaire has been translated into 10 languages and it has been prepared for sectors such as ICU and emergency care. In this study, the informed written consent was obtained from patients after obtaining permission from research deputy of the Islamic Azad University of Isfahan (Khorasgan) and Research Deputy and Ethics Committee of the University of Medical Sciences (Isfahan) and coordination with the Research Council of Shahid Chamran hospital, Isfahan. Demographic and disease information was collected before, during, and after surgery using a questionnaire. In this research, in a 5-step cycle was conducted (Figure1).

The first step: Identifying the problem

At this stage, 58 patients were enrolled to explain the nature of delirium. Before surgery, patients were evaluated in terms of delirium using two instruments RASS and CAM-ICU. During the surgery, one person was excluded due to connecting to pump balloon device and two persons were excluded due to repairing the mitral. Four persons were excluded in ICU because of bleeding or tamponade and one person was excluded for connecting to a pump balloon.

The remaining 50 persons were evaluated after surgery for the occurrence of delirium in the Intensive Care Unit (ICU) every 8 hours [6, 14 and 22] using the CAM-ICU. At this point, explanation of delirium was established.

Second and third stages: Planning and developing a program

At this stage, a team was formed composed of surgeons, anesthetists, nurses, and the information about delirium, its risk factors, diagnosis, prevention, management, and treatment were collected and discussed. Group orientation, documentation (books and articles), and the Delphi technique were used to collect data. During the investigation, sessions were held based on needs and finally delirium risk factors and effective medical and non-medical treatment were detected. After corrective feedback based on collected data, the care program for the management of postoperative delirium was developed and early detection and prevention were considered as the first logical step in the program. Delirium management program was written in three areas before surgery, during surgery, and after surgery. Preoperative management was related to communicate effectively with patients, identifying risk factors that cause delirium, eliminating or controlling it, training staff and patient. Intraoperative management is related to identifying the risk factors, and trying to control that effort to stabilize hemodynamics and trying not to waste time, especially CBP and using arter line. Identifying risk factors, optimizing the environment, orientation, effective communication, psychological support, physical stability, physical activity, safety, medical support, sleep and sensory function were done in postoperative management.

The fourth and fifth stages: Implementation and evaluation of the developed program

At this stage, 54 patients were enrolled in the study who were examined before surgery by RASS and CAM-ICU and the care program was implemented. During the research process, one patient was excluded due to balloon pump connection and patient was excluded due to dying. Two patients were excluded due to remobilization to the operating room in the Intensive Care Unit (ICU). Finally, the incidence of delirium in these 50 patients who came to Intensive Care Unit (ICU) was evaluated with CAM-ICU tool every 8 hours [6, 14, 22]. At this stage, the current operation of patients was reviewed according to their condition to identify the changing required aspects. Thus, mitigation and monitoring of the program were done until achieving a satisfactory result. Interviews with personnel, observing patients enrolled in the section, and recorded reviews in reports represent the successful implementation of the program. Finally, the information of 100 patients was compared and analyzed in two groups with and without interference using descriptive and inferential statistics in SPSS software for final evaluation.

RESULTS

60% of patients without the intervention and 56% of patients with the intervention were men. In terms of age, the majority of research units was 44% in the group without intervention and 48% in the group with intervention for the range of 60-69 years old. The mean age of patients in the group without intervention was 62.5 ± 9.08 . This value for the group with the intervention was 62.34 ± 7.54 . The average of BMI in the group without intervention was 27.10 ± 3.25 . This value for the group with the intervention was 27.19 ± 3.15 . The most common underlying disease in subjects was diabetic so that 48% of patients in the group without intervention and 44% of patients in the group with intervention had diabetes. Chi-square tests, t-test, and Fisher's exact test showed that the subjects in both groups with and without interference are homogeneous in terms of gender, age, marital status, place of residence, education, occupation, body mass index, diabetes, pressure blood, thyroid, smoking, and drug and alcohol addiction (Tables 1 and 2).

According to the chi-square test, the incidence ratio of delirium in the group without intervention was significantly higher than the group with intervention. Table (3) delirium was observed at least once in 68% of patients without the intervention and 38% of patients with the intervention after surgery. Mann-Whitney test result shows that the total number of delirium in the duration of ICU was significantly lower in the group with the intervention ($P < 0.05$).

62% of patients in the group with the intervention have not experienced delirium and 48% patients in the group without the intervention had delirium every 8 hours for 1 to 3 times (Table 4).

DISCUSSION

The results showed that the developed care program could reduce the incidence of delirium by 30%. If the incidence of delirium in the group with and without intervention were respectively 38% and 68%, Chi-square test showed that the incidence of delirium was significantly higher in patients without intervention. In Zolfaghari *et al.* (30) study

who applied a multi-factor intervention based on nursing performance in open heart surgery patients, it was concluded that the incidence of delirium in the control and test group was respectively 35.6 and 11.1% and incidence of delirium was reduced by about 25% ($P < 0.001$).

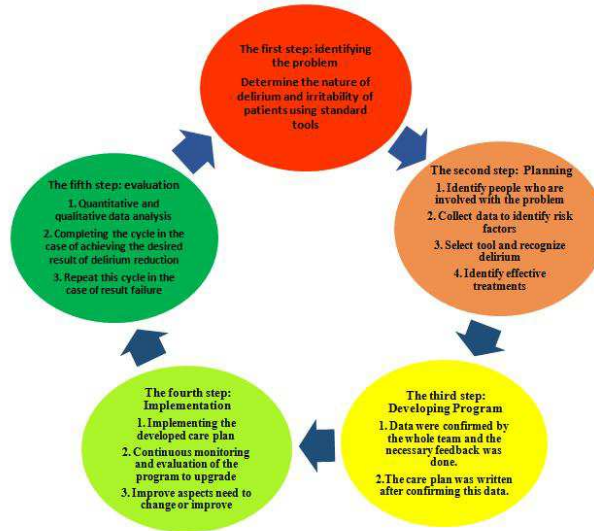


Figure 1: Schematic diagram of the study process of action research methodology

Table 1. Absolute and relative frequency distribution in both groups of subjects according to individual characteristics

Variable	Category	Without intervention		With intervention		Test statistics	Degrees of freedom	Significance level
		Number	Percentage	Number	Percentage			
Gender	Female	20	40.0	22	44.0	$\chi^2=.164$	1	.685
	Male	30	60.0	28	56.0			
Age	40-49 years	6	12.0	4	8.0	$t=.096$	98	.924
	50-59 years	11	22.0	14	28.0			
	60-69 years	22	44.0	24	48.0			
	70-80 years	11	22.0	8	16.0			
Marital status	Single	0	0.0	2	4.0	----	----	.495
	Married	50	100.0	48	96.0			
Residence address	City	24	48.0	28	56.0	$\chi^2=.841$	2	.657
	country	17	34.0	13	26.0			
	Village	9	18.0	9	18.0			
Educational level	Illiterate	22	44.0	19	38.0	$\chi^2=.445$	2	.800
	Under Diploma	19	38.0	20	40.0			
	Diploma	9	18.0	11	22.0			
Occupation	Employed	14	28.0	13	26.0	$\chi^2=.180$	2	.914
	Retired	16	32.0	18	36.0			
	Unemployed	20	40.0	19	38.0			
BMI	Underweight (BMI<20)	1	2.0	2	4.0	$t=.127$	98	.899
	Normal (20<BMI<25)	12	24.0	10	20.0			
	Overweight (25<BMI<30)	26	52.0	29	58.0			
	(BMI>30) fat	11	22.0	9	18.0			

Ryan et al [23] conducted that the most common useful interventions were mobility, reorientation, training nurses, and music therapy. This study was associated with the average of 24.7% reduction (range 9.7% to 31.8%) in the incidence of delirium. Both of these studies were consistent with this study. Marcantonio et al. [34] caused 18% reduction in the incidence of delirium by multidisciplinary interventions in the orthopedic ward. With the standard protocol, which was implemented for 6 risk factors by Inouye et al. (35) in the internal ward patients, the amount of delirium in the control and test group was respectively, 15 and 9.9%. Caplan and Harper [36] reduced the incidence of delirium as much as 31.8% by the multi-sector protocol. In the study of Day et al. [37], which was done in an

action research methodology during a three-stage cycle of looking, thinking, and acting. It was found that after 9 months, delirium alerting protocol had prevented a part of hyperactive delirium and it showed a lower incidence of delirium in progress at the other patients in Intensive Care Unit (ICU). Colombo et al. [27] reduced the incidence of delirium as much as 13.5% by reorientation, giving information to patients, music, and noise reduction. Training nurses in Milisin et al. [22] did not create any difference in the incidence of delirium. In the study of Nazari Astaneh et al. [31] who have applied six risks factors of cognitive impairment, visual impairment, hearing impairment, dehydration and sedentary and sleep deprivation were used in open heart surgery patients, there was no significant reduction in the incidence of delirium compared with the control group ($P < 0.144$).

Table 2. Absolute and relative frequency distribution of research units according to the comorbidities records in two groups

*Fisher's exact test**

Variable	Category	Without intervention		With intervention		Test statistics	Degrees of freedom	Significance level
		Number	Percentage	Number	Percentage			
Diabetes	Does not have	26	52.0	28	56.0	$\chi^2=.161$	1	.688
	have	24	48.0	22	44.0			
Blood pressure	Does not have	28	56.0	29	58.0	$\chi^2=.041$	1	.840
	have	22	44.0	21	42.0			
Thyroid Disorders	Does not have	43	86.0	44	88.0	$\chi^2=.088$	1	.766
	have	7	14.0	6	12.0			
Obesity	Does not have	49	98.0	50	100.0	----	----	1.000*
	have	1	2.0	0	0.0			
History of smoking	Does not have	31	62.0	35	70.0	$\chi^2=.713$	1	.398
	have	19	38.0	15	30.0			
History of drug addiction	Does not have	35	70.0	36	72.0	$\chi^2=.049$	1	.826
	have	15	30.0	14	28.0			
History of alcoholism	Does not have	47	94.0	49	98.0	----	----	.617*
	have	3	6.0	1	2.0			

Table 3. Absolute and relative frequency distribution of research units based on the incidence of delirium after surgery in both groups

Significance level	Degrees of freedom	Statistics	With intervention		Without intervention		Incidence of delirium
			Percentage	Number	Percentage	Number	
.001	1	9.033	62.0	31	32.0	16	Does not have
			38.0	19	68.0	34	have
			100.0	50	100.0	50	Total

Table 4. Absolute and relative frequency distribution of research units based on the number of incidence of delirium after surgery in both groups

Significance level	Statistics	With intervention		Without intervention		Number of delirium during hospitalization In ICU
		Percentage	Number	Percentage	Number	
.008	923.00	62.0	31	32.0	16	zero
		24.0	12	48.0	24	1-3 times
		10.0	5	16.0	8	4-7 times
		4.0	2	4.0	2	8 times and more
		100.0	50	100.0	50	Total

CONCLUSION

Since coordination of several medical teams is needed to for the diagnosis and treatment of patients with delirium [30], this study was conducted in an action research method in the form of interdisciplinary teams. With views of the entire team and by using the known risk factors and useful interventions carried out in other delirium protocols, a program was developed, which was successful to reduce delirium (30%). The implementation of such programs for logical and useful management of delirium and its implementation in other medical centers to reduce delirium are recommended.

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