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The Effects of the G5 Educational Program on Treatment Adherence After Coronary Artery Bypass Graft Surgery

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Abstract

Background: Patients undergoing coronary artery bypass graft (CABG) surgery have moderate to poor treatment adherence. These patients should benefit from simple, feedback-centered educational methods that produce deep and sustainable learning to improve their treatment adherence.

Objectives: The present study was conducted to examine the effect of the G5 training program on treatment adherence in patients undergoing CABG.

Methods: A quasi-experimental, pretest-posttest study was conducted on patients undergoing CABG visiting Rouhani Hospital, cardiology clinics, and cardiology physicians' offices in Babol, Iran. The participants were selected by convenience sampling, and those who met the study inclusion criteria were randomly assigned to an intervention (n = 37) or a control group (n = 37). Patients in the intervention group received a G5 training program (i.e., bags containing flashcards with questions and answers on lifestyle after surgery) and a 30-minute face-to-face, daily training session. The control group received 30 minutes of daily self-care instruction from a cardiac surgery nurse. A demographic and clinical data checklist and Modanloo's Adherence to Treatment Questionnaire (MATQ) were used to collect data before, one month, and two months after the intervention.

Results: Most participants in the intervention and control groups were male (64.9% and 56.8%, respectively). The mean baseline treatment adherence score was 119.59 ± 7.82 in the intervention group, which changed to 152.62 ± 8.44 and 151.43 ± 8.65 one and two months after the intervention, respectively ($P < 0.001$). The mean baseline treatment adherence score was 120.35 ± 8.76 in the control group, which did not change significantly during the study (117.67 ± 6.28 and 116.97 ± 6.67 one and two months after the intervention, respectively). Repeated-measures analysis showed that the intervention significantly increased the mean treatment adherence score in the intervention group over time ($P = 0.001$). Female patients, patients with academic education, and urban patients scored higher on the query about the treatment, commitment to treatment, and sticking to treatment subscales, respectively.

Conclusions: Education using the G5 method effectively improved treatment adherence of patients undergoing CABG. Nurses are suggested to follow up with patients, check their treatment adherence, and implement simple and low-cost educational methods, such as the G5 method, to improve patients' adherence to treatment.

Keywords: Education, Program, Model, Treatment Adherence, Coronary Artery Bypass, Graft, Patients

1. Background

Cardiovascular diseases (CVDs) are the leading cause of death worldwide (1). Approximately 80% of CVD-related deaths occur in low- and middle-income countries (2). With a prevalence of 39%, CVDs accounted for 46% of all deaths in Iran in 2015 (3). Coronary artery disease (CAD) is the most common cardiovascular disease. This disease is primarily characterized by the narrowing of the coronary arteries due to atherosclerotic lesions (4). Although there are many ways to treat CAD, CABG is the most common treatment (5). In Iran, over 60,000 open-heart surgeries are performed yearly (6).

Patients undergoing CABG may experience many physical, psychological, and social problems (7). Preventive and therapeutic measures such as physical activity, adherence to an appropriate diet, and long-term

medication are necessary to prevent these side effects. This is only possible through treatment adherence and the patient's active participation in the treatment plan. Treatment adherence is a process that begins with awareness of the disease and results in staying on treatment (8). Increasing treatment adherence and following health care professionals' recommendations are the primary goals of treatment programs. However, evidence shows that only 60% of patients complete their drug treatment (9). In a clinical trial conducted in Hamadan, Iran, patients undergoing CABG were found to have poor treatment adherence, which was 62.53% and 41.66% in the intervention and control groups, respectively (10).

Various educational strategies have been employed to improve patients' lifestyles and treatment adherence. A study reported that a lifestyle modification program could effectively improve dietary adherence in patients with hypertension (11). In another study, Sanaei et al. found that an educational program could improve the diet and quality of life in patients undergoing CABG surgery (12). Chan et al. also found that a combination of simple and understandable education and hands-on training could effectively improve patient adherence (13). However, a study showed that need-based education for intensive care unit patients could improve patients' knowledge but failed to affect dietary adherence significantly (14).

The literature suggests that most training methods have short-term effects that diminish over time, but simple and engaging game-based training programs can have more lasting effects. G5 is a simple and powerful method for learning and memorizing content using flashcards. The G5 training bags contain flashcards with questions and answers on lifestyle after surgery (i.e., activities, diet, medications, stress management, and so on). Using flashcards and squire signing takes place without effort but not incidentally. It has been designed with a very simple repetition algorithm according to the Ebinghauses hypothesis: (1) Better memory representation (e.g., with mnemonic techniques); and (2) repetition based on active recall (esp. spaced repetition). This method uses Ebbinghaus' forgetting curve, Skinner's immediate reward, Guthrie's all-or-none law, and repetition and association to enter the material into long-term memory (15).

Many studies have focused on the recognition and instruction of lifestyle learning strategies in general. There are, however, a few studies on mnemonic devices. Most of the results on mnemonic devices consistently indicated that using mnemonic devices substantially enhances higher retention levels in immediate and delayed recall of lifestyle learning strategies compared with other learning strategies. Although there have been studies on the effects of various educational methods on patient adherence, no studies have examined the effect of G5 on treatment adherence.

2. Objectives

The present study was conducted to determine the effect of G5 on treatment adherence in patients undergoing CABG.

3. Methods

3.1. Study Design and Participants

This quasi-experimental, pretest-posttest study was conducted from August 2022 to April 2023. Participants included patients undergoing CABG visiting Rouhani Hospital, cardiology clinics, and cardiology physicians' offices in Babol, Iran. The sample size was calculated based on a pilot study and using the following formula: $N = (Z\ 1\text{-}\alpha/2 + Z\ 1\text{-}\beta)^2\ (\delta 1^2 + \delta^2)/(\mu 1\text{-}\mu 2)^2$. Accordingly, with a type I error of 0.05, a power of 0.80, a $\mu 1$ of 120.49 ± 5.78, a $\mu 2$ of 119.34 ± 7.68, an S1 of 2.36, and S2 of 3.31, the sample size was calculated as 34 per group. However, considering the possibility of a dropout of 10%, we recruited 37 patients in each group.

Inclusion criteria included undergoing CABG in the past 6 months, no known auditory, visual, speech, cognitive, mental, or motor disorders based on the medical record, access to a telephone, and the ability to read and write Persian. Exclusion criteria were the patient's death or decision to withdraw from the study. Convenience sampling was conducted to enroll eligible patients in the study. After listing eligible patients and creating a sampling frame, patients were randomly assigned to either the intervention or the control group. To this end, participants with even and odd numbers were manually allocated to the control and intervention groups, respectively. The intervention group received the G5 training program, and the control group received routine training.

3.1. Instruments

A two-part instrument was used to collect data. The first part included a demographic and clinical data form with questions on age, sex, marital status, job, financial status, education level, place of residence, history of chronic diseases, length of hospital stay, and ejection fraction value. The second part of the instrument included Modanloo's Adherence to Treatment Questionnaire (MATQ). The MATQ consists of 40 items in seven subscales,

namely effort toward treatment (9 items), willingness to participate in treatment (7 items), ability to adapt (7 items), integration of treatment into life (5 items), sticking to treatment (4 items), commitment to treatment (5 items), and query about treatment (3 items). All items are answered on a five-point Likert scale from "5: Absolutely important" to "1: Not important at all". The overall score ranges between 40 and 200. The higher the score, the better the adherence. The total and subscale scores are then converted to a scale of 0 to 100. The lowest and highest possible scores range from 0 to 100, and scores of 0 - 25, 26 - 49, 50 - 74, and 75 - 100 indicate weak, moderate, good, and very good treatment adherence, respectively. The original developers assessed the validity and reliability of the MATQ, reporting its Cronbach's alpha and reliability coefficients as 0.921 and 0.78, respectively (16). The questionnaire was reviewed before the content validity assessment, and the items' simplicity, clarification, and comprehensiveness were checked. The reliability of the MATQ was confirmed with Cronbach's alpha of 0.82 in this sample.

3.3. Intervention

Before patients were assigned to study groups, they were informed about the purpose of the study and signed an informed consent form to participate in the study. All patients completed the demographic information form and MATQ approximately 3 - 5 days postoperatively after coming to the cardiac surgery department from the ICU. Each patient in the intervention group received a G5 training bag and a daily 30-minute face-to-face training session. The training sessions were held in the evening shifts during hospitalization. The G5 training bags contained flashcards with questions and answers on lifestyle after surgery (i.e., activities, diet, medications, stress management, and so on).

The G5 system consists of five boxes, each containing several flashcards or G-cards. Each G-card has a question on it, and a short answer to the question is written on the back of the card. For example, the card asks, "What foods increase healthy fat levels in the blood?" and the back of the card says, "Walnuts, almonds, and nuts". All G-cards are arranged vertically in Box 1. The patient takes the first card, reads the question on it, answers it, and then checks the answer against what is written on the back of the card. If the answer is correct, the card is moved to Box 2. Then, another card is taken from Box 1, its question is answered, and in case of a correct answer, the card is transferred to Box 2 and placed behind the previous card. In case of a wrong answer, the card is returned to Box 1 and is placed behind the last card (17).

When Box 1 is empty, Box 2 will be completely filled. The cards are reviewed again, and if the answers are correct, they are moved to the next box (Box 3). The previous steps are then repeated until all G-cards reach Box 5. By reviewing them, Box 5 will also be emptied. If the patient does not know any of the cards, he/she must move the card to the first box and repeat the whole procedure until the cards that received wrong answers reach the boxes ahead. After all the cards have arrived in Box 5 and are successfully reviewed, the cards are removed from Box 5 and archived. At this stage, the process of repetition is complete, and the person has been able to retain all the content in his/her long-term memory.

It should be noted that how to work with the G5 educational program was taught during the hospitalization period to the extent that they mastered it. These bags with flashcards were available to them, and they needed to meet their educational needs. After discharge, the main researcher contacted the participants weekly to answer their doubts and questions and ensure they used the flashcards. Each patient in the control group received 30 minutes of self-care instruction daily from a cardiac surgery nurse. The MATQ was completed by the patients in both groups before surgery, one month, and two months after surgery.

3.4. Data Analysis

Descriptive and inferential statistics were used for data analysis with SPSS version 26 software. The Shapiro-Wilk test was used to check the normality of the variables. The Mauchly test was performed to check the homogeneity of variances. The independent samples and paired *t*-tests were used to compare the treatment adherence mean score between and within the intervention and control groups. Repeated-measures analysis was performed to compare changes in treatment adherence scores over three consecutive measurements. Furthermore, analysis of variance was used to compare the treatment adherence mean scores between the subgroups of patients in the intervention group. The Pearson correlation coefficient was used to investigate the correlation between treatment adherence and age, ejection fraction, and disease duration in the intervention group.

3.5. Ethical Considerations

The Ethics Committee of Babol University of Medical Sciences approved this research proposal (code: IR.MUBABOL.REC.1401.017). All participants signed the written informed consent form, all questionnaires were kept anonymous and confidential, and the rights of the participants were respected according to the Helsinki Declaration.

4. Results

Most participants in the intervention and control groups were male (64.9% and 56.8%, respectively). The mean ages of the participants in the intervention and control groups were 59.30 ± 11.24 and 60.08 ± 9.36 years, respectively. There were no statistically significant differences between the two groups regarding demographic characteristics (Table 1).

The Shapiro-Wilk test results for the treatment adherence and its subscales scores at three measurements in the two groups were insignificant at the 0.05 level. Therefore, the assumption of normality of the data was confirmed. The Mauchly test was also performed to check the homogeneity of variances, and the results showed that the assumption of sphericity was violated. As the epsilon value was smaller than 0.75, the degrees of freedom were corrected using the Greenhouse-Geisser test.

The results showed that the intervention significantly increased mean adherence in the intervention group over time ($F = 143.88$, and $P = 0.001$). Based on the effect size, the difference between the two groups was large during the study. Furthermore, the effect of the group on adherence and its subscales was significant ($P < 0.001$). Given the significant interaction between the time of measurement and the type of intervention (group) ($P = 0.001$), the *t*-test was used to conduct pairwise comparisons between the two groups at the three measurement times. The results illustrated that the treatment adherence mean score differed significantly between the two groups one and two months after the start of the intervention ($P < 0.001$) (Table 2). Within-group changes in adherence and its subscales also differed significantly over time in the control group ($P < 0.001$). However, the magnitude of change in the treatment adherence and subscale scores was much higher in the intervention group than in the control group (Table 2).

No demographic variables were significantly associated with the treatment adherence total scores two months after the intervention ($P > 0.05$). However, females scored higher than males on the query about treatment subscale. In addition, patients in the intervention group with academic education scored higher than others on the commitment to treatment subscale at the end of the study. Besides, patients from urban areas scored higher on the sticking to treatment subscale than patients from rural areas. In addition, scores on the ability to adapt, sticking to treatment, and query about treatment subscales were higher in patients hospitalized for two days or more. No significant relationship was found between other demographic variables and the scores of treatment adherence subscales ($P > 0.05$) (Table 3).

5. Discussion

In the present study, the G5 educational program could improve treatment adherence and all its components in patients undergoing CABG. This finding is compatible with the findings of studies by Mirkarimi et al., Sanaie et al., and Posht-Chaman et al. (4, 11, 12). A study by Zakipour et al. showed that teaching proper nutrition, self-care skills, and relaxation exercises based on the protection motivation theory effectively improved self-care in patients with ischemic heart disease (18). Habibzadeh et al. also reported that implementing the Health Belief Model could significantly increase the mean scores of all components of treatment adherence in patients with CAD. However, it failed to significantly affect patients' perceived sensitivity and perceived benefits of preventive behaviors (19). Another study also found that simple and comprehensible training and practical exercises for patients and families effectively improved patients' adherence to treatment regimens (13).

In the present study, the intervention had the greatest impact on the effort toward treatment and the least on the query about treatment components of adherence. However, in a study by Dehdilani and Hashemzadeh, the integration of treatment into life and query about treatment subscales scored the highest and lowest, respectively (20). These findings show that most patients, after CABG, try to adapt their life circumstances to the treatment and adhere to the recommended treatment regimens. Therefore, any effort to enhance patients' understanding of the implementation of recommended treatments and improve their financial status can affect their willingness to adhere to treatment (21, 22). By considering the patient's medical history and providing simple, creative, and attractive training, nurses, as core members of the healthcare system, can play an effective role in promoting treatment adherence in patients (22, 23).

The mean adherence scores to the treatment regimen were higher than in other studies. It can be said that in the present study, a teaching method was used to strengthen memory recall. The G5 technique is a mnemonic strategy that involves learners going more deeply into the learning process. With a selective learning process, these techniques allow learners to learn what they need and when they want to learn. Using the review scheduling system allows learners to maintain proper learning, minimizing the time required to complete a card file in G5 and enhancing the learning process. Using flashcards and squires signing take place without effort but not incidentally (17).

In the current study, the mean treatment adherence

Table 1. Demographic Characteristics of Patients Undergoing Coronary Artery Bypass Graft [a]

Variables	Group		Test Result		
	Control (n = 37)	Intervention (n = 37)	χ^2	*t*	P
Sex			(1) = 0.51		0.47
Female	16 (43.2)	13 (35.1)			
Male	21 (56.8)	24 (64.9)			
Marital status [b]					1
Married	33 (89.2)	33 (89.2)			
Widowed	4 (10.8)	4 (10.8)			
Financial status			(1) = 3.53		0.06
Moderated	25 (67.6)	17 (45.9)			
Favorable	12 (32.4)	20 (54.1)			
Job			(3) = 0.58		0.90
Self-employed	11 (29.7)	12 (32.4)			
Official	4 (10.8)	5 (13.5)			
Retired	8 (21.6)	9 (24.3)			
Homemaker	14 (37.8)	11 (29.7)			
Education level			(3) = 2.75		0.43
Elementary	24 (64.9)	17 (45.9)			
Secondary	7 (18.9)	10 (27)			
High school	5 (13.5)	8 (21.6)			
Academic	1 (2.7)	2 (5.4)			
Residential place			(1) = 0.87		0.351
Urban	18 (48.6)	22 (59.5)			
Rural	19 (51.4)	15 (40.5)			
History of hypertension			(1) = 0.49		0.48
Yes	20 (54.1)	17 (45.9)			
No	17 (45.9)	20 (54.1)			
History of diabetes mellitus			(1) = 0.95		0.33
Yes	11 (29.7)	15 (40.5)			
No	26 (70.3)	22 (59.5)			
Other comorbidities			(1) = 2.33		0.12
Yes	14 (37.8)	8 (21.6)			
No	23 (62.2	29 (78.4)			
Number of hospitalization days			(2) = 0.08		0.96
0	18 (48.6)	17 (45.9)			
1	10 (27)	11 (29.7)			
≥ 2	9 (24.4)	9 (24.3)			
Age (y)	60.08 ± 9.36	59.30 ± 11.24		(72) = -0.33	0.74
Ejection fraction (%)	46.35 ± 7.87	44.59 ± 7.20		(72) = -1.01	0.32
Duration of illness (y)	4.46 ± 34.31	28.16 ± 39.53		(72) = 0.43	0.66

[a] Values are presented as No. (%) or mean ± SD.
[b] Fisher's exact test.

Table 2. Comparison of the Mean Scores of Treatment Adherence in the Three Subsequent Measurements in Patients Undergoing Coronary Artery Bypass Graft [a]

Variables	Time			Repeated-Measures Analysis of Variance			P *
	Two Months After the Intervention	One Month After the Intervention	Before Intervention	Group	Time × Group	Time	
Treatment adherence							
Intervention	151.43 ± 8.65	152.62 ± 8.44	119.59 ± 7.82	P < 0.001, F = 265. 57, η^2 = 0.79	P < 0.001, F = 208. 59, η^2 = 0.75	P < 0.001, F = 143. 88, η^2 = 0.66	< 0.001
Control	116.97 ± 6.67	117.67 ± 6.28	120.35 ± 8.76				0.023
Between-group estimation *	*t* = 19.18, P < 0.001	*t* = 20.19, P < 0.001	*t* = 0.39, P = 0.696				-
Effort toward treatment							
Intervention	38.89 ± 3.19	39.05 ± 2.98	33.64 ± 3.97	P < 0.001, F = 77.75, η^2 = 0.52	P < 0.001, F = 32.55, η^2 = 0.31	P < 0.001, F = 17.29, η^2 = 0.20	< 0.001
Control	31.59 ± 3.20	31.64 ± 3.13	32.45 ± 3.71				0.270
Between-group estimation *	*t* = 9.80, P < 0.001	*t* = 10.41, P < 0.001	*t* = 1.33, P = 0.188				-
Willingness to participate in treatment							
Intervention	26.75 ± 3.63	26.91 ± 3.60	20.59 ± 2.08	P < 0.001, F = 49.85, η^2 = 0.41	P < 0.001, F = 66.65, η^2 = 0.48	P < 0.001, F = 30.62, η^2 = 0.30	< 0.001
Control	20.45 ± 2.29	20.59 ± 2.14	21.72 ± 3.56				0.035
Between-group estimation *	*t* = 8.91, P < 0.001	*t* = 9. 17, P < 0.001	*t* = 1. 67, P = 0.099				-
Ability to adapt							
Intervention	26.18 ± 2.74	26.35 ± 2.51	21.78 ± 3.23	P < 0.001, F = 32.92, η^2 = 0.32	P < 0.001, F = 39.28, η^2 = 0.36	P < 0.001, F = 8.08, η^2 = 0.10	< 0.001
Control	21.21 ± 2.61	21.24 ± 2.55	22.91 ± 4.03				0.023
Between-group estimation *	*t* = 7.98, P < 0.001	*t* = 8.66, P < 0.001	*t* = 1.34, P = 0.186				-
Integration of treatment into life							
Intervention	19.70 ± 2.20	19.89 ± 2.29	15.18 ± 2.22	P < 0.001, F = 53.40, η^2 = 0.43	P < 0.001, F = 30.79, η^2 = 0.30	P < 0.001, F = 43.43, η^2 = 0.38	< 0.001
Control	15.32 ± 2.68	15.45 ± 2.76	15.00 ± 1.73				0.513
Between-group estimation *	*t* = 7.66, P < 0.001	*t* = 7.51, P < 0.001	*t* = 0.41, P = 0.684				-
Sticking to treatment							
Intervention	18.24 ± 1.57	18.48 ± 1.48	13.37 ± 1.76	P < 0.001, F = 127.72, η^2 = 0.64	P < 0.001, F = 53.86, η^2 = 0.43	P < 0.001, F = 73.29, η^2 = 0.51	< 0.001
Control	13.37 ± 2.09	13.54 ± 1.90	13.08 ± 1.93				0.409
Between-group estimation *	*t* = 11.29, P < 0.001	*t* = 12.45, P < 0.001	*t* = 0.69, P = 0.493				-
Commitment to treatment							
Intervention	14.27 ± 4.21	14.43 ± 4.57	9.67 ± 2.86	P < 0.001, F = 16.50, η^2 = 0.19	P < 0.001, F = 21.68, η^2 = 0.23	P < 0.001, F = 28.30, η^2 = 0.28	< 0.001
Control	10.51 ± 1.86	10.54 ± 2.06	10.21 ± 2.18				0.512
Between-group estimation *	*t* = 4.96, P < 0.001	*t* = 4.72, P < 0.001	*t* = 0.91, P = 0.365				-
Query about treatment							
Intervention	7.37 ± 2.87	7.48 ± 2.94	5.32 ± 1.78	P < 0.001, F = 23.55, η^2 = 0.25	P < 0.001, F = 16. 95, η^2 = 0.19	P = 0.004, F = 8.35, η^2 = 0.11	< 0.001
Control	4.48 ± 1.53	4.64 ± 1.58	4.94 ± 1.89				0.151
Between-group estimation *	*t* = 5.40, P < 0.001	*t* = 5.17, P < 0.001	*t* = 0.89, P = 0.380				-

[a] * Repeated-measures analysis of variance, ** Independent *t*-test

Table 3. Relationship Between Demographic Variables and Treatment Adherence in Patients in the Intervention Group Two Months After the Intervention

Variables	Treatment Adherence (Mean ± SD)	Test Result			
		t	F	r	P
Sex					
Female	155.69 ± 8.01	1.66			0.104
Male	150.95 ± 8.35				
Marital Status *					
Married	152.15 ± 8.21	-0.97			0.338
Widowed	156.50 ± 10.66				
Financial status					
Moderated	150.70 ± 6.24	-1.28			0.208
Favorable	154.25 ± 9.80				
Job					
Self-employed	153.08 ± 7.71		1.13		0.348
Official	147.20 ± 4.81				
Retired	151.66 ± 11.15				
Homemaker	155.36 ± 7.63				
Education level					
Elementary	154.76 ± 7.68		2.42		0.083
Secondary	154.70 ± 6.91				
High school	147.50 ± 10.11				
Academic	144.50 ± 3.53				
Residential place					
Urban	151.32 ± 8.11	-1.70			0.09
Rural	156.66 ± 8.63				
History of hypertension					
Yes	152.29 ± 9.57	-0.21			0.831
No	152.90 ± 7.60				
History of diabetes mellitus					
Yes	152.01 ± 8.45	-0.36			0.717
No	153.04 ± 8.61				
Other comorbidities					
Yes	153.12 ± 10.24	0.19			0.852
No	152.48 ± 8.08				
Number of hospitalization days					
0	150.47 ± 8.61		1.03		0.369
1	154.27 ± 7.28				
≥ 2	154.66 ± 9.38				
Age (y)				0.01	0.95
Ejection fraction (%)				0.32	0.052
Duration of illness (y)				0.21	0.210

[a] t, independent *t*-test; F: Analysis of variance; r, Pearson correlation coefficient.

score was 151.43 in the intervention group, which was higher than in previous studies that used WhatsApp Messenger to educate patients (24) or provided face-to-face education and telephone follow-up (4). The higher treatment adherence scores in the present study can be attributed to the nature of the intervention because the G5 method uses a set of Ebbing-Haus forgetting curve rule, Skinner's immediate reward, Guthrie's all-or-none law, and repetition and association to enter educational content into the long-term memory and helps people learn deeply and sustainably (2).

In the current study, significant differences were found between the two groups in the mean total score of treatment adherence and its components one and two months after the beginning of the study. Kamrani et al. also reported that patient education and follow-up improved treatment in patients with acute CAD (25). Poor treatment adherence is a major cause of treatment plan failure, and evidence suggests that adequate education and follow-up after hospital discharge can significantly improve patient adherence (25). Negarandeh et al. also investigated the effects of two methods of visual and feedback-based education on awareness, medication adherence, and diet in patients with diabetes. The results showed that the mean scores of awareness, medication adherence, and diet increased significantly after both interventions (26). All these results demonstrate that using appropriate educational methods improves patients' awareness and treatment adherence, regardless of patients' personal characteristics, such as their education level.

Although we found no significant relationship between the total treatment adherence score and patients' demographic variables, women scored higher than men on the query about treatment subscale. This finding is consistent with the findings of Badrizadeh et al. (27) but contradicts the findings of a study by Pérez-Garza et al., where men were more compliant with treatment (28). The discrepancy might be attributable to the fact that women are more inclined to self-care, seek health care services, and make more effort to recover quickly when ill.

In the present study, patients with academic education scored higher than others on the subscale of commitment to treatment. There are conflicting data on the relationship between treatment adherence and education level. Some studies found better medication adherence in higher-education patients (29). In a study by Dianati et al., the teach-back method improved knowledge and adherence to diet and medication regimens in patients with acute coronary syndrome. However, low-literate patients showed better adherence (30). Some studies, however, found no association between treatment adherence and education level (31, 32). However, patients with higher education levels appear to seek more knowledge about treatments, medications, and the complications of poor treatment adherence (33).

The strength of this study was the use of the G5 method for patient education. To the researchers' knowledge, this method has not been used to educate patients in previous studies.

Since the current research was conducted in a limited geographical area, the first limitation of the study was the impossibility of conducting research in large hospitals. Also, the small number of investigated hospitals in this region could affect the generalizability of the results. In this research, the mental state of the research units could have an effect on how they answered the questionnaire, which could not be controlled by the researcher.

This study demonstrated that patient education using the G5 training system can effectively improve treatment adherence in patients undergoing CABG. Empowering patients with simple, attractive, and feedback-focused educational programs such as G5 can help prevent complications caused by poor adherence and improve patients' health after CABG. Nurses are suggested to follow up with patients, assess their treatment adherence, and implement simple and low-cost educational methods, such as the G5 game, to increase patients' treatment adherence and reduce the costs and complications associated with poor adherence, such as hospital readmissions after CABG.

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Footnotes

Authors' Contribution: Fatemeh Saadati: Conceptualization, methodology, data curation, investigation, writing, and visualization. Zahra Fotokian: Methodology, validation, writing, review, editing, and original draft. Zahra Jannat Alipour: Conceptualization, methodology, validation, supervision, review, and editing. Hengameh Karimii and Hamidreza Vafaey: Supervision, review, and editing.

Conflict of Interests: There are no conflicts of interest.

Data Reproducibility: The dataset presented in the study is available on request from the corresponding author

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