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Effects of Continuous Care Model on Self-Efficacy and Adherence to Treatment in Patients Undergoing Coronary Artery Bypass Grafting

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Abstract

Background: Coronary artery bypass grafting (CABG) has been advocated among the top treatment options to deal with ccoronary artery disease. Nearly all patients experiencing this type of surgery grapple with various postoperative challenges. Accordingly, providing the essential information in an appropriate manner to these patients could be a significant solution.

Aim: The present study was performed with aim to determine the effect of the continuous care model on self-efficacy and adherence to treatment in patients undergoing CABG.

Method: This randomized clinical trial study was conducted in 2023 on 77 patients undergoing CABG in two hospitals affiliated to Shahid Beheshti University of Medical Sciences. The research units were randomly assigned to the intervention and control groups. The patients filled out the Self-Efficacy Scale and the Adherence to Treatment Questionnaire before and 8 weeks after the intervention. The intervention group received the Continuous Care Model education, which comprised of four stages (orientation, sensitization, control, and evaluation), but the control group only received routine care. The data was analyzed using SPSS statistical software (version 18) and chi-square, independent t and paired t statistical tests. $p<0.05$ was considered significant.

Results: The two groups were similar regarding demographic characteristics, self-efficacy and adherence ($p>0.05$). After the implementation of the Continuous Care Model, the self-efficacy and adherence of patients increased in the intervention group compared to the control group ($p<0.0001$).

Implications for Practice: The Continuous Care Model education increased the level of self-efficacy and adherence of patients. The findings of the present research can be suggested to the policymakers and nursing managers in order to plan how to enhance the role of nurses.

Keywords: Adherence, Continuous Care Model, Coronary Artery Bypass Graft, Self-Efficacy

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Introduction

Cardiovascular diseases (CVDs) are the highest cause of morbidity and mortality worldwide (1). Among them, coronary artery disease (CAD) has been introduced as the leading cause of death in developed and developing nations (2, 3). According to reports by the World Health Organization (WHO), about 40% of all deaths in Iran in 2018 were attributable to CAD, and this rate is projected to be higher than 50% by 2030 (3). Even with abundant treatment options for CVDs, coronary artery bypass grafting (CABG) has been one of the most common procedures in this domain (4). This type of surgery augments survival rates, minimizes some symptoms, and improves functions in patients. Regardless, physical, mental, and social problems may simultaneously arise (5). Several factors are involved in the rehospitalization of these patients that is associated with an economic, physical and psychological burden for the patient, family and treatment system (4,5).

One of the major concerns and clinical challenges frequently detected by healthcare providers is no adherence to treatment. This is more evident during chronic diseases, wherein such patients are obliged to take prescribed treatments for a longer period of time. Additionally, adherence to treatment is influenced by some social factors that neglecting them makes it impossible to achieve health goals (6, 7). Favorable adherence to treatment by patients can be demonstrated by taking medications as prescribed at the appropriate time, keeping to the recommended doses and durations, having a proper diet, and following mobility plans (7). As declared by WHO, the average adherence rate in patients with chronic diseases in developed countries is 50%, and this is even lower in the developing ones (8). Regarding the significance of adherence in patients with CVDs, Heidari et al. (2010) argued that no adherence in terms of treatment regimens in such cases could be one of the contributors to readmissions. For this reason, certain strategies need to be provided to promote adherence (9). Medication adherence could enhance quality of life (QoL) and it is likely to reduce mortality and readmission rates in patients with heart failure (10,11).

The most common complications after CABG often occur in the first six months and improving the patient's self-efficacy is a necessity to reduce these problems (9,12). Self-efficacy has been described as an individual’s belief in one’s capacity to practice a behavior to attain the desired goals. Improving self-efficacy leads to better self-management, redoubles life expectancy, and facilitates health-related behaviors (12). Shafiei et al.(2020) concluded that higher self-efficacy could promote quality of life (QoL) in patients with diabetes mellitus (13). According to Blank et al., self-efficacy could definitely diminish healthcare costs in patients with chronic heart failure or chronic obstructive pulmonary disease (14). As mentioned in Liu et al., upgrading self-efficacy could expand health literacy in patients living with CAD (15). Therefore, individuals dedicated with high self-efficacy could be confident enough to solve their problems, make attempts to recognize their own abilities and beliefs, detect mistakes, and achieve the desired success. Such people, mainly when facing problems, could make more effort and show perseverance, as compared to those having doubts about their capabilities, so training patients about self-care behaviors, particularly self-efficacy is essential (16).

Several interventions were implemented, such as phone and SMS follow-up after discharge, family-oriented and self-management training, motivational interventions based on self-management behaviors, telenursing, and peer education to improve self-efficacy and adherence in heart surgery patients (17,18). The continuous care model, according to its steps, is a comprehensive model which includes a large part of the above interventions and has not been performed in patients undergoing CABG.

The chronic nature of heart diseases and the necessity of continuous care accordingly implies that the use of a model matching the conditions of such patients is of utmost importance (19). The continuous care model (CCM) was developed for the first time by Ahmadi and Abedi with four stages of orientation, sensitization, control, and evaluation, and then evaluated on patients with CAD (20). This model creates sensitivity in the patient and the caregiver to follow the treatment plan and accompanying the patient, therefore, it seems to be effective in improving the acceptance of treatment and improving the attitude and self-efficacy of the patient and controlling the disease and its complications. In general, the practical goals of the given model are to establish a continuous, effective, and interactive care relationship between patients and their families, upgrade their responsibilities, and ultimately sensitize and empower them regarding continuous care. The main objective is to minimize the disease complications and control the risk factors, and then to increase the quality of healthcare services as well as satisfaction and QoL in patients (21). In their study, Beghaei

et al. found that the implementation of effective CCMs, as well as training and follow-up of patients with heart failure, could improve their QoL (22). As evidenced, continuous care enhances QoL and multiply anxiety and depression scores in patients with myocardial infarction (23-25), adherence among patients undergoing CAD (26), health-related behaviors, QoL in women with preeclampsia (25), and self-efficacy, QoL, and motor functions among patients with stroke (26). With considerable focus on home-based care and training in the health system reform plan, this study was conducted with aim to investigate the effects of the CCM on self-efficacy and adherence of treatment in patients undertaking CABG.

Methods

This randomized clinical trial study was performed from April to September 2023 on all patients who had undergone CABG at Shahid Modares Hospital and Imam Hossein Hospital, Tehran, Iran. The Pocock's formula was used to estimate the sample size by considering α=0.05, power=0.90, and the effect size (d)=0.20, indicating the minimum required sample size of 37 participants per group, which was considered as 40 subjects (27). In total, 80 patients were included in this study, but two individuals in the group A were excluded due to their unwillingness to cooperate, and one patient was removed for entering the acute phase of the disease; so 37 patients in the groups A and 40 in the group B completed the study (Figure 1).

The inclusion criteria were: patients aged 18-65 years, undergoing CABG for the first time, having consciousness, not living in emergency conditions, at least 24 hours passing since their admission, having no debilitating diseases, as well as speech, hearing, and vision impairments, having the ability to communicate and cooperate, not suffering from known physical and mental disorders affecting QoL, such as hemodialysis or other mental problems, such as depression and schizophrenia which required medications or special diets, as self-reported, and access to a smartphone. The exclusion criteria were: not attending two or more intervention program sessions, participating in other educational programs during the study, needing readmission upon entering the acute phase of the disease, transferring from the study setting to another ward, refusing to cooperate, and not answering all the questionnaire items.

The demographic characteristics information form included patients' characteristics, such as age, gender, marital status, educational attainment, level of income, and a history of chronic diseases. The Cardiovascular Management Self-Efficacy Scale, developed by Steca et al. (2015) (28) was employed to measure self-efficacy; its validity and reliability have been established by Jafari Sejzi et al. (29). Considering its validity in this study, the construct and convergent validity were determined through confirmatory factor analysis (CFA) and the correlation coefficient between the major factors and the total score of the questionnaire, respectively. Pearson's correlation between each item and the total score of the given scale was also found to be between 0.43 and 0.73, which was significant at the 0.001 level. The method of internal consistency (viz., Cronbach's alpha coefficient) was further utilized to define the reliability of the questionnaire. Cronbach's alpha coefficients for the subscales of cardiac risk factors, compliance, self-efficacy manifestations, and total score were 0.75, 0.97, 0.57, and 0.80, respectively, indicating the acceptable reliability of this scale. Overall, Cronbach's alpha coefficient for the questionnaire was estimated 0.80. The Cardiovascular Management Self-Efficacy Scale also consisted of nine items and three components of cardiac risk factors (4 items), compliance (2 items), and self-efficacy manifestations (3 items), which is scored in a Likert-type format, viz. "I am not sure at all: 1, I am a little sure: 2, I am almost sure: 3, I am very sure: 4, and I am completely sure: 5". For further analysis, the scores could be summed up. The possible minimum and maximum scores were 9 and 45, respectively.

The Adherence to Treatment Questionnaire was designed for patients with chronic conditions and then its psychometric properties were evaluated by Modanloo (2013) (30). The content validity index (CVI) of the given questionnaire was 0.914 and its Cronbach's alpha coefficient was equal to 0.921. This questionnaire had 40 items about interest in treatment (9 items), willingness to participate in treatment (7 items), ability to adapt (7 items), integration of treatment into life (5 items), Stick to treatment (4 items), commitment to treatment (5 items), and planning to implement treatment (3 items). The range of scores was also from 0 to 100. Accordingly, the scores of 75-100, 50-74, 26-49, and 0-25 indicated high, good, moderate, and poor adherence to treatment, respectively.

To design the patient education program in this study, a literature review was initially managed to

retrieve the related articles, books, programs, and educational booklets in order to determine the needs in patients experiencing CABG and the interventions for their caregivers. To access the relevant texts, the reliable English databases, including Scopus, PubMed, Google Scholar, Science Direct and the Persian ones, SID and Magiran, were searched using the desired keywords. To validate the given program along with its sources, it was submitted to three experts, including two cardiac surgeons and one nursing professor, having work experience with patients undergoing CABG. Upon confirming the scientific accuracy of the program content, it was handed to three patients undergoing CABG, but not those among the study participants, to measure its face validity without mentioning the sources, and then examine various factors, such as its clarity, ease of content, and necessity and non-necessity of the content from the patients' viewpoints. To assess the qualitative content validity, the prepared content, along with the resources were submitted to five experts, i.e., cardiac surgeons and nursing professors, and their comments and corrections were finally applied.

Sampling was done in a randomized two-block manner for the intervention and control groups. The random allocation sequence and the list of blocks were then obtained by the statistical consultant and website of https://www.sealedenvelope.com, so that there was no limit on the number of blocks for random allocate. Block randomization was accordingly based on randomizing the patients into blocks, so an equal number could be in each group at consecutive intervals. After recruiting the patients meeting the inclusion criteria, each one was randomly allocated to group A (intervention) or B (control) according to the block organized in the first stage. The samples were assigned to the intervention or control groups until the procedure was completed. Upon creating a random sequence, sampling was performed by placing the created sequence inside opaque envelopes. In this way, a random sequence was developed. A number of envelopes were prepared based on the sample size, each random sequence was written on a card, and the cards were then placed in the envelopes in a specific order, so there were 34 cards in 34 opaque envelopes within the random sequence from 1 to 34, containing a combination of four. To maintain the random sequence, the outer surface of the envelopes was numbered in the same order. Finally, the envelopes were sealed and placed in a box in a specific order. Subsequently, group A received the CCM-based intervention program, as follows:

1- Orientation: This step included a 30-35 min face-to-face individual training session with patients in the presence of their caregivers for 24 hour before the surgery. This step focuses on the definition of CABG and the reasons for its practice, the importance of adherence to treatment, and the benefits of the given program. Training and the ways to communicate and hold the training sessions along with anxiety reduction were done before the surgery, and it was briefly explained about the events after the surgery until the day of discharge, then the questionnaires were completed by the patients.

2- Sensitization: At this stage, three sessions of face-to-face training on the third, fifth and seventh day after the surgery (every other day), after transferring the patient from the open heart ICU to the ward, lasting for 30-35 min were held based on an educational booklet designed to explain some postoperative changes in lifestyle, with much emphasis on medication, diet, and exercise plans.

3- Control: This stage of the model was done completely virtually and after discharge that aimed at controlling adherence and rechecking the accuracy of the training given, answering questions, and meeting educational needs started 72 hour after discharge, which could help researchers evaluate the knowledge and skills acquired by the patients indirectly. This step included five sessions (one session a week) of individual training online in the form of phone calls and messages, which continued up to six weeks after discharge, in order to involve the patients and their families as much as possible in the treatment process and meet their educational needs after discharge.

4- Evaluation: At this stage, the quality of the continuous education process in the previous three stages was evaluated through the verbal feedback of the patients and finally the questionnaires were completed at the end of the eighth week. The most important feature of this model is the continuous companionship of the provider with the patients and their family and the componentization of the training content for better stability in the minds of the learners.

The data were analyzed using the IBM SPSS Statistics (version 18) software and descriptive (mean and standard deviation [SD]) and inferential (Chi-square test, Fisher's exact test, paired-samples t-test, and independent-samples t-test) statistics. $p<0.05$ was considered statistically significant.

Ethical Consideration

The study was derived from the Master's thesis in Critical Care Nursing, fulfilled at Shahid Beheshti University of Medical Sciences, Tehran, Iran (ethical code: IR.SBMU.PHARMACY.REC.1402.044) and was registered in the Iranian Registry of Clinical Trials (IRCT20230924059499N1). The study was approved by the Joint Organizational Ethics Committee of Shahid Beheshti School of Nursing and Midwifery and a letter of introduction was received from the vice president of research. The researcher explained the purpose and method of conducting the research to the relevant officials. In all stages of the research, ethical considerations such as obtaining informed consent, information confidentiality and the possibility of withdrawing from the study at each stage was taken into account.

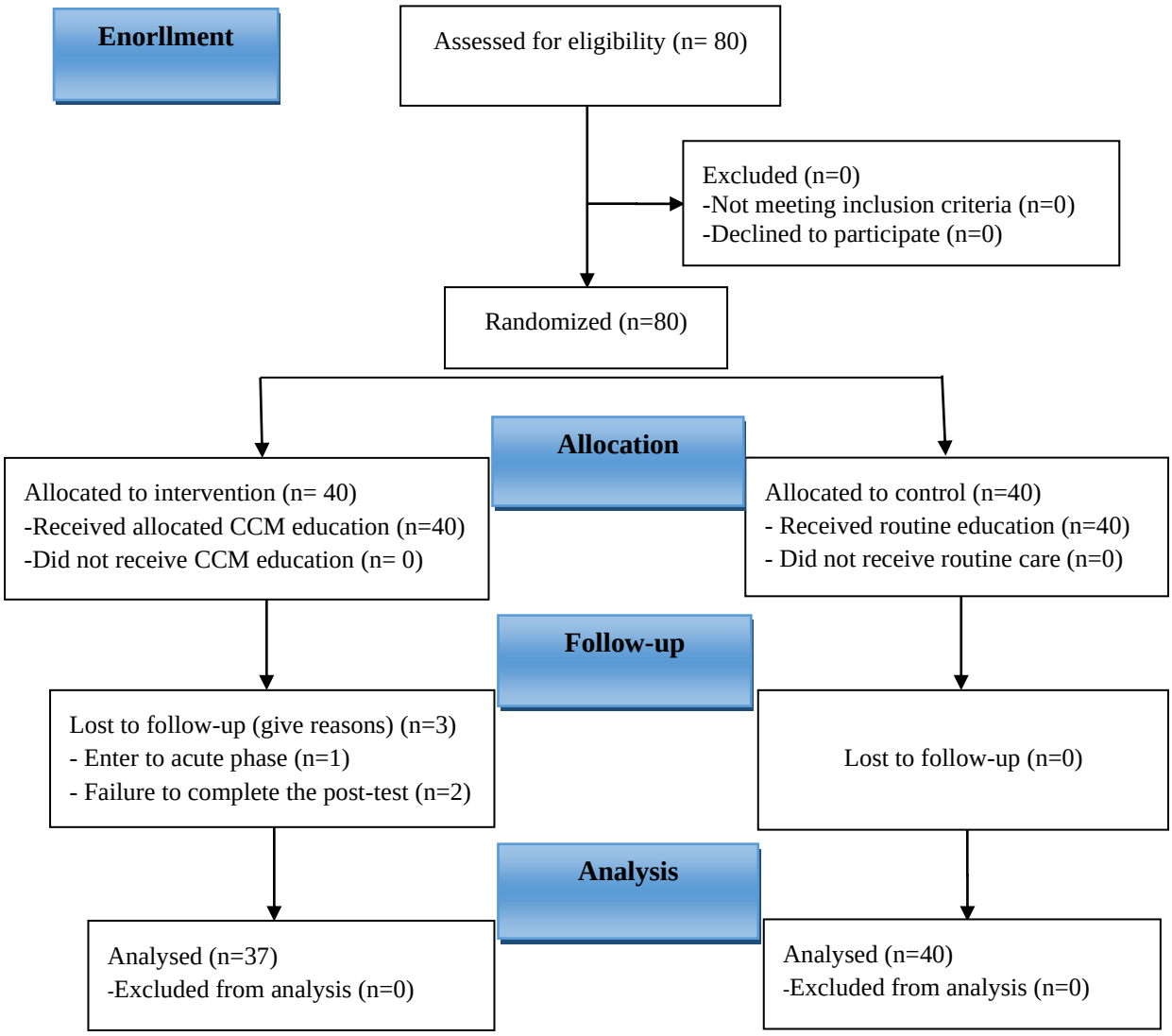

Figure 1. Flowchart of the effect of CCM on self-efficacy and adherence to treatment in CABG patients

Results

The data analysis revealed that the Mean age of the patients in group A was 59.1±5.28 years and in group B was 58.4±6.84 years. As well, 51.4% and 67.5% of the patients, , in groups A and B, respectively were male. Moreover, 91.9% and 82.5% in groups A and B, respectively were married. With regard to educational attainment, 67.6% of the patients had less than a high school diploma, and 65% were in group B, so the two groups were homogeneous with no statistically significant difference.

The mean self-efficacy scores of the patients before the intervention program in groups A and B were 21.97±2.42 and 21.27±3.02, respectively, with no statistically significant difference based on the independent-samples t-test results (p=0.26). Following the program, these values reached 23.08±2.49 in group A and 21.42±3.02 in group B. Independent-samples t-test found this difference to be significant, and self-efficacy improved in the patients in group A (p=0.01). Paired-sample t-test was used to compare the self-efficacy scores of the patients in group A before and after the intervention program and a significant difference was observed (p<0.001). Nevertheless, this difference was not significant in the group B (p=0.11) Moreover, the independent-sample t-test results showed that the mean changes in the self-efficacy scores in group A were significantly higher than that in group B (p=0.001) (Table 1).

Table 1. Mean of self-efficacy in patients undergoing CABG before and after the intervention

Self-efficacy dimensions		Mean±SD		Paired-samples t-test results
		Before	After	
Cardiac risk factors	Intervention	8.45±2.03	8.75±1.77	t=-1.81 df=36 p=0.07
	Control	7.95±1.85	8±1.73	t=-1.43, df=39 p=0.16
Independent-samples t-test results		t=1.15 p=0.25	t=1.83 p=0.07	-
Compliance	Intervention	3.13 0.63	3.78 1	t=-3.47 df=36 p=0.001
	Control	3.07 0.79	3.2 0.75	t=-1.7 df=39 p=0.09
Independent-samples t-test results		t=0.36 P=0.71	t=2.89 P=0.005	-
Self-efficacy manifestations	Intervention	10.37±1.53	10.54±1.59	t=-2.23 df=36 p=0.03
	Control	10.25±2.31	10.22±2.23	t=0.37 df=39 p=0.71
Independent-samples t-test results		t=0.28 p=0.77	t=0.7 p=048	-
Total score of Self-efficacy	Intervention	21.97±2.42	23.08±2.49	t=-4.09 df=36 p<0.001
	Control	21.27±3.02	21.42±3.02	t=-1.63 df=39 p=0.11
Independent-samples t-test results		t=1.11 p=0.26	t=2.61 p=0.01	-
Changes before and after intervention		Intervention	Control	Independent-sample t-test results
Self-efficacy		1.10±1.64	0.15±0.57	t=3.45 df=75 p=0.001

The adherence to treatment score of the patients in group A before the intervention program was 95.97±8.07 and in group B was 96.60±11.11. According to the results of the independent-samples t-test, there was no statistically significant difference between the two groups (p=0.77). After the intervention program, such values reached 108.70±5.89 in group A and 96.40±10.79 in group B, which was significant based on the independent-sample t-test results.

As a whole, adherence to treatment increased after the intervention in the patients of group A (p<0.001). Besides, the independent-samples t-test demonstrated that the mean changes in the adherence score in group A were significantly higher than those in group B (p<0.001) (Table 2).

Table 2. Mean of adherence in patients undergoing CABG before and after the intervention

Adherence dimensions		Mean±SD Before	Mean±SD After	Paired-samples t-test results
Interest in treatment	Intervention	19.13±4.55	23.97±3.43	t=-6.22 df=36 *p*<0.001
	Control	21.12±4.78	21.25±4.51	t=-96 df=39 *p*=0.34
Independent-samples t-test results		t=-1.86 *p*=0.06	t=2.96 *p*=0.004	-
Willingness to participate in treatment	Intervention	17.51 2.37	18.62 2.04	t=-3.97 df=36 P<0.001
	Control	16.35 3.12	16.25 3.11	t=1.66 df=39 P=0.1
Independent-samples t-test results		t=1.82 *p*=0.07	t=3.91 *p*<0.001	-
Ability to adapt	Intervention	17.48±2.57	19.86±1.75	t=-6.64 df=36 *p*<0.001
	Control	18.3±2.74	18.42±2.58	t=-1.7 df=39 *p*=0.09
Independent-samples t-test results		t=-1.33 *p*=0.18	t=-2.84 *p*=0.006	-
Integration of treatment into life	Intervention	12.51±1.67	13.56±1.55	t=-5.94 df=36 *p*<0.001
	Control	12.57±1.99	12.75±1.91	t=-1.86 df=39 *p*=0.07
Independent-samples t-test results		t=-0.14 *p*=0.88	t=2.4 *p*=0.04	-
Stick to treatment	Intervention	9.62±2.07	10.59±1.9	t=-3.37 df=36 *p*=0.002
	Control	9.4±2.04	9.25±2.12	t=1.09 df=39 *p*=0.27
Independent-samples t-test results		t=0.47 *p*=0.63	t=2.9 *p*=0.005	-
Commitment to treatment	Intervention	12.27±2.07	14.24±2.1	t=-6.34 df=36 *p*<0.001
	Control	11.59±2.03	11.77±2.03	t=1.18 df=39 *p*=0.24
Independent-samples t-test results		t=0.68 *p*=0.49	t=5.24 *p*<0.001	-
Planning to implement treatment	Intervention	7.43±1.67	7.83±1.6	t=-3.23 df=36 *p*=0.003
	Control	6.9±1.76	6.7±1.75	t=1.53 df=39 *p*=0.12
Independent-samples t-test results		t=1.37 *p*=0.18	t=2.95 *p*=0.004	-
Total score of adherence to treatment	Intervention	95.97±8.07	108.70±5.89	t=-70.11 df=36 *p*<0.001
	Control	96.60±11.11	96.40±10.79	t=-56.08 df=39 *p*=0.036
Independent-samples t-test results		t=-0.28 *p*=0.77	t=6.13 *p*<0.001	-
Changes before and after intervention		Intervention	Control	Independent-sample t-test results
Adherence to treatment		12.72±7.30	-0.20±2.05	t=10.75 df=75 *p*=<0.001

Discussion

The purpose of the present study was to determine the effect of the continuous care model on self-efficacy and adherence to treatment in patients undergoing CABG. This study results showed that the scores in the patients of group A before and after the intervention program indicated a significant difference between the pre-and post-intervention stages, but this was not significant in group B. In this regard, Rahmanian et al. (2023) confirmed the effectiveness of the CCM in adherence to diet and fluids in patients undergoing hemodialysis (31). Hakim et al., examining the effects of the given model on parental knowledge and control of symptoms and disease recurrence in children with nephrotic syndrome found that methotrexate had influenced the systolic blood pressure mean value in both study groups and there was also an increasing trend in parents' awareness after the intervention program, but there was no significant difference in the disease recurrence at the same time in the two groups (32), the reason for its discrepancy was the nature of the disease. However, Basher et al. (2019) evaluated the impacts of a training program on fluid and diet control on patients with hemodialysis and concluded that the mean scores of adherence to diet and fluids were low after the intervention (33). The reason for its inconsistency with the present study may be the education model and duration, so that the education in the model of the present study was based on four main steps from before surgery to 8 weeks later with verbal and virtual contents, which prevents interruption of training.

Rezamand et al. in their study reported that the CCM implementation promoted QoL in patients with heart failure (34). Gohari et al. also (2022) similarly observed that training through phone follow-ups and home visits had improved self-efficacy in patients experiencing CABG (35), which is in line with the results of the present study. Xu et al. probing the effects of the CCM based on a mobile app on self-efficacy, QoL, and motor functions in patients with stroke, similarly revealed that these variables enhanced after the intervention program (26), which was in line with the results of the present study. Moreover, the results reported by Xia et al. regarding the effectiveness of the CCM revealed elevated self-efficacy and reduced anxiety in patients with colostomy (36). Previous research established that CCM implementation in the right manner could give rise to adherence and self-efficacy (24, 31, 37). Besides, Roshan Ghiyas et al., presenting the CCM and investigating its effects on self-efficacy in patients undertaking CABG, had just recruited a single intervention group before and after the intervention (24). The present study included two groups, the intervention and control groups. Therefore, the main reason for the uniformity between the studies and their results was the nature of training and the benefits of the distance-based method practiced at the control stage. Expanding information in any way could thus have an impact on the levels of knowledge and attitudes, so patients could learn how to care for themselves and exploit some methods to improve these two variables while becoming more aware of the disease. Many ambiguities could be further established and less difficulty would be observed in many dimensions. In the present study, the CCM facilitated access to educational materials in a time-saving manner. The study results were also predictable considering the control group with no intervention but receiving routine care training.

One of the limitations of the present study is individual, social, cultural, and economic differences that may affect patient education. Furthermore, the slow internet connection to access educational materials and the related costs were the other limitations. In order to manage this limitation, the content of the educational program was prepared and uploaded to the group so that it could be downloaded by the patient within the possible time limit, and in few patients with limited internet access, telephone calls were made and internet packages were purchased.

Implications for practice

Confirming the hypothesis addressed, the present study indicated that CCM-based intervention program was effective on self-efficacy and adherence to treatment in patients undergoing CABG. This treatment plan as one of the simple, economical, applicable, and effective non-pharmaceutical nursing interventions could elevate patient self-care. Novel educational methods thus seem to complement nursing care, and their practice, specifically the existing ones corresponding to the existing conditions, could be effective in fulfilling nursing care services. Therefore, CCMs could help manage the possible conflicts in care, so it is of utmost importance to utilize them in nursing. The findings of the present research can be suggested to policymakers and nursing managers to use this model in a non-invasive and low-cost way that can lead to positive results to improve the role of nurses.

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Conflicts of interest
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Authors' Contributions
Anis Kunani: conception, design, data collection, data analysis and drafting the manuscript. Neda Sanaie: conception, design, supervision of project, and revising the manuscript. Mahsa Boozaripour: data collection and revising the manuscript. Malihe Nasiri: data analysis and drafting the manuscript. All authors contributed to the writing of the manuscript and discussed on the manuscript.

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