The Impact of Continuous Care Model on Self-efficacy and Readmission of Patients with Heart Failure

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Abstract

Background: Patients with heart failure (HF) need continuous medical care, including regular follow-up, training, and information acquisition to increase self-care capacity. Adherence to self-care behaviors reduces patient readmission

Objectives: This study examined the impact of the continuous care model (CCM) on self-efficacy and readmission of patients hospitalized with HF.

Methods: This quasi-experimental study was conducted on patients with HF visiting two teaching hospitals in southeastern Iran in 2021. The participants were 70 patients who were selected using convenience sampling and were placed into two control and intervention groups, each with 35 patients through limited random sampling. The patients in the control group received routine care, but the CCM was performed for the patients of the intervention group in the form of individual training for 6 sessions in the hospital and after discharge and then through telephone follow-up once a week until the end of the twelfth week. The instruments used to collect the data were a demographic information form that assessed patient readmission and their demographic information and Sullivan's Cardiac Self-Efficacy Scale. The collected data were analyzed with SPSS software (version 22) using the chi-square test, independent and paired samples *t*-test, and analysis of covariance at the significance level of $P < 0.05$.

Results: Analysis of covariance showed that the mean self-efficacy score of the patients with HF was significantly different between the two groups after implementing continuous care ($P = 0.001$). The results of the independent samples *t*-test suggested that the mean and standard deviation of readmission frequencies in the control group (1.03 ± 1.01) were significantly higher than the mean readmission frequencies of the patients in the intervention group (0.34 ± 0.68) ($P = 0.001$).

Conclusions: Given the positive and significant effect of the CCM on increasing patient self-efficacy and reducing the frequency of readmissions, and considering the ease, applicability, and low cost of this intervention, relevant authorities need to make effective planning and policies to implement the CCM for patients with HF.

Keywords: Heart Failure, Self-Efficacy, Continuous Care Model, Readmission

1. Background

Heart failure (HF) is one of the most common chronic diseases and a major health problem associated with high mortality, low quality of life, and frequent hospitalizations (1). It is a clinical syndrome of left ventricular dysfunction characterized by a combination of clinical symptoms, including vascular congestion, shortness of breath, fatigue, weakness, symptoms of fluid retention such as lung congestion or edema of the legs, and obvious signs of abnormal heart structure or function at rest (2). HF is divided into four classes based on clinical symptoms: Class I heart disease with no limitation in physical activity; class II heart disease, which causes mild limitation of physical activity;

class III HF, which leads to significant limitation in physical activity; and class IV heart disease which causes the inability to perform physical activities with a constant feeling of discomfort (3).

The number of people with HF in the United States is 6.2 million, and every year 400,000 people are added to this number. The annual cost of treating HF in the United States is estimated at \$43.6 billion, most of which is related to disease exacerbation and readmission (4). Thus, the readmission rate has been reported 19% within 30 days after discharge in the United States, 44% within 12 months in Europe, and 30% within two months in Iran (5-7).

HF is associated with cardiovascular diseases, espe-

cially heart attack. The disease significantly affects the physical, physiological, social, and normal activities of affected individuals and imposes high costs on health systems, so the cost of this disease in the United States is \$39.2 billion annually (8). HF is a debilitating and costly disease, with 29 - 47% of patients being readmitted within three to six months of initial discharge, while 50% of readmissions are preventable (9).

Patients with HF need continued medical care, including regular follow-up and information acquisition, effective communication with health care providers, and thus adaptation skills should be taught to these patients. Self-care behaviors can reduce the complications of the disease by 80% and lead to the improvement of abilities, better performance of daily activities, and the attainment of independence in the patient (10). Studies have shown that adherence to self-care behaviors leads to reduced readmissions, improved quality of life, and reduced treatment costs for patients (11, 12).

An important prerequisite for successful self-care and behavior change is to enhance self-efficacy. Self-efficacy refers to a person's confidence in being able to perform self-care tasks desirably, enabling the person to achieve more desirable self-care outcomes (13). Self-efficacy is a key component of self-care programs in cardiovascular diseases (14). Patients with high levels of self-efficacy are more likely to repeat self-care behaviors and can manage the disease more effectively (15). Accordingly, in their study on patients with HF, Bagheri-Saweih et al. reported that people with higher levels of self-efficacy have more control over the symptoms of HF (16). According to previous studies, people with high self-efficacy are stronger in difficult situations and when facing problems (17). A sense of self-efficacy enables people to do extraordinary things and use their skills in dealing with obstacles (18).

Unawareness of self-care behaviors is one of the significant problems faced by patients at the time of discharge, so 90% of patients at the time of discharge ask questions about self-care, medication, diet, and complications of the disease (19). Niakan et al. showed that within 30 days after discharge, 84.1% of patients had undesirable self-care behaviors (20). Thus, improving patients' knowledge and functions should be considered as the main goal of care and treatment.

One way to improve self-care behaviors is to use nursing theories and models. The continuous care model (CCM) was developed by Ahmadi et al. for coronary artery disease patients (21) and has been used in various studies (5, 22). However, no study has yet addressed the effect of the CCM on self-efficacy and readmission of patients with HF. A study by Ahmadi et al. showed that the use of this model was effective on several indicators, such as the fre-

quency of readmissions, physician visits, blood lipid level, diet modification, frequency of taking sublingual nitroglycerin tablets, and quality of life (21). This model introduces the client as a consistent and effective caregiver in the process of their health. The main purpose of the CCM is to design and formulate a program that leads to acceptance and increases the insight and proper function of the patient for continuous self-care (22). Continuous care allows clients to live more comfortably in their social environment with the knowledge of preventive care, which in turn increases their self-care and self-efficacy, and consequently reduces the readmission of patients. The effectiveness of this model has been confirmed in patients with HF (23), diabetes (24), and myocardial infarction (25). Since the treatment process is long in patients with HF, and it is necessary to continue the post-discharge care process in these patients for effective control of the disease and its possible complications, it seems that the implementation of this model is effective in promoting self-efficacy and reducing readmissions in patients with HF.

Since the number of patients with HF is growing due to the changing age pyramid of society and increasing high-risk behaviors, it is necessary to pay more attention to the empowerment of these patients. Furthermore, promoting patients' self-efficacy behaviors has a positive effect on the self-care behaviors of patients and increases their adherence to treatment and quality of life, and coping with the disease, and reduces the risk of readmission due to recurrence of complications and imposing additional costs on the health system and the patient.

2. Objectives

The present study aimed to investigate the effect of implementing CCM on self-efficacy and readmission of patients hospitalized with HF in two hospitals affiliated to the Zahedan University of Medical Sciences, Iran, in 2021.

3. Methods

The present study was conducted using a quasi-experimental design with two groups and a pretest-posttest procedure. The research population included all patients with class II and III HF admitted to the coronary care unit (CCU), progressive cardiac care unit (PCCU), and internal wards of Ali Ibn Abi Taleb and Khatam Al-Anbia hospitals in Zahedan, Iran, in 2021.

The inclusion criteria were as follows: being in the age range of 25 - 70 years; diagnosis of HF based on clinical symptoms confirmed by a cardiologist, ECG, and echocardiogram (EF < 40%); Class II and III HF based on the New

York Heart Association (NYHA) classification; basic literacy; access and ability to use mobile phones to coordinate training sessions after discharge and follow-up by telephone (once a week until the end of week 12); no history of heart surgery; no other diseases affecting self-efficacy; and self-care ability. Meanwhile, failure to attend more than one training session, heart surgery, myocardial infarction, and patient's refusal to continue cooperation during the research process were the exclusion criteria.

Following the mean and standard deviation of self-efficacy score reported by Akbari et al. (2014) and considering a 95% confidence interval and 95% statistical test power, the sample size was estimated using the following formula:

$$n = \frac{\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta}\right)^2 (S_1^2 + S_2^2)}{(\bar{X}_1 - \bar{X}_2)^2}$$

$$= 25.2$$

Where $Z_{1-\frac{\alpha}{2}} = 1.96$, $Z_{1-\beta} = 1.64$, $S_1 = 1.79$, $S_2 = 1.19$, $\bar{X}_1 = 5.27$, and $\bar{X}_2 = 6.81$.

However, to ensure the sample adequacy and account for the possible dropout rate, the sample size for each group was considered as 35 individuals ($n=70$ in total) (25).

A personal information form was used to assess the patients' age, sex, marital status, education, occupation, primary caregiver, underlying disease, duration of HF, and the number of readmissions following HF. Moreover, the patients' self-efficacy was assessed using the Cardiac Self-Efficacy Scale designed by Sullivan, which is a 16-item tool with a total score on the scale ranging from 0 to 64. The items are scored on a Likert scale from 0 to 4 (0 = not at all confident, 4 = completely confident), with higher scores indicating higher self-efficacy and vice versa (26). The validity of the scale and its reliability with Cronbach's alpha (0.97) were confirmed by Shamsizadeh (27). The reliability of the scale in the present study was calculated to be 0.85 using Cronbach's alpha. Besides, the number of elective or emergency readmissions due to heart problems during the study period until the end of the week 12 and after the study was evaluated and recorded in the information form.

After obtaining permission from the ethics committee and receiving a letter of introduction from the Vice-Chancellor for Research and Technology, the researcher referred to Ali Ibn Abi Talib and Khatam Al-Anbia hospitals in Zahedan and obtained permission from the managers of the hospitals to attend the CCU. Also, the necessary arrangements were made with the officials of CCU, PCCU, and internal wards.

The patients were selected using convenience sampling. To this end, first, the patients with HF who met the

inclusion criteria were identified. Informed written consent was obtained from the patients after explaining the goals of the study and the reasons for the intervention program. The selected patients were divided into two intervention and control groups using limited randomization based on the random allocation rule. First, 70 color cards (equal to the number of patients) specifying group membership (red cards for the intervention group and white cards for the control group) were prepared. Then, each patient was placed in either control or intervention group based on the color of a card taken out of a container. After the allocation of the patients to the two groups, the CCM was implemented for the patients in the intervention group through the four steps of orientation, sensitization, control, and evaluation (Table 1). The instructional content of the intervention program was prepared based on a review of the latest articles and books and in cooperation with subject-matter experts (28-31).

The intervention program was conducted in six sessions that started 24 hours after the patient's hospitalization. To this end, an individual face-to-face session was held daily for each patient (due to the COVID-19 pandemic) without any time constraints until the patient, and the primary caregiver have a correct understanding of the instructions offered in the session. If all the six training sessions were not held at the time of the patient's hospitalization, two sessions were held per week (on two consecutive days) after discharge in the hospital or a health center near the patient's residence place or at the patient's home. Some questions were asked at the beginning of each session to assess the extent to which the patients had learned the instructions offered in the previous session and also help them to learn the instructions profoundly. The covered instructions were repeated if needed to help the patient resolve any ambiguity and problem and learn the materials perfectly. Some materials were also instructed in the form of lectures. Upon the completion of the training sessions, a training package (a pamphlet confirmed by a cardiologist) was given to each patient. Finally, the items in the Cardiac Self-Efficacy Scale were completed as the post-test by all patients after the last session.

The main caregiver was a family member who was directly responsible for the care, coordination, and follow-up of the patient's treatment process; the caregiver could read and write and answer the researcher's phone calls in the follow-up stage. If any patient in the intervention group was hospitalized during the study, the intervention plan continued, and the patient was not excluded from the study.

The patients in the control group received only routine treatments and care, and no intervention was performed on them. The post-test was also administered to them at

Table 1. The Content of the Continuous Care Model and Steps Taken to Implement It

Steps	Content and Procedure
Orientation	Getting familiar with the patients and caregivers; explaining the objectives of the study; ensuring the confidentiality of the clients' data; encouraging the clients; completing the informed consent forms, the demographic information form, and the items in the Cardiac Self-Efficacy Scale; and recording the clients' addresses and phone numbers; Time: 30 to 45 minutes
Sensitization (goal: sensitizing the patient and caregiver and engaging them in continuous care behaviors)	
Session 1	Discussing the nature of the disease, symptoms, and risk factors
Session 2	Discussing the diagnosis process, complication, the importance of taking the prescribed medication, and how to keep and store medications (question and answer)
Session 3	Discussing the effectiveness of physical activity in treating the disease
Session 4	Discussing the importance of dietary instructions and regular medical visits
Session 5	Controlling risk factors such as weight and hypertension, and how to stop smoking
Session 6	Controlling stress, anxiety, and sexual issues
Control (goal: institutionalizing health-promoting behaviors)	One week after the end of the sensitization step (completion of the training sessions), follow-up was done by phone once a week continuously until the end of the week 12. The patients' behavior and way of applying the instructions were monitored through telephone calls. Telephone follow-ups were performed following the client's needs after ensuring the existence or absence of previous problems. The occurrence of any new problems was examined, and educational and consulting measures were taken for any particular problem until the problem was resolved and effective care behavior was established. The care process was controlled dynamically.
Evaluation	As the last stage of the continuous care model, the care process and the level of changes were reviewed and evaluated. The patient's behavior and the impact of the training program were monitored and controlled. The existing problems and the incidence of a new problem were assessed. The items in the Cardiac Self-Efficacy Scale were completed by the patients in both groups. The collected data were analyzed at the end of the week 12 in both groups.

the same time it was given to the patients in the intervention. To comply with ethical considerations, the instructions offered during the intervention programs were made available for the patients in the control group. The collected data were analyzed with SPSS software (version 22) using chi-square test, independent and paired samples *t*-test, and analysis of covariance (ANCOVA) at the significance level of $P < 0.05$.

Goal: Institutionalizing health-promoting behaviors. One week after the end of the sensitization step (completion of the training sessions), follow-up was done by phone once a week continuously until the end of the week 12. The patients' behavior and way of applying the instructions were monitored through telephone calls. Telephone follow-ups were performed following the client's needs after ensuring the existence or absence of previous problems. The occurrence of any new problems was examined, and educational and consulting measures were taken for any particular problem until the problem was resolved and effective care behavior was established. The care process was controlled dynamically.

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4. Results

Data analysis showed no significant difference between the two groups in terms of age ($P = 0.21$). As can be seen in Table 2, the patients in the intervention and control groups did not show any statistically significant differences in terms of other demographic characteristics such as occupation, education, marital status, gender, underlying diseases, and type of caregiver ($P > 0.05$).

The data in Table 3 indicate that the mean of the patients' self-efficacy score in the intervention and control group significantly increased after the intervention ($P = 0.001$). The results of independent samples *t*-test showed that the mean scores of self-efficacy for the patients in the intervention and control groups before the continuous care were not significantly different ($P = 0.1$), but the self-efficacy scores were significantly greater after the implementation of the CCM in the intervention group compared to the control group ($P = 0.001$). As shown in Table 4, the

Table 2. Comparison of the Demographic Characteristics of the Patients in the Two Groups^a

Variables	Intervention	Control	P-Value
Age (mean $\pm$ SD)	57.11 $\pm$ 9.37	60.03 $\pm$ 10.25	0.21 ^b
Gender			0.47 ^b
Female	17 (48.6)	14 (40)	
Male	18 (51.4)	21 (60)	
Education			1 ^c
Middle school	24 (68.6)	24 (68.6)	
Diploma and higher education	11 (31.4)	11 (31.4)	
Marital status			0.25 ^c
Single	6 (17.1)	10 (28.6)	
Married	29 (82.9)	25 (71.4)	
Occupation			0.33 ^c
Employed	17 (48.6)	13 (37.1)	
Unemployed	18 (51.4)	22 (62.9)	
Underlying disease			0.75 ^c
Yes	29 (82.9)	28 (80)	
No	6 (17.1)	7 (29)	
Main caregiver			0.81 ^c
Children	19 (54.3)	20 (57.1)	
Others	16 (45.7)	15 (42.9)	

^a Values are expressed as No. (%).^b Independent samples t-test^c Chi-square test

results of ANCOVA to control the significant effect of pre-test scores showed that the mean self-efficacy scores of patients with HF were significantly different between the two groups after implementing the continuous care program ($P = 0.001$).

The results of the study concerning the frequency of readmissions in patients with HF showed that the number of readmissions in the control group (1.03 ± 1.01) was significantly higher than the frequency of readmissions in the intervention group (34.68 ± 0.68) ($P = 0.001$).

5. Discussion

The results of the present study showed that the implementation of the CCM was effective in increasing the self-efficacy of patients with HF. Consistent with this finding, Ghaem Maghami et al. found that the implementation of a family-centered self-care program during discharge and afterward led to increased self-efficacy and health literacy in patients with acute coronary syndrome in the intervention group compared to the control group (32). Similarly, Shim

et al. examined the long-term effects of nurse-led individualized education on middle-aged patients with acute coronary syndrome and showed that educating middle-aged patients with acute coronary syndrome at discharge by nurses significantly improved their self-efficacy and self-care behaviors (33). Furthermore, Moradi et al., in a quasi-experimental study, showed that the implementation of the CCM significantly improved the self-care management score in the intervention group compared to the control group (34). In another study, Aghamohammadi et al. showed that the implementation of self-management programs improved the self-efficacy of the elderly with HF (35). Navidian et al. showed that education and self-care promotion programs improved the knowledge, awareness, and self-care behaviors of patients with HF (36). Chainani-Wu et al. also showed that educational interventions and continuous care improved lifestyle and increased the physical activity of heart patients (37). Implementing the CCM creates a sense of emotional and social support in patients with HF, leading to better acceptance of the treatment process in these patients. Consequently, the acceptance of the disease and the development of a sense of self-efficacy in self-care along with a sense of necessary support might reduce the physical and mental problems of patients with HF. As a result, the patients may enjoy a better social life, self-care, and self-efficacy.

The findings of this study showed that the implementation of the CCM led to a significant reduction in readmission during the three months in the intervention group compared to the control group. In a similar vein, Delaney et al. found that telemonitoring and self-care training could be effective in reducing the frequency of readmissions in patients with HF (38). Furthermore, Azizi et al. showed that the teach-back training approach reduced the number of readmissions in patients with the acute coronary syndrome. Moreover, Shojaee et al. assessed the effect of patient education and telephone follow-up by nurses on readmissions of the patients with HF and showed that readmissions in the intervention group significantly decreased within three months after the intervention (39). This finding was consistent with the findings of the present study. Although the training method was different from the model used in the present study, the data confirmed the positive effect of patient education on their readmissions. The data in the present study confirmed the positive impact of the CCM on the improvement of self-care, and consequently the number of readmissions. A cross-sectional study by Shahbaz et al. showed that the self-care behaviors of most patients were not of good quality and there was an inverse relationship between self-care behaviors and readmission (7). It seems that improving continuous care reduces the possibility of

Table 3. Comparison of the Self-efficacy Scores of the Patients in the Two Groups

Group	Stage			P-Value
	Pre-intervention	Post-intervention	Changes	
Intervention	38.77 ± 11.61	61.80 ± 9.74	23.03 ± 10.11	0.001 ^a
Control	34.74 ± 12.60	38.51 ± 8.99	3.77 ± 4.26	0.001 ^a
P-value	0.1 ^b	0.001 ^b	0.001 ^b	

^a Paired samples *t*-test^b Independent samples *t*-test**Table 4.** The ANCOVA Results for the Patients' Self-efficacy Scores After Implementing the Continuous Care Model

Source of Changes	Sum of Squares	df	Mean Square	F	Effect Size	Test Power	P-Value
Pretest	2850.33	1	2850.33	61.09	0.47	1	0.001
Group	7247.46	1	7247.78	155.3	0.69	1	0.001
Error	3126.01	67	46.65				
Total	191567	70					

readmissions. Brown et al. studied the feasibility of using teach-back to reinforce discharge instructions and its influence on readmission and treatment adherence of patients with HF and showed that the difference in the treatment adherence scores for the patients in the two groups after the intervention was not significant (40). Perhaps the difference between the results reported by Brown et al. and the present study can be attributed to a shorter follow-up period. Boyde demonstrated that multimedia self-care education could be effective in reducing readmission of people with HF (41). In other words, the use of simple and understandable tools and methods in providing education to patients to facilitate their understanding of the self-care and offering practical and necessary instructions can play an important role in reducing readmissions. In the present study, the educational program was implemented with emphasis on the necessary instructions, and combined training was implemented for the patients in a comprehensible way.

Since unawareness of patients with chronic diseases about how to take care of themselves and preventive behaviors is one of the main reasons for the increase in severity and complications of treatment, providing education and information about HF by implementing a continuous care model can increase the sense of self-efficacy in self-care and the sense of control over the disease in these patients, which in turn leads to improved self-care, quality of life, and reduced readmission.

Due to the nature of chronic diseases, in this study, gaining experience in disease management, increasing the number of visits to the doctor, increasing the number of readmission of patients in the control group compared

to the intervention group, and the possibility of receiving training led to a significant increase in self-efficacy in patients in the control group after the intervention.

One of the limitations of this study was that due to the COVID-19 outbreak, training sessions were conducted individually instead of in groups following health protocols.

5.1. Conclusions

The results of this study showed that the implementation of the CCM was effective in reducing readmission cases and increasing the self-efficacy of patients with HF. Overall, it can be concluded that the application of the CCM for patients with HF is a necessity and it can improve all aspects of their lives, and consequently lead to improved patient self-efficacy. Thus, considering the increase in the number of patients with HF in Iran in recent years and the ease, applicability, and low cost of this intervention strategy, relevant authorities need to make effective planning and policies to implement the CCM for patients with HF.

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Footnotes

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