Original Article

Effect of Home Care Program on Re-hospitalization in Advanced Heart Failure: A Clinical Trial

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Abstract

Background: Heart failure is the leading cause of readmission in all medical and surgical patients. Home care studies have reduced hospitalization in heart failure. This study aimed to investigate the effect of home care program on readmission in advanced heart failure. **Materials and Methods:** The study was a randomized clinical trial conducted at the Rajaie Cardiovascular, Medical and Research Center from September 2017 to March 2018. Ninety-eight patients with advanced heart failure were selected using census method and were randomly divided into experimental and control groups. For the experimental group, the home care program was implemented for 6 months. The date and frequency of hospitalization were recorded during 30, 90, and 180 days before and after the home care program. The quantitative data analysis was performed using Mann–Whitney and Wilcoxon's signed-rank tests and qualitative data analysis was performed using the Chi-square test. **Results:** The number of hospitalization and length of hospital stay 30, 90, and 180 days after implementation of the home care program in the experimental group was significantly less than the control group ($p < 0.001$). The number of hospitalizations and length of stay in the experimental group decreased significantly after the program ($p < 0.001$). In the control group, 90 days after the intervention, the number of hospitalizations ($p = 0.013$) and length of stay increased significantly ($p < 0.001$), and 180 days after the intervention, increased significantly ($p < 0.001$). **Conclusions:** The implementation of a designed home care program reduces readmission and the length of hospital stay in advanced heart failure.

Keywords: *Heart failure, home care services, hospitalization, patient readmission*

Introduction

Heart failure is the most common reason for readmission of all medical and surgical patients.[1] According to the American Heart Association, the prevalence of heart failure is estimated at 5.7 million and about 1 million hospitalizations are due to heart failure.[2] According to scarce literature, heart failure prevalence in Asia seems to be rather similar compared to western countries, which ranges between 1 and 1.3%.[3] Heart failure is the leading cause of hospitalization in people over 65, leading to 6.5 million days of annual hospitalization in the United States.[4] Of the 1 million heart failure patients admitted to the US hospitals each year, an average of 18, 50, and 60% of these patients are readmitted within 30 days, 6 months, and 9 months. The studies have shown that up to 70% of the readmissions to heart failure can be prevented if the patients have self-management skills.[5] In western countries, 1–2% of the total annual care costs are related to the care of patients with heart failure. Most of these costs are due to hospitalization.[6] Heart failure has a heavy financial burden on the health care system and communities.[7] Due to the high prevalence of chronic heart failure and problems related to the high rate of readmission, it is necessary to identify the factors associated with the high readmission and develop strategies to reduce the risk of readmission among the high-risk groups.[2]

The reasons for readmission are worsening of symptoms, disease progression, psychosocial issues, inadequate self-care, and inadequate knowledge of how to seek help. Therefore, it is necessary to pay attention to the physical, mental, and spiritual needs of the patients with advanced heart failure to facilitate a better discharge from hospital to home for these patients.[8] Studies of heart failure have shown that nursing-supervised training and follow-up programs improve patients'

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self-care behaviors and their ability to follow, adhere to treatment, improve their quality of life, increase their knowledge of the disease, and reduce the incidence of readmission.[9] In recent years, the rate of readmission has become an indicator of the quality of hospital care. Today, due to the importance of this issue, reducing hospitalization is a major challenge for health care managers as well as those in Iran.[10] Organizing care for heart failure patients has dramatically changed in recent years with the introduction of heart failure management programs. Outpatient care has also been developed and is mostly provided in the patients' homes. Studies of home care for patients with heart failure under the supervision of nurses have yielded positive results and significantly reduced hospitalization.[11]

As heart failure progresses to the end stage, it becomes difficult to maintain the quality of life by treating patients. Innovation in home care for patients with heart failure is essential with an emphasis on quality of life and early intervention.[12] Further research is needed to determine the best performance of home and hospital care services.[13] Redesigning care systems with the goal of evidence-based clinical practice can improve the clinical outcomes of the patients with heart failure who have high readmission and mortality. Clinical guidelines suggest evidence-based practice to improve patient outcomes, but little evidence is available. More research is needed to improve the outcomes of heart failure patients and reduce readmission.[14] Home care is offered in different forms in different countries of the world and the meaning of "home care" varies in different countries. Health systems need to design home care guidelines to get the most out of them.[15]

In view of the above and the insufficiency of research in the field of home care, the research team decided to implement a home care program designed by them to change the care of patients with heart failure and assess its impact on the readmission rate. If effective, it can be used to provide the best possible care for heart failure patients and reduce the rate of readmission, and thus, the bed occupancy rate. Therefore, this study was conducted to assess the effect of home care program on re-hospitalization in advanced heart failure.

Materials and Methods

The study was a clinical trial (IRCT20190205042636N2) conducted at the Rajaie Cardiovascular Medical and Research Center from September 2017 to March 2018. It is one of the largest heart hospitals in Asia and a referral center for cardiovascular diseases throughout the country. In this study, patients with heart failure, who met the inclusion criteria and signed written consent, were selected to participate in the study. First, 102 advanced heart failure patients were enrolled by the census sampling method in 2 months from September to October 2017 in the study. After applying the inclusion criteria, 98 patients were randomly assigned to the experimental (n = 50) and control (n = 48) groups. During the study, seven patients from the experimental group died and three patients withdrew from the study. Eight patients in the control group died during the study. Finally, the study continued with 40 patients in the experimental group and 40 patients in the control group and their results were analyzed [Figure 1]. The blocking method was used for random assignment to the control or experimental groups. For this purpose, 17 blocks with size 6 in which letter A means experimental and letter B means the control group, were used. The inclusion criteria included patients hospitalized in one of the wards of the hospital with a diagnosis of advanced heart failure, Left Ventricular Ejection Fraction (LVEF) ≤30%, having class III–IV symptoms of heart failure according to the New York Heart Association (NYHA) classification, have been hospitalized more than once in the last 6 months, of 18 years of age or older, consented to participate in the study, living in Tehran, no history of heart surgery in the last 8 weeks, no history of myocardial infarction or cardiogenic shock in the last 4 weeks, did not need dialysis, and having no severe cognitive impairment nor severe chronic disease. The exclusion criterion was the patient's unwillingness to continue participating in the study.

The home care program was implemented for 6 months for the experimental group. It was designed based on the literature review, clinical guidelines for heart failure and home care, and consultation with specialists during three expert-panel sessions with the presence of a researcher, two hospital managers, two supervisors, two doctors,

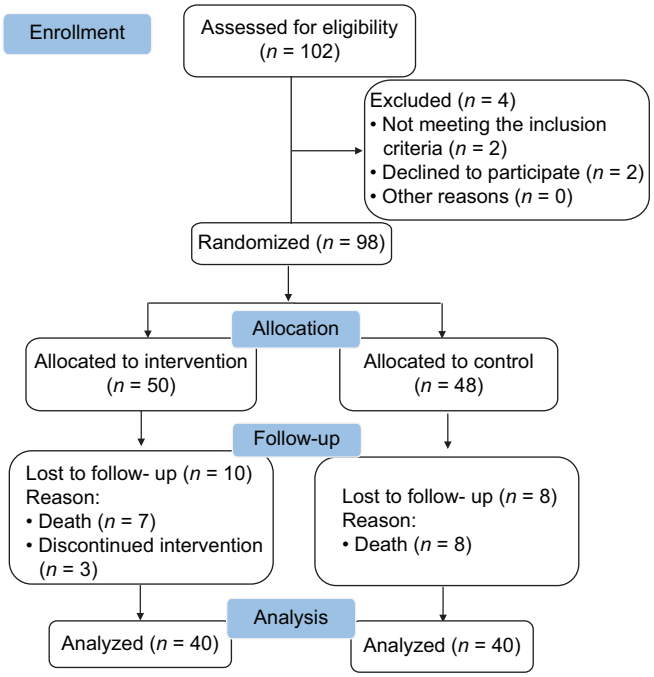

Figure 1: The flowchart of the study's inclusion, allocation, and follow-up phases.

and four nurses. Four nurses were selected from hospital wards to participate in the study by members of expert panels. The researcher, as the coordinator of the home care program, called the patients 24 h after discharge and coordinated a home visit for the next 24–48 h. Then, the nurses went to the patients' homes to provide care according to the nursing process and the physician's instructions. The nurses participating in the study visited the patients' homes once every 2 weeks, and in between the home care session intervals, the patients were followed up by telephone every 3 days. At each visit to the patients' home, the patients' health status form was completed by the nurses at home, and physical exam results, vital signs, functional class of heart failure, nursing diagnoses based on patient assessment, and reports were recorded. The home care program performed at home included implementation of care program based on the nursing process, assessment of treatment adherence, educating the patient and family or the patient's caregiver, prescribing and adjusting medications, implementing the medication order (injection of drugs prescribed by the doctor), blood sampling, taking telephone instructions from the treating physician if needed, providing the patient and family with the caregiver nurse's contact information to call for a consultation if needed. In case of patient contact, the nurse in charge of home care was obliged to inform the patient's physician as soon as possible if necessary. Also, if the patient needed a blood test, the results of the tests were followed up by the researcher and provided to the treating physician, and if there was a problem in the tests, necessary action was taken. No cost was charged to the patient for these procedures.

In the control group, all steps and measurements were the same except for the home care program. First, the demographic questionnaire was completed for all the patients, and then, the number of hospitalization and length of hospital stay of the heart failure patients during 30, 90, and 180 days before and after the home care program was recorded and compared in both groups. Quantitative data analysis was performed using the Mann–Whitney and Wilcoxon's signed-rank tests and qualitative data analysis was performed using the Chi-square test. The significance level was considered less than 0.05 and analysis was performed in the SPSS software version 16 (SPSS for Windows, version 16.0. Chicago, SPSS Inc.).

Ethical considerations

This study was approved by the Medical Ethics Committee of the Rajaie Cardiovascular Medical and Research Center (RHC.AC.IR.REC.1396.36). First, permission to conduct research was obtained from the ethics committee, and after obtaining permission and identifying the eligible participants, informed and written consent was obtained from them to take part in the study, and the confidentiality of the information was emphasized. The participants were assured that they had the right to withdraw from the study at any stage of the research.

Results

Out of the 80 patients participating in the study in the experimental and control groups, 47 patients (58.80%) were males and 29 patients (36.30%) were between 61 and 70 years. The education of 38 patients (47.70%) was below diploma; 10% were single; 67.50% were married; and 22.50% had lost their spouse. Among them, 37 patients (46.30%) were homemakers or unemployed. About 10% of the patients lived alone while 90% lived with family or spouse. Twenty-one patients (26.30%) had no other underlying disease while 59 patients (73.70%) had at least one underlying disease and the most underlying disease was related to diabetes. The cause of heart failure in 20% of the patients was ischemic cardiomyopathy, 28% dilated cardiomyopathy, 10% valvular heart disease, 40% ischemic cardiomyopathy with valvular heart disease, and 2% hypertensive cardiomyopathy. The experimental and control groups were homogeneous in terms of all demographic characteristics except education and there was no statistically significant difference between the two groups [Table 1]. There was a statistically significant difference between the two groups in terms of education ($p = 0.005$). The level of education of the experimental group was lower than the control group. So, the education of the majority of the experimental group (60%) was below diploma while half of the control group (50%) had a diploma. Also, 15% of the illiterate people were in the experimental group and 2.50% were in the control group. In terms of ejection fraction, the two groups of control and experiment were homogeneous ($p = 0.749$). There was no statistically significant difference in the duration of the disease between the groups ($p = 0.701$). In general, the two groups were clinically similar.

Table 2 shows a comparison of the number of hospitalizations and length of hospital stay before and after the implementation of the home care program between the experimental and control groups. Before the implementation of the program, the experimental and control groups did not have a statistically significant difference in terms of the frequency and length of hospital stay 30 and 90 days before the intervention. One hundred and eighty days before the intervention, the two groups did not have a significant difference in the number of hospitalizations, but the experimental group had a longer hospital stay 180 days before the intervention than the control group ($p = 0.035$). The results of the study show that after the implementation of the home care program, the number of hospitalization and hospital stay 30, 90, and 180 days after the intervention in the experimental group was less than the control group and a statistically significant difference was observed between the groups ($p < 0.001$).

Table 3 shows the in-group comparison of the experimental group in terms of the number of hospitalization and length of hospital stay 30, 90, and 180 days before and after the implementation of the home care program. The number of hospitalizations and hospital stay in the experimental group decreased significantly after the program ($p < 0.001$).

Table 1: Demographic characteristics of the patients (n=80)

Group Demographic changes	Experiment (n=40) n (%)	Control (n=40) n (%)	p*
Gender			
Female	18 (45%)	15 (37.50%)	0.496
Male	22 (55%)	25 (62.50%)	
Age			
31-40	1 (2.50%)	8 (20%)	0.14
41-50	3 (7.50%)	4 (10%)	
51-60	10 (25%)	6 (15%)	
61-70	14 (35%)	15 (37.50%)	
71-80	7 (17.50%)	5 (12.50%)	
81-90	5 (12.50%)	2 (5%)	
Education			
Illiterate	6 (15%)	1 (2.50%)	0.005
Below diploma	24 (60%)	14 (35%)	
Diploma	7 (17.50%)	20 (50%)	
Bachelor's degree	2 (5%)	5 (12.50%)	
PhD	1 (2.50%)	0	
Marital status			
Single	1 (2.50%)	7 (17.50%)	0.081
Married	29 (72.50%)	25 (62.50%)	
Widowed	10 (25%)	8 (20%)	
Occupation			
Unemployed	18 (45%)	19 (47.50%)	0.317
Clerk	0	3 (7.50%)	
Self-employed	3 (7.50%)	5 (12.50%)	
Retired	17 (42.50%)	12 (30%)	
Disabled	2 (5%)	1 (2.50%)	
Living condition			
Alone	4 (10%)	4 (10%)	0.862
With spouse	8 (20%)	10 (25%)	
With Family	28 (70%)	26 (65%)	

*Chi-square test

Table 4 shows the in-group comparison of the control group in terms of the number of hospitalizations and hospital stay 30, 90, and 180 days before and after the implementation of the home care program. The number of hospitalizations in the control group 30 days before and after the program was not statistically significant ($p = 0.476$). The length of hospital stay in the control group 30 days before and after the intervention was not statistically significant ($p = 0.067$). The number of hospitalizations 90 days before and 90 days after the intervention in the control group was statistically significant ($p = 0.013$) so the number of hospitalizations increased 90 days after the program. The length of hospital stay in the control group 90 days after the intervention increased significantly compared to the previous 90 days ($p < 0.001$). Also, comparing the number of hospitalizations and hospital stay in the control group 180 days before and after the home care program showed that 180 days after the intervention, the readmission and hospital stay in the control group increased significantly ($p < 0.001$).

Discussion

The study aimed to investigate the effect of home care program on the re-hospitalization of patients with advanced heart failure. The results of the study showed that the implementation of home care program reduced the number of readmissions and length of hospital stay. In this regard, the results of a study showed that readmission and mortality of the elderly patients with heart failure decreased after discharge and follow-up program at home in the experimental group and the time interval between discharge and hospitalization increased,[16] which is similar

Table 2: Comparison of the number of hospitalizations and hospital stay of heart failure patients before and after the implementation of home care program between the experimental and control groups

	Experiment (n=40) Median (IQR*)	Control (n=40) Median (IQR)	p**
Number of hospitalizations 30 days before intervention	1 (1-1)	1 (1-2)	0.16
Number of hospitalizations 30 days after intervention	0 (0-0)	1 (1-2)	<0.001
Number of hospitalizations 90 days before intervention	1 (1-2)	2 (1-3)	0.085
Number of hospitalizations 90 days after intervention	0 (0-1)	3 (2-4)	<0.001
Number of hospitalizations 180 days before intervention	2 (2-3)	2 (1-4)	0.575
Number of hospitalizations 180 days after intervention	0 (0-1)	4 (3-5)	<0.001
Length of hospital stay (days) 30 days before intervention	6 (3-9.75)	5 (3-8)	0.199
Length of hospital stay (days) 30 days after intervention	0 (0-0)	4.5 (2-11.75)	<0.001
Length of hospital stay (days) 90 days before intervention	9 (5-17.50)	9 (6-12.75)	0.791
Length of hospital stay (days) 90 days after intervention	0 (0-2.75)	16 (10-24)	<0.001
Length of hospital stay (days) 180 days before intervention	16 (8.25-22)	10 (6-14.75)	0.035
Length of hospital stay (days) 180 days after intervention	0 (0-6.75)	20.5 (14.50-31)	<0.001

*Interquartile range. **Mann–Whitney test

Table 3: Comparison of the number of hospitalizations and hospital stay of heart failure patients before and after the implementation of the home care program in the experimental group

Variable	Measuring Status	Median (IQR*)	*p***
Number of hospitalizations 30 days before and after intervention	Before intervention	1 (1-1)	<0.001
	After intervention	0 (0-0)	
Number of hospitalizations 90 days before and after intervention	Before intervention	1 (1-2)	<0.001
	After intervention	0 (0-1)	
Number of hospitalizations 180 days before and after intervention	Before intervention	2 (2-3)	<0.001
	After intervention	0 (0-1)	
Length of hospital stay 30 days before and after intervention	Before intervention	6 (3-9.75)	<0.001
	After intervention	0 (0-0)	
Length of hospital stay 90 days before and after intervention	Before intervention	9 (5-17.50)	<0.001
	After intervention	0 (0-2.75)	
Length of hospital stay 180 days before and after intervention	Before intervention	16 (8.25-22)	<0.001
	After intervention	0 (0-6.75)	

*Interquartile range. ** Wilcoxon's signed-rank test

Table 4: Comparison of the number of hospitalizations and hospital stay of heart failure patients before and after the implementation of home care program in the control group

Variable	Measuring Status	Median (IQR*)	*p***
Number of hospitalizations 30 days before and after intervention	Before intervention	1 (1-2)	0.476
	After intervention	1 (1-2)	
Number of hospitalizations 90 days before and after intervention	Before intervention	2 (1-3)	0.013
	After intervention	3 (2-4)	
Number of hospitalizations 180 days before and after intervention	Before intervention	2 (1-4)	<0.001
	After intervention	4 (3-5)	
Length of hospital stay 30 days before and after intervention	Before intervention	5 (3-8)	0.067
	After intervention	4.5 (2-11.75)	
Length of hospital stay 90 days before and after intervention	Before intervention	9 (6-12.75)	<0.001
	After intervention	16 (10-24)	
Length of hospital stay 180 days before and after intervention	Before intervention	10 (6-14.75)	<0.001
	After intervention	20.5 (14.50-31)	

*Interquartile range. ** Wilcoxon's signed-rank test

to the present study. Early readmission after discharge from hospital usually indicates inadequate hospital treatment, poor coordination of services or programs at discharge, or inadequate access to care and follow-up after discharge.[17] Also, a study reported that home care intervention reduced the length of hospital stay and the annual number of admissions.[18] In another study, telephone follow-up and home visit intervention were performed for 9 weeks and reduced the symptoms of the disease and readmission, and increased patients' quality of life.[19] In the present study, the patients were followed up after discharge through telephone follow-up and home care for 6 months.

Frequent hospitalizations of heart failure patients are a challenge for the elderly, and multidisciplinary measures such as patient education, home care, and physician training reduce the hospitalization of elderly patients with heart failure.[20] The results of a study showed that the nursing follow-up and care program conducted by nurses in the outpatient clinic for heart failure patients increased self-care and quality of life. Also, the readmission of the experimental group was reduced 3 months after the intervention. But there was no difference in the readmission between the groups 6 months later.[9] However, in the present study, the readmission of the patients decreased both in the short-term (30 days after the program) and in the long-term (90 and 180 days after the program).

The researchers examined the readmission of the patients with heart failure, myocardial infarction, and pneumonia 30 days after discharge in a study between 2007 and 2009. The results showed that the hospitals that were less willing to follow-up on the heart failure patients within 7 days of discharge had the highest readmission rate 30 days after discharge. Most patients, in addition to the initial visit and follow-up after discharge, needed longer attention and follow-up.[21] The results of the present study also showed that since the home care program was implemented, the readmission of the patients in the experimental group was less than the control group in the short-term and long-term. Since the home care program of the present study was implemented for 6 months, it can be concluded that

frequent and long-term follow-up has reduced short-term and long-term readmission.

The important point of the present study was a long-term follow-up of heart failure patients after hospital discharge. One of the limitations of our study is a lack of financial resources. We would recommend future cost-effective studies on the feasibility of home care provision through insurance.

Conclusion

The results of the study showed that the implementation of home care program reduced the number of readmissions and length of hospital stay of the patients in the experimental group in the short-term (30 days after the intervention) and long-term (90 and 180 days after the intervention) compared to the control group.

Also, the comparison of readmission and length of hospital stay in the control group before and after the program showed that the condition of the control group did not change 30 days before and after, but in the long run (90 and 180 days after the intervention), their condition not only did not improve but also worsened, so that readmission and hospital stay increased more than before the study. Therefore, the home care program has reduced the readmission and length of hospital stay, and based on the results of the study, it can be said that a continuous follow-up of the heart failure patients is necessary to reduce readmission.

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Conflicts of interest

Nothing to declare.

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