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Effect of a nurse-led follow-up program on the health-related quality of life among patients with heart failure: A randomized clinical trial

Reza Rahimi, Mostafa Amiri¹, Fatemeh Mohammadzadeh², Masoumeh Amirideli, Elham Saberi Nougabi

Abstract:

BACKGROUND: Cardiovascular disease is the leading cause of death worldwide. One of the primary consequences of heart failure is the decline in patients' functional abilities and quality of life. This study investigated the effect of a nurse-led follow-up program on the quality of life among patients with heart failure.

MATERIALS AND METHODS: In this randomized-clinical trial, 88 eligible patients with heart failure were selected using purposive sampling. Patients were randomly assigned to either an experimental group or a control one. Data collection tools included a demographic questionnaire, the New York Heart Association functional classification tool, and a standardized chronic heart failure and quality of life questionnaire. The experimental group received telephone follow-ups 3 to 7 days postdischarge, guided by a checklist from the Iranian Ministry of Health. The follow-up frequency ranged from 3 days to 3 months after discharge. The control group received only standard follow-up care. Data were analyzed using independent sample *t*-test, Mann–Whitney U test, Chi-square test, Fisher's exact test, and multiple linear regression via SPSS software, V.21. The significance level was set at $P < 0.05$.

RESULTS: Linear regression analysis showed no statistically significant difference in the mean quality of life scores between the experimental and control groups before the intervention ($P = 0.53$). However, after the intervention, a significant difference was observed ($P = 0.02$).

CONCLUSION: The findings demonstrate the positive effect of the nurse-led follow-up program on the quality of life for patients with heart failure. Further multicenter studies with larger sample sizes are recommended to validate these results and provide stronger evidence.

Keywords:

Follow-up program, heart failure, health-related, nurse-led, quality of life

Introduction

Among chronic diseases, cardiovascular diseases are seeing a growing incidence and prevalence, with the number of affected individuals continuing to rise.^[1] According to a report from the World Health Organization, heart diseases are the leading cause of death worldwide, with 82% of these fatalities occurring in developing

countries.^[2] The costs associated with hospitalization and treatments for these diseases are substantial, creating significant challenges for healthcare systems. Heart diseases are regarded as an epidemic, and by 2020, they were identified as the most critical cause of mortality, morbidity, disability, and economic burden.^[3] Studies indicate that over 37 million Americans are affected by some form of cardiovascular disease, leading to around 1.2 million deaths each

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Department of
Community Health
Nursing and Nursing
Management, School
of Nursing, Gonabad
University of Medical
Sciences, Gonabad,
Iran, ¹Department of
General Course and
English Language, School
of Medicine, Mashhad
University of Medical
Sciences, Mashhad,
Iran, ²Department of
Epidemiology and
Biostatistics, School
of Health, Social
Development and Health
Promotion Research
Center, Gonabad
University of Medical
Sciences, Gonabad, Iran

Address for correspondence:

Dr Elham Saberi Noughabi,
Department of
Community Health
Nursing and Nursing
Management, School
of Nursing, Gonabad
University of Medical
Sciences, Gonabad, Iran.
E-mail: saberi.e@
gmu.ac.ir

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year and 3.7 million disabilities, resulting in annual costs amounting to millions of dollars.^[4]

Heart failure is one of the most prevalent cardiovascular disorders, which is recognized as a chronic, progressive, and debilitating condition. The incidence of this disease is on the rise, and predictions suggest that its prevalence will increase by 25% by 2030.^[2] Contributing factors to this increase include the aging population in industrialized and developed countries, the prevalence of diabetes and hypertension, rising obesity rates, improved survival rates following heart attacks, and efforts to prevent sudden deaths.^[5] Furthermore, findings from Heidarzadeh *et al.*^[6] indicated that 49.6% of patients with congestive heart failure had an unfavorable quality of life, which was significantly different from that of healthy individuals. Additionally, reports from the United States indicate that 7.3% of all deaths caused by cardiovascular diseases are related to heart failure,^[7] and one out of every eight deaths in America is due to heart failure.^[8] Besides, studies have shown that heart failure is one of the main causes of high mortality in Iran, with published statistics revealing that about 25% of patients hospitalized in cardiology departments are patients with heart failure.^[9]

The complications and limitations associated with heart failure result in a lower quality of life for these patients compared to the general adult population and individuals with other chronic diseases.^[10] Financial and economic factors, as well as the income levels of affected individuals, also significantly influence their quality of life. Additionally, the interventions and services provided by healthcare professionals play a crucial role in improving the quality of life for these patients.^[11] On the other hand, a decline in quality of life is linked to an increased likelihood of hospitalization and mortality.^[12] The imposed restrictions make it challenging for the patient to fulfill job responsibilities, engage with family, and maintain a social life, leading to social isolation and depression. In this context, Nesbitt *et al.*^[13] reported low quality of life among 612 patients with heart failure in their study. Similarly, a study by Shojaei *et al.*^[14] showed that 76.4% of heart failure patients experienced an unfavorable quality of life.

Patients with heart failure are often left in the community after discharge, and their care is not adequately managed, as evidenced by rehospitalization and the need for more invasive interventions such as surgery.^[15] In the new era, prioritizing prevention and empowering individuals to improve their health is a key focus of health policies worldwide. The ultimate goal of these services is to enhance the quality of life and promote public health. Therefore, providing care and educational services to individuals is of particular importance.^[16] The

most significant challenges in the follow-up of chronic patients after discharge include nonadherence to treatment, low health literacy, insufficient family involvement, failures in the discharge follow-up system, insufficient motivation to continue care, the complex nature of the chronic disease, and the ineffectiveness of patient education. For this reason, continuous care and follow-up for these patients are crucial for improving their quality of life.^[17]

Considering the high and growing prevalence of heart failure and its chronic nature, the follow-up method should be cost-effective and applicable to a large number of patients. Today, the use of telephone follow-up has enabled nurses to perform various actions, such as monitoring patients, providing training, collecting information, implementing nursing interventions, controlling disease severity, and supporting patients' families.^[18] Based on this, to realize a comprehensive health approach, improve the quality of life, enhance health levels, prevent issues at different levels, promote health-related behaviors, foster independence in self-care, increase cost-effectiveness, ensure continuity of care, respond to possible questions and needs of patients, and increase the effectiveness of nursing care, a new model titled 'Nurse-led follow-up' has been announced by the Iranian Ministry of Health. This model follows up with patients using a different method that has been less utilized in past studies.^[17]

This guideline is currently being tested as a pilot program, and if successful, it will be rolled out to all hospitals and applicable to all diseases following hospital policies. Unlike the models used in previous studies, which were researcher-developed methods, the follow-up model will be implemented according to the new guidelines issued by the Iranian Ministry of Health. So, the study evaluated the effectiveness of the nurse-led follow-up plan on the quality of life of patients with heart failure.

Materials and Methods

Study design and setting

This study was a randomized and controlled clinical trial conducted at the nursing training and patient follow-up clinic at Bohlool Gonabadi hospital, Gonabad, Iran, in 2023. The participants included individuals diagnosed with heart failure by a cardiologist and discharged from the hospital.

Study participants and sampling

The minimum sample size was initially determined to be 38 patients per group using G.Power 3.1.9.2 software, based on the sample size formula for comparing means between two groups, considering a Type I error rate

of 0.05, a test power of 0.80, the values of $\mu_1 = 40.92$, $\mu_2 = 61.66$, $\sigma_1 = 22.50$, and $\sigma_2 = 18.82$ from a similar study.^[19] It was then increased to 44 patients per group to account for a 15% attrition rate.

The inclusion criteria were: willingness to participate, age over 18 years, access to a landline or mobile phone, no history of neurological or mental disorders, malignant diseases, and vision and hearing impairments. Exclusion criteria were: experiencing a physical or psychological incident, refusal to continue participation, failure to complete the questionnaires, and unavailability during the follow-up period.

Data collection tool and techniques

The instruments included a demographic questionnaire, the New York Heart Association (NYHA) functional classification scale, and the Chronic Heart Failure Quality of Life Questionnaire (CHFQOLQ-20).

1) Demographic questionnaire: The questionnaire included questions about different factors such as age, sex, education level, marital status, income, occupation, place of residence, underlying diseases, and body mass index.

2) New York Heart Association (NYHA) Functional Classification Tool: This tool is a standard method for assessing functional capacity, illustrating the relationship between performance levels and the presence or absence of cardiac symptoms during normal activities. According to the NYHA classification, individuals are categorized into four groups: Class 1: No restrictions on physical activity; Class 2: Mild limitation of physical activity; there are no issues at rest, but normal physical activity triggers symptoms; Class 3: Significant limitation in physical activity; less activity than usual results in symptoms; and Class 4: Inability to perform physical activities; symptoms are present even at rest.^[20]

3) Chronic heart failure health-related quality of life questionnaire (CHFQOLQ-20): This questionnaire was developed and psychometrically evaluated by Khajavi *et al.*,^[21] in 2023. It consists of 20 items in four dimensions: physical functioning (10 questions), cognitive functioning (4 questions), general health (3 questions), and mental health (4 questions). Responses are scored on a five-point Likert scale, ranging from "not at all" (score of 5) to "very much" (score of 1), reflecting the impact of heart failure on patients' daily lives over the past 4 weeks. The total score ranges from 20 to 100, with higher scores indicating a better quality of life. The content validity of the questionnaire was assessed by 10 experts. Additionally, the internal consistency and test-retest reliability of the CHFQOLQ-20 were found to be satisfactory, with Cronbach's alpha and intraclass

correlation coefficient (ICC) values of 0.93 and 0.84, respectively.

Study procedure

After obtaining approval from the postgraduate education council of Gonabad University of Medical Sciences, registering in the Iranian Registry of Clinical Trials, and receiving a code from the ethics committee of Gonabad University of Medical Sciences, the researcher introduced himself to the hospital's research assistant and other authorities. The study participants were heart failure patients referring to the self-care and follow-up unit of the hospital through the Hospital Information System (HIS). Those who met the inclusion criteria were selected using a purposive sampling method and assigned to either the experimental or control group.

In both groups, the researchers explained the study's objectives and the follow-up process to the patients and their families. Informed consent was obtained, and patients and their families were assured of the confidentiality of their information. The researcher's contact number was made available to the patients for any inquiry. Heart failure patients discharged from the hospital were referred to the nursing education and follow-up clinic at Bohlool Gonabadi Hospital and were entered into the study if they met the inclusion criteria. At the beginning of the study, patients in both groups completed the questionnaires. In the experimental group, telephone follow-ups were conducted according to the ministry of health's checklist, with the first follow-up occurring 3 to 7 days after the discharge. During the telephone calls, the researchers introduced themselves and performed the necessary follow-up based on the checklist. If a patient required additional training, recommendations were provided. In case of necessity, the patients were referred to various support resources, such as outpatient clinics, hospital self-care clinics, health centers, psychologists, addiction and smoking cessation centers, nutritional counselors, and home care services. Follow-ups with these institutions continued until complete assurance of the patient's wellbeing was achieved.

The frequency of follow-up was determined based on the severity of the disease, warning signs, and the area in which patients were categorized, under the doctor's instructions, ranging from 3 days to 3 months after discharge as follows:

In the Green Zone, the patients were followed up once a month; in the Yellow Zone, the patients were followed up once a week; and in the Red Zone, besides recommending an immediate visit to the hospital's emergency room, follow-up calls were made within a maximum of 6 hours. After the discharge, these patients were followed

up twice a week until they were moved to the Green Zone. It is important to note that, to maintain ethical standards, at least one usual follow-up was conducted in the control group. Finally, after the telephone follow-ups, the quality of life questionnaire was administered again to the participants.

Ethical considerations

The research project obtained approval from the Ethics Committee of Gonabad University of Medical Sciences. After registering with the Iranian Registry of Clinical Trials under the code (IRCT20230227057546N1) and obtaining the ethics code from the regional committee (IR.GMU.REC.1401.180), the necessary permissions were secured to conduct the study. The study objectives were clearly explained to all participants, and they were informed of their right to withdraw at any stage. Additionally, the principles of confidentiality and the protection of patients' personal information were upheld.

Statistical analysis method

After collecting the data, they were entered into SPSS software, version 21. The normality of the variables was assessed using the Kolmogorov–Smirnov test. For normally distributed quantitative variables, the mean and standard deviation were calculated, while the median and interquartile range were used for non-normally distributed quantitative variables. Qualitative variables were described using absolute and relative frequencies. The independent sample *t*-test was employed to compare normal quantitative variables between the two groups, while the Mann–Whitney U test was used for non-normal quantitative variables. The Chi-square test was applied to compare qualitative variables between the two groups, provided that the assumptions for the test were met; otherwise, Fisher's exact test was utilized. The effect of the intervention on patients' quality of life was evaluated using linear regression to adjust for potential confounding variables. A significance level of less than 0.05 was considered statistically significant.

Results

In this study, 88 patients with cardiovascular diseases were evaluated in both the experimental and control groups. In the experimental group, two of the participants died, and four were excluded from the study due to not responding to the questionnaires. In the control group, four of the participants were also excluded because they did not complete the questionnaires. The flow diagram of the study is presented in Figure 1.

Based on the descriptive statistics, the median age of the patients in the experimental group was 75 years old (interquartile range = 12.00), while in the control group, it was 70 years old (interquartile range = 23.25).

The majority of participants were women (55%), and the rest (45%) were men.

Regarding the inferential statistics, the statistical analyses including *t*-test, Mann–Whitney U test, and Chi-square revealed no significant differences between the two groups regarding age ($P = 0.145$), sex ($P = 0.350$), marital status ($P = 0.387$), length of hospitalization ($P = 0.245$), BMI ($P = 0.555$), place of residence ($P = 0.500$), frequency of follow-up ($P = 0.061$), and income level ($P > 0.05$). However, the groups did differ significantly in terms of occupation ($P = 0.039$), chronic obstructive pulmonary disease (COPD) ($P = 0.005$), hypertension ($P = 0.028$), and duration of heart failure ($P = 0.038$). The individual and clinical characteristics of the studied patients and the results of the aforementioned analyses in the two groups are presented in Tables 1 and 2.

Again through the inferential statistics, according to the results of the linear regression model, after adjusting for potential confounding variables, including occupation, COPD, hypertension, and duration of heart disease, the group effect was not significant for the dimensions or the total score of quality of life ($P = 0.010$). This indicates that before the intervention, there was no statistically significant difference between the intervention and control groups regarding the mean scores of the dimensions and the total quality of life score. Additionally, the interaction effect of time and group was not significant for the dimensions of physical functioning and mental health ($P = 0.170$ and $P = 0.150$, respectively), suggesting no statistically significant difference between the two groups in terms of changes in the total quality of life score over time. However, a statistically significant difference was observed in the dimensions of cognitive function ($P = 0.006$), general health ($P = 0.003$), and the total quality of life score ($P = 0.010$), with the mean scores for these dimensions and the total score being significantly higher in the experimental group compared to the control group [Table 3].

Discussion

Regarding the primary and secondary outcomes of the study which were altogether the determination of the effect of a nurse-led follow-up program on the quality of life of patients with heart failure, the results indicated that the mean total quality of life scores after the intervention were 58.73 ± 10.03 in the experimental group and 54.22 ± 18.66 in the control group. The linear regression model results also showed that after adjusting for potential confounding variables, the effect of the group was not statistically significant, indicating that before the intervention, there was no significant difference between the intervention and control groups regarding the mean total quality of life score. However,

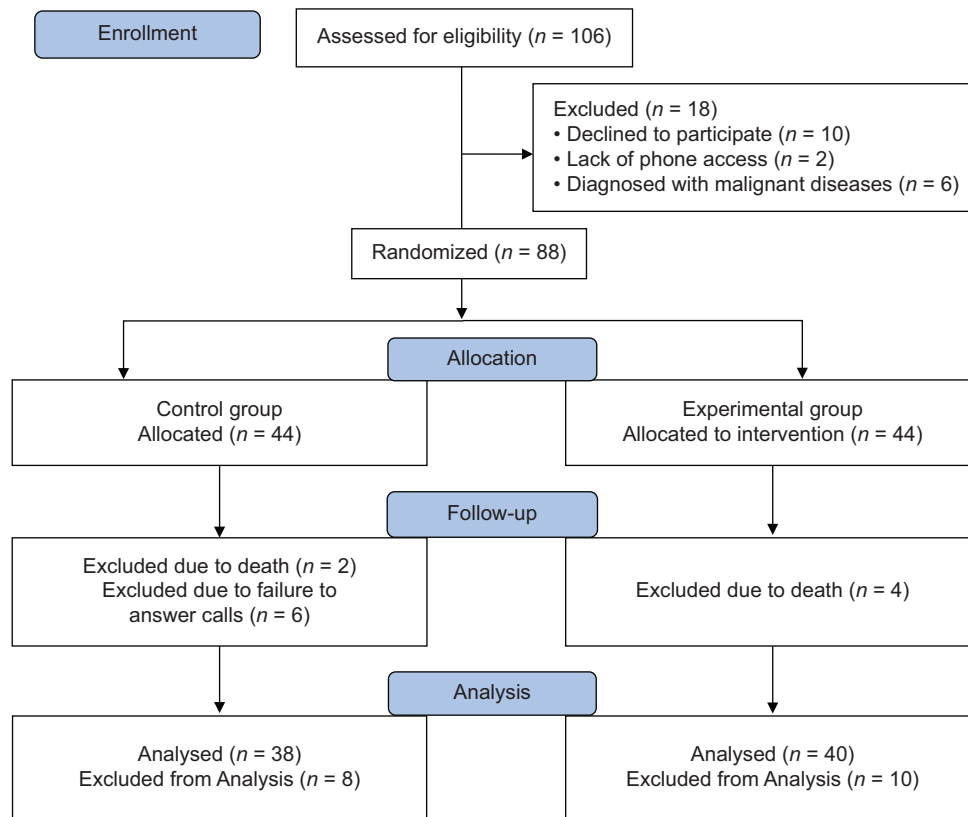


Figure 1: CONSORT flow diagram of the study

the interaction effect of time and group was significant, indicating a statistically significant difference between the two groups regarding changes in the total quality of life score over time, so that after the intervention, the mean total quality of life score for the experimental group was 11.95 units higher than that of the control group.

In line with the results of the present study, Sadeghi *et al.*^[22] demonstrated that the quality of life of patients with heart failure increased in all dimensions after implementing a follow-up care model for 3 months. Harrison *et al.*^[23] also reported that a specialist nurse-led training intervention, combined with a visit 2 weeks after discharge and follow-up for up to 12 weeks, significantly improved the quality of life in both physical and mental health components in the experimental group. These improvements remained significant after 6 weeks.

Further, Stewart *et al.*^[24] reported that when the treatment and follow-up of heart failure patients are managed by a heart failure specialist nurse, it leads to an improvement in the patients' quality of life, resulting in better adherence to their medication and treatment regimens, and a decrease in their rate of rehospitalization. Ahmadi *et al.*^[25] applied a continuous counseling model to 200 elderly individuals for 4 months, successfully increasing their quality of life in both the physical and psychological dimensions, as well as the overall mean

score in the experimental group compared to the control group after the intervention. Additionally, West *et al.*^[26] demonstrated that the quality of life in both physical and mental dimensions significantly improved through the implementation of a treatment program led by a nurse for patients with heart failure, which included training, monitoring, and a 24-hour follow-up.

Baghaei *et al.*^[27] also showed that the educational, care, and counseling interventions are effective in improving the quality of life for patients with heart failure. In their study, all factors affecting quality of life, including physical activity, diet, medication regimen, establishing a skill pattern, lifestyle changes, and demonstrating successes and failures, with a focus on the early complications and progression of the disease for both the individual and their family, were emphasized. This approach emphasized ongoing sensitization and encouraged family involvement in patient care. Additionally, Roshan Ghias *et al.*^[28] reported that implementing a follow-up care model for patients who underwent coronary artery bypass grafting improved mean scores for quality of life, self-efficacy, and adherence to treatment regimens. In the study by Shojaei *et al.*,^[29] an effort was made to manage anxiety in patients with heart failure through telephone follow-ups. The use of telephone follow-ups by nurses after discharge significantly reduced the anxiety levels of the patients.

Table 1: The results of the analyses and the participants' characteristics in experimental and control groups

Variable		Experimental Group	Control Group	P
Age (years), median (1 st quartile, 3 rd quartile)		75.00 (68.00, 80.00)	70.00 (57.50, 80.00)	0.145*
Sex, <i>n</i> (%)	Male	15 (39.50)	20 (50.00)	0.350***
	Female	23 (60.50)	20 (50.00)	
Marital Status, <i>n</i> (%)	Married	29 (76.30)	27 (67.50)	0.387***
	Spouse Deceased	9 (23.70)	13 (32.50)	
Occupation, <i>n</i> (%)	Housewife	23 (60.50)	20 (50.00)	0.039†
	Employee	1 (2.60)	2 (5.00)	
	Self-employed	0 (0.00)	8 (20.00)	
	Farmer	7 (18.40)	3 (7.50)	
Educational Level, <i>n</i> (%)	Retired	7 (18.40)	7 (17.50)	0.097†
	Illiterate	27 (71.10)	24 (60.00)	
	Diploma or Lower	11 (28.90)	11 (27.50)	
	University	0 (0.00)	5 (12.50)	
Residence, <i>n</i> (%)	City	18 (47.40)	22 (55.00)	0.500***
	Village	20 (52.60)	18 (45.00)	
Income Level, <i>n</i> (%)	Less than Sufficient	5 (13.20)	4 (10.00)	0.734***
	Sufficient	33 (86.80)	36 (90.00)	
Smoking, <i>n</i> (%)	No	34 (91.90)	36 (90.00)	0.0001†
	Yes, in the past	2 (5.40)	2 (5.00)	
	Yes, currently	1 (2.70)	2 (5.00)	
Alcohol Consumption, <i>n</i> (%)	No	38 (100.00)	38 (95.00)	0.0001†
	Yes, in the past	0 (0.00)	2 (5.00)	
	Yes, currently	0 (0.00)	0 (0.00)	
Drug Use, <i>n</i> (%)	No	36 (94.70)	36 (90.00)	0.0001†
	Yes, in the past	0 (0.00)	1 (2.50)	
	Yes, currently	2 (5.30)	3 (7.50)	

SD, Standard Deviation; *Mann–Whitney *U* test; **Independent *t*-test; ***Chi-square test; †Exact test

Table 2: The results of the analyses and the participants' characteristics in experimental and control groups

Variable		Experimental Group	Control Group	P
BMI (kg/m ²), mean (SD)		21.28 (3.65)	21.87 (5.04)	0.555**
Comorbidity, <i>n</i> (%)	Yes	36 (94.70)	29 (72.50)	0.013††
	No	2 (5.30)	11 (27.50)	
Type of Comorbidity, <i>n</i> (%)	COPD	7 (18.40)	0 (0.00)	0.005††
	CVA	2 (5.30)	3 (7.50)	0.0001††
	Cancer	1 (2.60)	0 (0.00)	0.487††
	Kidney Disease	3 (7.90)	2 (5.00)	0.671††
	Diabetes	12 (31.60)	9 (22.50)	0.447***
	Hypertension	29 (76.30)	21 (52.50)	0.028††
History of Heart Attack, <i>n</i> (%)	Yes	1 (2.60)	1 (2.50)	0.0001††
	No	37 (97.40)	39 (97.50)	
Living alone, <i>n</i> (%)	Yes	13 (34.20)	11 (27.50)	0.521***
	No	25 (65.80)	29 (72.50)	
Having Supplementary Insurance, <i>n</i> (%)	Yes	25 (65.80)	19 (47.50)	0.103***
	No	13 (24.20)	21 (52.50)	
Cardiac Function Level based on NYHA, <i>n</i> (%)	Level 1	5 (13.20)	11 (27.50)	0.388†
	Level 2	22 (57.90)	22 (55.00)	
	Level 3	9 (23.70)	6 (15.00)	
	Level 4	2 (5.30)	1 (2.50)	
Follow-up zone, <i>n</i> (%)	Green	7 (18.40)	15 (37.50)	0.061***
	Yellow	31 (81.60)	25 (62.50)	
Duration of Heart Failure (years), median (1 st quartile, 3 rd quartile)		(9.00) (1.25, 10.00)	(11.00) (5.00, 20.00)	0.038*
Duration of Hospitalization (days), median (1 st quartile, 3 rd quartile)		(5.00) (3.00, 7.00)	(4.00) (2.00, 7.00)	0.245*

SD, Standard Deviation; NYHA, New York Heart Association; *Mann–Whitney *U* test; **Independent *t*-test; ***Chi-square test; †Exact test; ††Fisher's exact test

In the study by Najjar *et al.*,^[30] the results of examining the impact of individual counseling on the quality of life of

patients with myocardial infarction indicated that there was no statistically significant difference in quality of

Table 3: Comparison of mean quality of life scores and its dimensions in experimental and control groups based on the linear regression model

Dimension	Group	Before Intervention		After Intervention		Linear Regression Results				
		Mean	SD	Mean	SD	Effects	B	SE	t	P
Cognitive Functioning	Experimental	15.36	4.35	16.52	2.68	Group	-0.26	1.00	-0.27	0.780
						Time	-2.45	0.91	-2.69	0.008
	Control	16.27	4.39	13.82	4.99	Group * Time	3.60	1.30	2.76	0.006
Physical Functioning	Experimental	21.65	7.50	23.26	6.51	Group	2.05	1.92	1.07	0.280
						Time	-1.80	1.74	-1.03	0.300
	Control	24.82	10.03	23.02	11.95	Group * Time	3.40	2.50	1.36	0.170
General Health	Experimental	4.81	1.50	7.42	1.38	Group	-0.27	0.43	-0.63	0.530
						Time	0.87	0.39	2.23	0.020
	Control	5.62	2.13	6.50	2.24	Group * Time	1.73	0.56	3.07	0.003
Mental Health	Experimental	10.52	2.46	11.52	1.60	Group	0.48	0.63	0.77	0.440
						Time	-0.17	0.57	-0.30	0.760
	Control	11.05	3.24	10.87	3.28	Group * Time	1.17	0.82	1.42	0.150
Total Score	Experimental	52.36	12.83	58.73	10.03	Group	2.00	3.18	0.63	0.530
						Time	-3.55	2.89	-1.23	0.220
	Control	53.25	57.77	16.55	54.22	Group * Time	9.91	4.14	2.39	0.010

*Adjusted results for the variables of occupation, COPD, hypertension, and duration of heart disease

life scores between the intervention and control groups after educational counseling. Similarly, the research by Mistiaen *et al.*^[31] found that telephone follow-up was ineffective in reducing anxiety among patients undergoing heart surgery. Additionally, the study by Sahebalzamani *et al.*^[32] which investigated the effects of a continuous care model on the quality of life of patients with systemic lupus erythematosus, revealed that while the implementation of the continuous care model did not affect the subscales of bodily pain and social functioning, it did have a positive impact on patients' knowledge and six other qualities of life indicators.

In a study by Kamrani *et al.*^[33] examining the impact of telephone follow-ups on patients with acute coronary syndrome, it was found that this approach significantly improved adherence to treatment regimens. Likewise, Kotb *et al.*^[34] reported that telephone follow-ups not only did reduce hospital readmissions for these patients but also led to lower systolic blood pressure and decreased levels of depression. Moreover, Moradi *et al.*^[35] referenced the follow-up care model which was developed by Ahmadi and Faghihzadeh,^[25] noting that after implementing this model, a significant statistical difference was observed in the mean self-care management scores between the two groups, with a significant increase in the experimental group compared to the control group.

The results of the abovementioned studies showed that, despite differences in follow-up methods, study durations, and the tools used to measure quality of life, as well as investigating its effect on other responses such as anxiety, self-care, depression, and dietary adherence, telephone follow-ups significantly improved quality of life and the other mentioned response variables. This demonstrates the efficiency and effectiveness of this method.

The effect of telephone follow-ups and follow-up care has been studied in patient populations beyond those with heart failure. Sabzevari *et al.*^[36] reported an improvement in the quality of life for patients with diabetes following telephone follow-ups. Furthermore, their study found that nurse-led telephone follow-ups, with ongoing support and communication with patients during primary education, can significantly enhance quality of life. This method not only does improve patients' physical wellbeing but also positively influences their mental health.

In the study conducted by Mozafari *et al.*^[37] the impact of telephone follow-up on self-efficacy related to nutritional behavior and physical activity in patients after coronary artery surgery at Shiraz Namazi Hospital was examined. The results indicated that nurse-led telephone follow-ups significantly improved patients' self-efficacy in adhering to their diet and engaging in physical activities.

Zakerimoghdam *et al.*^[38] and Shamsizadeh *et al.*^[39] also reported that telephone follow-ups were effective in improving diet compliance and managing type 2 diabetes. They noted that telenursing allowed nurses to monitor patients, provide training, gather information, and implement nursing interventions. Moreover, Mistiaen and Poot *et al.* reported that a supportive-educative telephone follow-up program significantly improved knowledge levels and reduced anxiety in heart surgery patients during the 6 months following their hospital discharge.^[31] Consistent with these findings, a study by Nesari *et al.*^[40] revealed that after 12 weeks of nurse-led telephone follow-ups focusing on adherence to a diabetic diet, exercise, and medication therapy, there was a significant reduction in HbA1c, total cholesterol, triglycerides, and LDL levels. Furthermore, Sadeghi

et al.^[41] indicated that a continuous care model improved sleep quality in hemodialysis patients.

In most reviewed studies, the results were consistent with those of the present study. However, differences in the findings may be attributed to variations in the studies' methods. Many similar studies, conducted in the past, utilized the telephone follow-up models and the follow-up care models developed by Ahmadi and Faghihzadeh.^[25] Also, other factors that could contribute to the differences in results include variations in the duration of follow-ups across the studies and the use of different tools to assess quality of life compared to the present study. Furthermore, disparities in the knowledge and literacy levels of the patients studied may also explain the differences in outcomes. Individuals with higher education levels tend to have a better understanding of disease complications and the associated risks of illness. The anxiety may, in turn, be a contributing factor to the reduced quality of life observed in this group of patients.

Arjunan and Trichur stated that the education of patients with heart failure is the basis of the individual management of heart failure. In this regard, it is important to understand the clinical and personal experiences of the patients. Most patients are aware that their quality of life affects their daily activities. For this reason, they seek more information but do not receive education about their disease or a care improvement plan.^[42] It should also be kept in mind that patients who are discharged from the hospital after a heart attack have multiple anxieties related to their disease; this anxiety prevents learning educational materials in the acute stage of the disease. In these patients, it is better to provide training at home. Because the patient has moved past the acute stage of the disease and is feeling better about the issues caused by it, the follow-up care for these patients can be effective.^[43]

Most patients have questions about self-care at the time of discharge and afterward at home, including inquiries about diet, medication regimens, permissible activity levels, and potential complications of their condition. Patients with heart failure require self-care behaviors to manage their disease and address its challenges. Engaging in self-care can help patients maintain control over their lives and adapt to the complications of their condition, ultimately leading to an improved quality of life.^[44] Medical personnel, particularly nurses, play a crucial role in supporting patients through effective and continuous communication, especially via remote follow-up, to address any concerns or questions and provide necessary guidance.^[27] Follow-up care is beneficial regardless of the method used; in recent years, advancements in remote communication technology

have transformed healthcare delivery. This technology has reduced barriers of time and distance, increasing access to healthcare services. Through this approach, a two-way communication between patients and healthcare providers is facilitated via telephone.

A key strength of this study compared to previous research is the use of a more accurate and comprehensive methodology. However, it was conducted within a limited population, and since quality of life is influenced by cultural factors, beliefs, motivations, and personal interests, these elements can affect the effectiveness of the method. Therefore, replicating the study in different communities across Iran under various conditions and over more extended durations could provide valuable insights. Additionally, limitations related to age and patients' lack of knowledge as well as conducting the research in just one setting were the weaknesses in this study as these factors could hinder self-care and impact quality of life.

Conclusion

The study findings provided evidence that the nurse-led follow-up program as an affordable method improves the quality of life for heart failure patients and positively impacts various quality of life dimensions. So, it seems that with the implementation of this method, valuable results would be obtained in the field of improving the quality of life of patients with heart failure, hoping that the method will be used in the field of nursing education, management, and clinical services.

Authors' contributions

(deleted for blind review) designed the study, prepared the literature review, and collected the data, (deleted for blind review) performed the data analysis and drafted the manuscript, (deleted for blind review) drafted the initial draft and revised the manuscript. All the authors read and approved the final manuscript.

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Authors' contributions

Reza Rahimi and Elham Saberi Noughabi designed the study, prepared the literature review, and collected the data, Fatemeh Mohammadzadeh and Masoumeh Amirideli performed the data analysis and drafted the manuscript, Mostafa Amiri and Elham Saberi Noughabi drafted the initial draft and revised the manuscript. All the authors read and approved the final manuscript.

The authors declare that there are no conflicts of interest.

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Conflicts of interest

There are no conflicts of interest.

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