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Original Article

Effect of continuing care in the management of chronic heart failure and improvement of cardiac function

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Abstract: Objective: To explore the effect of continuing care in the management of chronic heart failure and the improvement of patients' cardiac function. Methods: In this retrospective study, 120 patients with chronic heart failure were randomly divided into the control group (n=60, patients received discharge instructions before hospital discharge but no intervention after discharge) and the research group (n=60, patients received continuing care after discharge). Patients' cardiac function, self-care ability, medication adherence, mood state and quality of life at discharge were compared to those at 6 months after discharge. Results: Six months after hospital discharge, the patients in both groups had decreased levels of left ventricular end systolic dimension, left ventricular end-diastolic dimension, and N-terminal pro B type natriuretic peptide and increased levels of left ventricular ejection fraction and cardiac output, and the magnitude of the changes in these markers was greater in the research group than in the control group (all P<0.05). Meanwhile, the scores of Morisky Medication Adherence Scale and Self-Care of Heart Failure Index v6.2 of the research group increased at 6 months after discharge and were higher than those in the control group at the same time point (all P<0.001). Also, the scores of Profile of Mood States reduced, and the scores of Generic Quality of Life Inventory-74 increased in both groups at 6 months after discharge, and the magnitude of changes in the research group was greater (all P<0.05). Conclusion: Continuing care for chronic heart failure patients can markedly improve the cardiac function and quality of life of the patients. It can also significantly reduce patients' negative emotions and improve the medication adherence and the self-care ability.

Keywords: Chronic heart failure, continuing care, cardiac function, self-care ability

Introduction

Chronic heart failure (CHF) is the end-stage manifestation of various heart diseases. The disease can cause dyspnea, and several other symptoms, various complications and high re-hospitalization rate, which tremendously affect patients' the quality of life [1]. Due to the long-term clinical course of CHF, home treatment for patients after discharge is essential in addition to the treatment in the hospital, is also very important and the quality of the out-of-hospital care can affect the treatment effect and the prognosis of patients [2]. In traditional nursing, the nursing care is mostly performed by nurses in the hospital, and there is no intervention for patients discharged from the hospital except for some discharge guidance (such as medication guidance). As a result, the traditional nursing mode cannot properly track the patients and monitor their conditions after discharge, which can negatively influence the outcome of the out-of-hospital treatment of patients [3]. Therefore, it is necessary to adopt appropriate out-of-hospital care to ensure a good home treatment outcome.

Continuing care usually refers to a series of actions designed and implemented to ensure that patients can receive continuing care after discharge from the hospital, including discharge plans, follow-up visits and guidance on medication, diet and exercise. It is a nursing model that extends the hospital's nursing service to the family, which can help patients safely transit from the acute phase to the subacute phase of diseases [4]. In recent years, continuing care has been widely applied in patients with diabetes or malignant tumors and patients who undergo percutaneous coronary inter-

vention due to acute myocardial infarction. It has been found that continuing care can significantly reduce the rehospitalization rate of diabetic patients, improve the cardiac function of patients with acute myocardial infarction, and increase the long-term survival rate of patients with malignant tumors [5-7]. In this study, we investigated the effect of continuing care on the cardiac function, medication adherence, mood state, and quality of life of patients with CHF, with an effort to provide some guidance for the nursing intervention of CHF patients outside of the hospital.

Materials and methods

General information

In this retrospective research, 120 CHF patients admitted to the Second Hospital of Dalian Medical University from July 2019 to January 2020 were selected as the research subjects, and they were divided into the research group (n=60) and the control group (n=60). Written informed consent was obtained from all subjects and this study has been approved by the Ethics Committee of the Second Hospital of Dalian Medical University.

Inclusion criteria were as follows: 1) Patients who met the CHF diagnostic criteria defined in the Chinese Journal of Heart Failure Diagnosis and Treatment Guide 2018 by the Heart Failure Group of Cardiovascular Branch of Chinese Medical Association; 2) Patients aged between 25 and 75 years; 3) Patients whose cardiac function grades were II-IV as classified by the New York Heart Association (NYHA); patients who signed the informed consent [8, 9].

Exclusion criteria were as follows: 1) End-stage patients with cachexia; 2) Patients whose estimated survival period was less than 1 year; 3) Patients with severe neurological, endocrine, respiratory, digestive, or hematological diseases that could cause repeated hospitalizations; 4) Patients with liver or kidney failure; 5) Patients with malignant tumors; 6) Patients who voluntarily withdrew from the research; 7) Patients who participated in other research projects at the same time; 8) Patients lost to follow-up.

Methods

The patients in the control group were given discharge guidance before discharge, including guidance on medication and diet. The patients received the medication instructions and were informed about the possible adverse reactions. The patients were also instructed to see the doctor if they suffered from serious adverse reactions or deterioration of the disease. There was no intervention for the patients after discharge [10].

Continuing care was given to the patients in the research group after discharge [11]. A continuing nursing team composed of outpatient nurses, head nurses and doctors in charge was established. The team was responsible for the various nursing work after the patients were discharged. A telephone follow-up was carried out once a week in the first month of discharge and twice a week afterward. Follow-up visits to the patients were conducted every 2 to 3 months. The contents of the follow-up mainly included: 1) Health education: The basic knowledge of the disease, including but not limited to the causes, clinical symptoms, treatment methods and adverse reactions, as well as the importance of following the doctor's advice were communicated to the patients. 2) Out-of-hospital life guidance: The patients were advised to regularly check blood pressure and body mass index. The patients were educated about first-aid measures and instructed to carry first-aid medicines with them. They were told to keep a balanced diet, have adequate rest, and take measures to prevent complications such as infection and deep vein thrombosis. 3) Medication guidance: We enquired whether the patient was taking medication as instructed and whether they had any bad medication habits, explained the pharmacological effects of each drug, communicated the use method, dosage, possible adverse reactions, and other precautions. We also stressed the importance of taking medication according to the doctor's instructions. 4) Exercise guidance: Patients with cardiac function level II did not need restrictions on their activities and were given appropriate exercise plans, such as outdoor walking and stairs. Patients with cardiac function level III needed some restrictions on their activities and were only allowed to walk indoors. If they want to do bathing, eating, or toileting, they need assistance from the family members. Patients with cardiac function level IV needed to be confined to their bed. 5) Dietary guidance: We advised patients to limit salt intake, quit

smoking and alcohol, diversify their diet, eat food rich in protein such as eggs, milk and lean meat, and eat enough fruits and vegetables. 6) Psychological intervention: Patients were instructed to maintain a good mood and taught about the self-regulation method. Nurses inquired about the patient's mood state through the conversation with them and provided appropriate counseling to patients to overcome their negative emotions. 7) Functional exercise: We taught patients about respiratory function training methods such as abdominal breathing, pursed-lip breathing, so as to help them enhance cardiopulmonary function. Evaluation of the intervention effect was conducted after 6 months.

Outcome measures

Main outcome measures: All patients were told to come to the hospital for reexamination 6 months after discharge, and to complete the evaluation form at the time when they were discharged and when they came back after 6 months. All the forms were filled out and retrieved on the spot. For patients who could not come back to the hospital on time, the forms were filled out by nurses through telephone follow-up with patients.

The Color Doppler Ultrasound (Voluson E8 Expert, General Electric Company, USA) was used to monitor cardiac function of patients at hospital discharge and 6 months after discharge. The indicators included left ventricular end systolic dimension (LVESD), left ventricular end-diastolic dimension (LVEDD), left ventricular ejection fraction (LVEF) and cardiac output (CO). ELISA was used to detect the level of N-termi nal pro B type natriuretic peptide (NT-proBNP) in whole blood (ELISA kit: ml061-452-1, Shanghai Enzyme Link Biotechnology, China).

The Self-Care of Heart Failure Index (SCHFI v6.2) was taken to evaluate the patient's self-care ability, including self-care maintenance, self-care management and self-care confidence, and each item consisted of 100 points [12]. A score of ≥70 points indicates good self-care ability.

Secondary outcome measures: (1) The Morisky Medication Adherence Scale (MMAS), of which the score ranged from 0 to 8, was used to assess the patient's medication adherence [13]. A higher score indicated better medication adherence.

(2) The Profile of Mood States (POMS) with a total score of 140 was used to assess the mood state of patients. A lower score indicated better mood state [14].

(3) The Generic Quality of Life Inventory-74 (GQOL-74) was used to assess the quality of life of patients, including social function, emotional function, physical function, and psychological function, with each item totaling 100 points [15]. A higher score indicated better quality of life.

Statistical analysis

SPSS 20.0 was used for data statistics. Count data was expressed as cases/percentage (n/%) and were examined by χ^2 test. Kolmogorov-Smirnov test was used to test normality. Measurement data that conformed to the normal distribution was expressed as mean ± standard deviation ($\bar{x}$ ± sd). Paired t test was used for comparison in the same group before and after intervention, while independent t test was used for comparison between groups. *P* values less than 0.05 were considered statistically significant.

Results

Comparison of baseline data

There was no significant differences in the baseline data between the two groups (all P>0.05), and the study results were comparable between the two groups. See **Table 1**.

Comparison of cardiac function

Compared with the cardiac function of the patients at the time of discharge, the levels of LVESD, LVEDD and NT-proBNP reduced, and LVEF and CO increased in both groups at 6 months after discharge. Meanwhile, the magnitude of the changes in these markers was greater in the research group than in the control group (all P<0.05). See **Table 2**.

Comparison of self-care ability

In the control group, the scores of SCHFI v6.2 of the patients at 6 months after discharge were not significantly different from those at

Table 1. Comparison of baseline data between the two groups

Index	Research group (n=60)	Control group (n=60)	χ^2/t	P
Gender (n)			0.835	0.361
Male	34	29		
Female	26	31		
Age (years)	57.7±7.5	58.4±6.8	0.536	0.593
BMI (kg/m^2)	23.33±2.22	23.68±2.40	0.829	0.409
Smoking (n)			0.574	0.449
Yes	24	20		
No	36	40		
Alcohol (n)			0.333	0.564
Yes	19	22		
No	41	38		
Course of the disease (years)	6.6±2.4	6.2±2.1	0.972	0.333
Primary disease (n)			0.675	0.472
CHD	19	22		
Hypertensive heart disease	14	10		
Dilated cardiomyopathy	10	7		
Rheumatic heart disease	10	12		
Other diseases	7	9		
NYHA cardiac function levels (n)			0.977	0.614
II	18	16		
III	26	23		
IV	16	21		
Education level of patients (n)			1.112	0.573
Junior college and above	5	3		
High school	30	27		
Junior high school and below	25	30		
Education level of accompanies (n)			1.017	0.601
Junior college and above	14	18		
High school	28	23		
Junior high school and below	18	19		
Accompanies having professional knowledge of nursing (n)			0.686	0.408
Yes	6	9		
No	54	51		

Note: BMI: body mass index; NYHA: New York Heart Association; CHD: coronary heart disease.

discharge (P>0.05). While in the research group, the scores of self-care maintenance, self-care management and self-care confidence of patients at 6 months after discharge were higher than those at discharge and higher than those in the control group at 6 months after discharge (all P<0.001). See **Table 3**.

Comparison of the medication adherence

The MMAS scores of the research group and the control group at discharge were 5.04±1.48 points and 4.98±1.18 points, respectively. The MMAS scores of the research group at 6 months after discharge were significantly higher than those at discharge and those in the control group at 6 months after discharge (7.03±0.65 points vs 5.11±1.21 points, all P<0.001). The MMAS scores of the control group at 6 months after discharge did not differ significantly from those at discharge (P> 0.05). See **Figure 1**.

Comparison of the mood state

The POMS scores of the research group and control group at discharge were 90.04±8.84 points and 91.29±7.46 points, respectively; the

Table 2. Comparison of cardiac function of patients between the two groups after discharge

Groups	Time	LVESD (mm)	LVEDD (mm)	LVEF (%)	CO (L/min)	NT-proBNP (pg/mL)
Research group (n=60)	At discharge	42.85±3.20	52.30±2.95	49.20±3.66	3.90±0.74	4340.60±288.50
	At 6 months after discharge	40.55±2.80$^{***,###}$	50.18±2.11$^{***,##}$	54.98±3.20$^{***,###}$	4.51±0.70$^{***,##}$	3786.50±240.65$^{***,###}$
Control group (n=60)	At discharge	43.27±2.55	52.77±2.50	48.86±3.05	3.88±0.75	4311.04±264.07
	At 6 months after discharge	42.16±2.11*	51.58±2.85*	53.02±2.59***	4.17±0.69*	4120.05±244.30***

Note: Compared in the same group at discharge, *P<0.05, ***P<0.001; Compared with the control group at 6 months after discharge, $^{##}$P<0.01, $^{###}$P<0.001. LVESD: left ventricular end systolic dimension; LVEDD: left ventricular end-diastolic dimension; LVEF: Left ventricular ejection fraction; CO: cardiac output; NT-proBNP: N-terminal pro B type natriuretic peptide.

Table 3. Comparison of SCHFI v6.2 scores between the two groups at discharge ($\bar{x} \pm sd$)

Groups	Time	Self-care maintenance	Self-care management	Self-care confidence
Research group (n=60)	At discharge	65.59±4.05	70.70±4.30	73.33±5.48
	At 6 months after discharge	78.79±4.88$^{***,\#\#\#}$	81.10±5.44$^{***,\#\#\#}$	80.04±5.77$^{***,\#\#\#}$
Control group (n=60)	At discharge	65.94±4.38	71.12±5.40	72.85±4.96
	At 6 months after discharge	66.10±4.33	71.04±4.87	73.10±4.30

Note: Compared with the time at discharge, ***P<0.001; Compared with the time at 6 months after discharge, $^{\#\#\#}$P<0.001. SCHFI v6.2: Self-care of Heart Failure index v6.2.

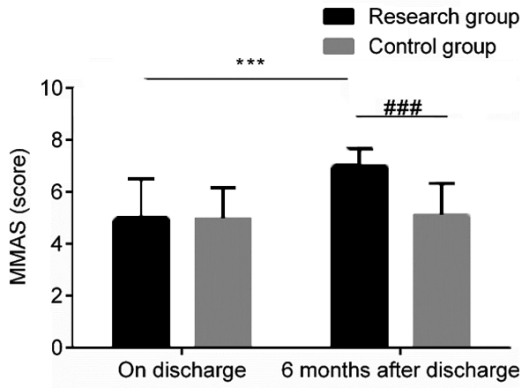

Figure 1. Comparison of medication adherence of patients between the two groups at discharge and 6 months after discharge. Compared with the MMAS score at hospital discharge within the same group (the research group), ***P<0.001; Compared with the control group at 6 months after discharge, $^{\#\#\#}$P<0.001. MMAS: Morisky Medication Adherence Scale.

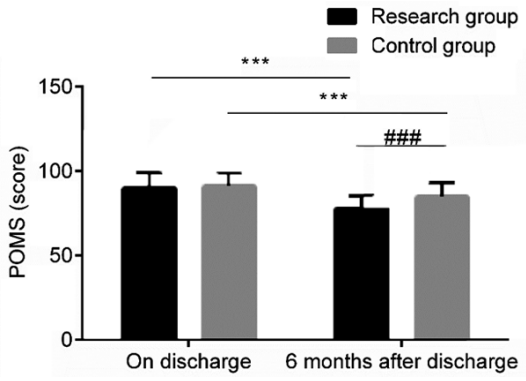

Figure 2. Comparison of mood state of patients between the two groups at discharge and 6 months after discharge. Compared in the same group at discharge, ***P<0.001; Compared with the control group at 6 months after discharge, $^{\#\#\#}$P<0.001. POMS: Profile of Mood States.

POMS scores of the research group and control group at 6 months after discharge were 77.70±7.69 points and 84.94±8.29 points, respectively. The POMS scores of the two groups of patients significantly reduced at 6 months after discharge, and the scores of the research group was significantly lower than those of the control group (all P<0.001). See **Figure 2**.

Comparison of the quality of life

Compared with the GQOL-74 scores at the time of discharge, the scores of social function, emotional function, physical function, and psychological function in GQOL-74 of the two groups of patients all increased at 6 months after discharge and the magnitude of the increase in the research group was greater (all P<0.05), See **Table 4**.

Discussion

The treatment of CHF patients not only focuses on the improvement of clinical symptoms, but it should also focus on the improvement of patients' cardiac function and the quality of life after discharge. This study found that compared with the patients' cardiac function at the time of discharge, the cardiac function improved in both groups at 6 months after discharge, and the improvement in the research group was greater, indicating that continuing care can significantly improve the cardiac function of CHF patients. This may be due to the fact that the improvement of cardiac function for CHF patients does not only rely on the in-hospital medication therapy, but is also affected by other factors such as the patients' medication adherence after discharge. In the continuing care, the regular follow-up and health education by medical staff can help patients understand the importance of following doctor's advice, and the detailed medication guidance also greatly reduced the incidence of medica-

Table 4. Comparison of GQOL-74 scores between the two groups ($\bar{x} \pm sd$)

Groups	Time	Social function	Emotional function	Physical function	Psychological function
Research group (n=60)	At discharge	67.78±5.69	70.07±5.48	72.20±6.33	70.49±5.85
	At 6 months after discharge	79.89±6.33$^{***,\#\#\#}$	77.79±5.10$^{***,\#\#\#}$	76.60±6.40$^{***,\#\#}$	77.70±5.08$^{***,\#\#\#}$
Control group (n=60)	At discharge	67.03±5.30	70.46±4.89	71.85±5.90	71.03±6.40
	At 6 months after discharge	70.05±5.08**	73.30±5.30**	73.95±5.48*	73.85±5.85*

Note: Compared in the same group at discharge, *P<0.05, **P<0.01, ***P<0.001; Compared with the control group at 6 months after discharge, $^{\#\#}$P<0.01, $^{\#\#\#}$P<0.001. GQOL-74: Generic Quality of Life Inventory-74.

tion errors, which was beneficial to the improvement of the patients' cardiac function [16]. Fan et al. also showed that multidisciplinary continuing care could help improve the cardiac function of patients with myocardial infarction and improve their self-care ability [17].

The results of this study showed that at 6 months after discharge, the research group achieved better scores of MMAS, SCHFI v6.2 and POMS than the control group, suggesting that continuing care can significantly improve the self-care ability and medication adherence of CHF patients and alleviate patients' bad mental state after discharge. This is because continuing care is a systematic nursing mode that continues outside the hospital. It provides patients with high-quality comprehensive nursing intervention through health education, life guidance outside the hospital, medication guidance, exercise guidance, diet guidance, psychological intervention, and functional exercise. For example, medication guidance can help improve patients' medication adherence; psychological intervention can help relieve patients' negative emotions [18]. Passetti et al. also pointed out that the implementation of continuing care could greatly reduce the incidence of medication errors [19]. Godley et al. reported that continuing care could help improve the medication adherence of patients who had substance use disorders after discharge [20]. Proctor et al. also confirmed that short-term continuing care could improve the medication adherence of patients after discharge and pointed out that short-term continuing care is extremely important for a positive prognosis of patients [21]. Meiklejohn et al. found that continuing care could help eliminate patients' negative attitudes [22]. Dadosky et al. found that continuing care could effectively improve the self-care ability of patients with heart failure [23].

Continuing care is an important intervention to improve the quality of life of patients outside the hospital [24]. The results of this study showed that the scores of social function, emotional function, physical function, and psychological function of the research group were higher than those of the control group at 6 months after discharge, suggesting that applying continuing care to discharged CHF patients can significantly improve their quality of life after discharge. A study in the UK also showed that implementing continuing care could help improve the quality of life of elderly patients [21].

However, this study was a single-center sample with a small sample size. Therefore, studies with larger sample size need to be conducted in the future to verify the effect of continuing care on the long-term quality of life and cardiac function of patients with CHF.

In summary, continuing care for patients with CHF can markedly improve the heart function and the quality of life of the patients. It can also significantly relieve patients' negative emotions and improve their medication adherence and self-care ability.

Disclosure of conflict of interest

None.

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