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Trends and influencing factors of self-management in patients with chronic heart failure: a longitudinal study

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Abstract

Background Good self-management behaviors can improve the physical function and quality of life of patients with heart failure and reduce hospitalization, mortality, and medical expenses. While the overall self-management level among patients with chronic heart failure (CHF) in China is low, previous studies have often used a cross-sectional design, and few have followed up on patients' self-management beyond 6 months after discharge. This study aimed to explore the factors influencing and the changes in the self-management level of patients with CHF and provide a basis for the timing and choice of interventions within 1 year after discharge.

Methods A longitudinal study was conducted from December 2021 to June 2022, including patients with CHF who met all the inclusion criteria. Data on demographics, disease-related details, social support, self-efficacy, and other information were collected during hospitalization (T0) and reevaluated at 1 month (T1), 3 months (T2), 6 months (T3), and 12 months (T4) after discharge.

Results A total of 213 patients were enrolled at T0, with 206, 201, 189, and 173 patients completing follow-up at T1, T2, T3, and T4, respectively. The self-management score was lowest at T0, highest at T1, began to decline at T2, and stabilized at T3; however, T3 remained higher than T0. Social support, self-efficacy, disease course, medication type, education level, and personal monthly income were identified as factors influencing self-management.

Conclusions The study findings indicate that self-management is a dynamic process of change. The level of self-management was at a high level 3 months after the patients were discharged from the hospital, but showed a decreasing trend from 6 months, which was related to numerous factors. This study helps to provide a theoretical basis for the timing and content of self-management intervention for patients with CHF by clinical healthcare professionals.

Keywords Chronic heart failure, Self-management, Longitudinal study, Influencing factors

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Background

Chronic heart failure (CHF) is a complex clinical syndrome caused by abnormal changes in cardiac structure and function or dysfunction of ventricular contraction and relaxation, which is the late stage of various heart diseases [1]. There are approximately 26 million people with heart failure worldwide [2–3], and there were about 8.9 million individuals with heart failure in China [4–6]. CHF is associated with high morbidity, mortality, and readmission rates, which increase medical expenses and caregiver burden. Due to the presence of multiple cardiovascular diseases, coexistence of multiple diseases, multiple medications, and the natural decline of body functions, older patients with CHF are more likely to be admitted to the hospital due to an ongoing deterioration of cardiac function or acute decompensation [7–8].

To prevent readmission and improve health outcomes for patients with heart failure, self-management is a key non-pharmacological intervention [9]. Self-management is an individual's ability to manage symptoms and physiological and psychosocial changes and make lifestyle changes to cope with chronic diseases [10–11]. In patients with CHF, self-management interventions have a beneficial effect on all-cause death or time to HF-related hospitalization. By improving self-management skills, patients' quality of life and mental health can also be improved [12–13]. Self-management is a dynamic process that changes with different periods of disease progression. Currently, the overall self-management level among patients with CHF in China is low, particularly among older patients with CHF as they tend to demonstrate poor symptom management, weight monitoring, and edema monitoring [14]. Most studies investigating self-management in this population have used a cross-sectional design, and only a few studies followed up patients' self-management longitudinally. Additionally, the timeframe was mostly limited to 6 months after discharge, and there was no longitudinal analysis of the dynamic changes in CHF self-management [15–16]. It is unclear how self-management behaviors change over time and which factors are associated with these changes in older patients with CHF.

The Health Ecological Model is a theory that the health of an individual is the result of a combination of the self and the environment in which he or she lives, which includes five layers, with the core layer being personal traits and, in descending order, the behavioral traits layer, the interpersonal network layer, the working and living conditions layer, and the policy environment layer [17]. At present, several studies have been conducted to apply this theory to self-management [18–19]. The present study is based on the Health Ecological Model and the variables designed in this study with reference to this theory are shown in Fig. 1.

This study aimed to investigate the self-management of patients with CHF at 1, 3, 6, and 12 months after discharge, understand any changing trends, and identify the influencing factors to provide a basis for clinicians to develop targeted follow-up interventions for patients within 1 year after discharge.

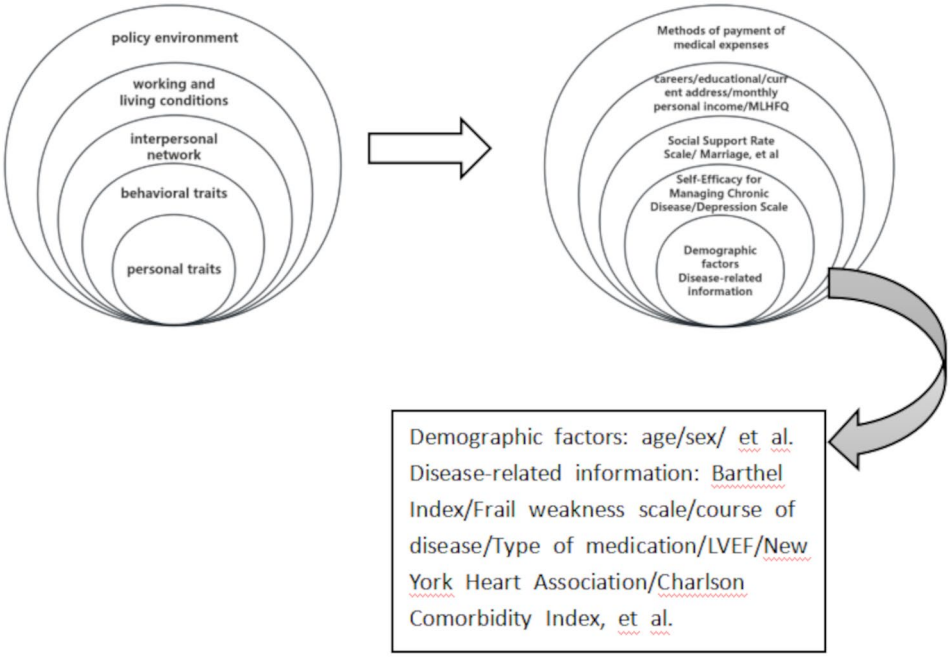

Fig. 1 Hypothesis model of influencing factors of self-management behavior in CHF patients

Methods

Research participants

From December 2021 to June 2022, older patients with CHF hospitalized in the cardiology ward of a third-class hospital in Yinchuan were selected as research participants, and a prospective longitudinal survey was conducted. (In China, hospitals are classified into three tiers (Class 1, Class 2, and Class 3) based on their size, medical service capacity, teaching and research capabilities, and overall quality of care. Among these, third-class hospitals represent the highest level of medical institutions in the Chinese healthcare system).

Inclusion criteria were as follows: (1) patients diagnosed with CHF based on the 2023 ESC Heart Failure Guidelines, including heart failure with mildly reduced ejection fraction and heart failure with preserved ejection fraction [20]; (2) age ≥ 60 years old; (3) good cognitive function and communication ability; and (4) voluntary participation in this study with written informed consent.

Exclusion criteria were (1) severe respiratory, liver, or renal failure, and terminal malignant tumors and (2) people with severe mental illness who were unable to communicate well.

Rejection criteria were (1) inability to cooperate with the researcher; (2) patients who asked to quit the research halfway; (3) development of other serious diseases or death during the study period; and (4) patients who could not be contacted continuously during follow-up.

For sample size estimation, the formula for calculating the sample size for $N = [1 + (k-1)\rho]\frac{\sigma^2(Z_{\alpha/2}+Z_{\beta})^2}{k\delta^2}$ repeated measurement data of a single group was used, where ρ is the correlation coefficient between repeated measurements of the same individual, the standard deviation of the pre-survey sample replaces the population standard deviation, the allowable error δ is 0.25 times the standard deviation, and k is the number of measurements. Finally, the sample size to be followed up was 120 cases, and at least 160 cases needed to be followed up after considering a 20% loss rate and a 5% mortality rate.

Survey tools

General information questionnaires

These questionnaires included questions regarding age, sex, place of residence, way of living, marital status, monthly income, education level, medical expense coverage, and professional status. With regard to disease data: classification of cardiac function, course of disease, New York Heart Association class, left ventricular ejection score, and number of medications taken.

Self-management scale for patients with heart failure

It was compiled by Shi Xiaoqing and others from the School of Nursing, Shanghai Jiaotong University, in 2012 [21] and is used to measure the health behavior of patients with heart failure in terms of self-management through 20 items across 4 dimensions (medication management, diet management, psychological and social adjustment management and symptom management). Likert 4's 4-level scoring method is adopted in the scale, with 1 being "never," 2 being "sometimes," 3 being "often," and 4 being "always," with a total score of 80. The higher the score, the better the patient's self-management level. Cronbach's α coefficient of the scale is 0.78.

Charlson comorbidity index (CCI)

The severity of patients' complications was calculated using Charlson's scoring system, developed by Charlson et al. [22], based on summarizing the clinical experience scores of 19 diagnostic diseases. Higher scores indicate more severe complications. The scale has a good predictive ability for patient prognosis [20].

Self-efficacy for managing chronic disease 6-item scale (SECD6)

The self-efficacy of the participants was measured using the Chronic Disease Management Self-Efficacy Scale, developed by Lorig et al. at Stanford University in 1996 [23]. There are six items across two dimensions (symptom management self-efficacy, overall disease management self-efficacy), each scored 1–10. The higher the average score for each item, the stronger the patient's self-efficacy. An average score ≥ 7 indicates a higher possibility of completing or persisting in certain behaviors. The Cronbach's α coefficient of the scale is above 0.91.

Social support rate scale (SSRS)

The SSRS developed by Xiao Shuiyuan [24] measured the participants' social support levels. The scale includes three dimensions: objective support, subjective support, and utilization of social support, with 10 items and a total score of 66. The Cronbach's α coefficient of the scale is 0.86.

Barthel index (BI)

The BI scale was used to measure the self-care ability of the participants in daily activities, with a scores ranging from 0 to 100. The higher the total score, the more independent the participants. A total score of ≤ 40 points indicates high dependence; a total score of 41–60 points indicates moderate dependence, and a total score of 61–99 indicates slight dependence. When the total score is 100, the participants' daily life is entirely self-care. Cronbach's α coefficient of the scale is 0.92.

15-item geriatric depression scale (GDS-15)

The GDS-15 is used to detect depression in older patients with CHF. This scale is a short version of the Elderly

Depression Scale designed by Sheikh and Yesavage in 1986 [25], based on the standard version of 30 items. It was used to evaluate depressive symptoms in the participants in the last week. The scale has 15 items, with a total score of 15. Scores < 8 indicate no depression; > 8 indicate depression. Higher scores indicate more serious depressive symptoms. Cronbach's α coefficient of the scale is 0.76 [26].

Frail weakness scale

The Frail weakness scale is used to identify weaknesses in older persons [27]. The scale contains five items, with the highest score of 1 for each item and a total score of 5. Zero represents no weakness, 1–2 represents pre-weakness, and 3–5 represents weakness. Cronbach's α coefficient of the scale is 0.83.

Minnesota living with heart failure questionnaire (MLHFQ)

The scale was compiled by Rector et al. in 1987 [28] and is specifically used for investigating the quality of life in patients with heart failure. It contains two dimensions and 21 items, including the physical and the emotional dimension, with a score range of 0–105. Likert 0– 5 scale is used for each item, where "0" means "no impact" and "5" means "very serious impact." The higher the score, the lower the patient's quality of life. In this study, the total score for quality-of-life was expressed by the transformation score, and the basic formula of transformation score conversion is transformation score = (the highest possible score of this dimension - original score)/ the highest possible score of this dimension X 100. The highest conversion score was 100; higher conversion scores indicate higher quality of life for patients. Chinese scholar Zhu Yanbo translated it into Chinese, and Cronbach's α coefficients in the total table, body field, and emotion field were 0.881, 0.82, and 0.78, respectively [29].

Statistical methods

SPSS 26.0 was used for data management and statistical analysis. Descriptive analysis was performed on demographic and disease-related data. Categorical data were expressed as frequency and composition ratios, and the measured data obeyed a normal distribution and were presented as mean ± standard deviation. Non-normally distributed data were presented as a median and interquartile range [M (P25 P75)].

The score differences in patients' self-management, self-care ability, quality of life, weakness, depression, social support, and self-efficacy at five-time points were compared using single-factor repeated measurement analysis of variance (ANOVA).

The factors influencing self-management behaviors in older patients with CHF at different time points were analyzed as follows: independent samples t-test and one-way ANOVA to test the differences in self-management levels among patients with varying characteristics at five-time points. Pearson or Spearman correlation was used to analyze the relationships between self-management and self-care ability, quality of life, weakness, depression, social support and self-efficacy of chronic disease management. Multiple linear regression analysis was used to analyze the factors influencing patient self-management at each time point.

Ethics

This study was approved by the hospital's ethics committee (KYLL-2021-463). All participants signed an informed consent form before being included in the study; consent was obtained from all participants and/or their legal guardian(s). The study was performed in accordance with the relevant guidelines and regulations.

Results

General information about the research participants

Baseline data were collected from December 2021 to June 2022, and the follow-up survey was completed in June 2023. During the hospitalization period (T0), 213 patients were included in the study. One month (T1), 3 months (T2), 6 months (T3), and 1 year (T4) after discharge, 206, 201, 189, and 173 patients respectively, completed the follow-up; the four-time loss-of-visit rates were 3.29% (T1), 2.43% (T2), 5.97% (T3), 8.47% (T4), respectively. The primary reasons for the loss of follow-up were death, withdrawal from the study, and other serious diseases. Figure 2 shows the inclusion and follow-up data of the participants.

Participant ages ranged from 60 to 88 years, and most of them were men ($n = 135$, 63.4%); most had primary school education or lower ($n = 130$, 61%), most had spouses ($n = 171$, 80.3%), and most had their spouses as caregivers ($n = 144$). Most of the patients had the disease for less than 1 year ($n = 103$, 48.4%). Further details are presented in Table 1.

Overall trends in patient self-management

Patients' self-management scores, including dimensions, were converted into a score rate equal to the actual score of the scale (dimension)/ the highest score of the scale ×100%. Table 2 presents the ranking of patients' self-management scores and scores of each dimension at different time points. The total self-management score and each dimension score of patients during hospitalization and at 1, 3, 6, and 12 months after discharge were analyzed by repeated measurement variance. Repeated measurement variance analysis did not conform to the spherical test, and the results were corrected using the Greenhouse–Geisser method. The results showed that the changes in the total self-management score and each

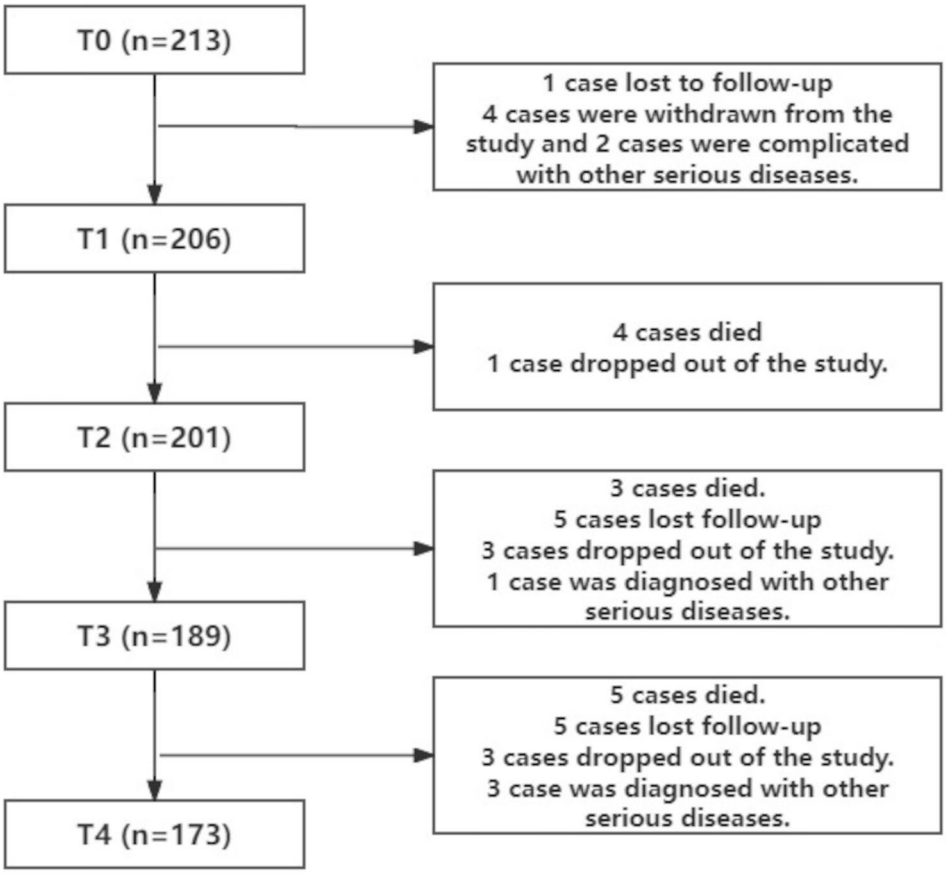

Fig. 2 Follow-up chart of study participants included

dimension score were statistically significant at different time points (all *P*-values were <0.01). Further details are presented in Table 3.

The patients' self-management showed a dynamic change across the five-time points, and the total self-management score showed a trend of an initial increase followed by a decrease. The self-management score was lowest at T0, highest at T1, began to decrease at T2, and stabilized at T3, remaining higher than at T0. Certain dimensions of self-management (drug management, diet management, and symptom management) scored the highest 1 month after discharge but decreased significantly 3 months after discharge and then showed a slow upward trend. The dimensions of psychological and social adaptation management slowly increased after discharge.

Scores for each evaluation index

A repeated-measures ANOVA was used to compare the BI, quality of life, weakness, depression, social support, and chronic disease management self-efficacy scores at the five-time points. The results showed a statistically significant difference ($P<0.05$). The comparison between the two results showed that with the extension of discharge time, the BI began to rise 1 month after discharge, peaked at 3 months, and stabilized at 6 months. The quality of life and self-efficacy in chronic disease management gradually improved from 1 month after discharge. Weakness, depression, and social support began to decline slowly 1 month after discharge. The self-efficacy scores for BI, quality of life, weakness, depression, social support, and chronic disease management of the patients at different time points are shown in Table 4.

Analysis of the factors influencing self-management

In this study, the self-management scores of older patients with CHF at T0–T4 were taken as dependent variables. Independent variables included general demographic variables, disease-related variables, self-management-related self-care activities of daily living, quality of life, weakness, depression, social support, and self-efficacy of chronic disease management, multiple stepwise linear regression analysis was conducted.

The results showed that the main factors influencing patients' self-management behavior at T0 were the disease course, social support, complications, education level, and medication type ($P<0.05$), which explained 30.1% of the total variation. At T1, the main influencing

Table 1 General demographic and disease-related data of older patients with CHF

Item	Classes	T0($n=213$)		T1($n=206$)		T2($n=201$)		T3($n=189$)		T4($n=173$)	
		Number of cases	constituent ratio (%)	Number of cases	constituent ratio (%)	Number of cases	constituent ratio (%)	Number of cases	constituent ratio (%)	Number of cases	constituent ratio (%)
Age	60–69	103	48.8	99	48.1	97	48.3	88	46.6	82	47.4
	70–79	99	46.0	97	47.1	94	46.8	92	48.7	83	48
	80 and above	11	5.2	10	4.9	10	5.0	9	4.8	8	4.6
Sex	Male	135	63.4	129	62.6	126	62.7	119	63.0	108	62.4
	Female	78	36.6	77	37.4	75	37.3	70	37.0	65	37.6
Marital status	Divorced/widowed/other	42	19.7	42	20.4	41	20.4	38	20.1	33	19.1
	Married	171	80.3	164	79.6	160	79.6	151	79.9	140	80.9
Education level	Primary and below	130	61.0	126	61.2	122	60.7	117	61.9	105	60.7
	Middle school \ high school	72	33.8	70	34.0	69	34.3	62	32.8	58	33.5
	University and above	11	5.2	10	4.9	10	5.0	10	5.3	10	5.8
Living pattern	Live with others	183	85.9	177	85.9	173	86.1	163	86.2	150	86.7
	solitude	30	14.1	29	14.1	28	13.9	26	13.8	23	13.3
place of residence	City	130	61.0	127	61.7	126	62.7	117	61.9	110	63.6
	Country	83	39.0	79	38.3	75	37.3	72	38.1	63	36.4
Personal monthly income	Less than 1000 yuan	64	30.0	61	29.6	59	29.4	56	29.6	51	29.3、5
	1000–2999 yuan	72	33.8	70	34.0	68	33.8	63	33.3	58	33.5
	3000–4999 yuan	50	23.5	49	23.8	48	23.9	46	24.3	41	23.7
	5000 yuan and above	27	12.7	26	12.6	26	12.9	24	12.7	23	13.3
Payment of medical expenses	Medical insurance for urban residents	119	55.0	115	55.3	113	56.2	107	56.6	100	57.8
	New rural cooperation medical system	94	45.0	91	44.2	88	43.8	82	43.4	73	42.2
The primary caregiver	Children	50	23.5	48	23.3	47	23.4	44	23.3	38	22.2
	Mate	148	69.5	143	69.4	139	69.2	131	69.3	121	69.9
	Care worker/nanny	5	2.3	5	2.4	5	2.5	5	2.6	5	2.9
	Others	10	4.7	10	4.9	10	5.0	9	4.8	9	5.2
New York Heart Association	I	32	15.0	32	15.5	31	15.4	31	16.4	29	16.8
	II	107	50.2	101	49.0	101	50.2	96	50.8	90	52
	III	60	28.2	60	29.1	57	28.4	52	27.5	48	27.7
	IV	14	6.6	13	6.3	12	6.0	10	5.3	6	3.5
Course of disease	< 1year	103	48.4	98	47.6	96	47.8	89	47.1	81	46.8
	1-3years	38	17.8	38	18.4	37	18.4	36	19.0	33	19.1
	> 3 year	72	33.8	70	34.0	68	33.8	64	33.9	59	34.1
LVEF	< 40%	26	12.2	24	11.7	22	10.9	21	11.1	21	12.1
	40-49%	54	25.4	50	24.3	48	23.9	46	24.3	40	23.1
	≥ 50%	107	50.2	106	51.4	106	52.7	98	51.9	93	53.8
	Unexamined	26	12.2	26	12.6	25	12.4	24	12.7	19	11.0

Table 1 (continued)

Item	Classes	T0($n=213$)		T1($n=206$)		T2($n=201$)		T3($n=189$)		T4($n=173$)	
		Number of cases	constituent ratio (%)	Number of cases	constituent ratio (%)	Number of cases	constituent ratio (%)	Number of cases	constituent ratio (%)	Number of cases	constituent ratio (%)
Number of medications taken	≤3 kinds	83	39.0	81	39.3	80	39.8	74	39.2	66	38.2
	>3kinds	130	61.0	125	60.7	121	60.2	115	60.8	107	61.8
Charlson Comorbidity Index	0–1 points	71	33.3	69	33.5	67	33.3	64	33.9	62	35.8
	2–3 points	104	48.8	101	49.0	99	49.3	92	48.7	84	48.6
	>3 points	38	17.8	36	17.5	35	17.4	33	17.5	27	15.6

factors were self-efficacy in chronic disease management, social support, disease course, education level, and medication type ($P<0.05$), which explained 48% of the total variation. At T2, the main influencing factors were social support, self-efficacy in chronic disease management, medication type, and personal monthly income ($P<0.05$), which explained 50.7% of the total variation. At T3, the main influencing factors were self-efficacy in chronic disease management, education level, social support, and personal monthly income ($P<0.05$), which explained 61.9% of the total variation. Additionally, at T4, the main influencing factors were self-efficacy in chronic disease management, education level, social support, and personal monthly income ($P<0.05$), which explained 56.4% of the total variation. There was no collinearity among the variables in this study. Detailed results are presented in Table 5.

Discussion

Trends in self-management levels in patients with CHF

This study reveals that the self-management level of patients with CHF is dynamic. After comparing the self-management scores at four time points, we found that the self-management score was lowest at T0 (47.13 ± 10.18), increased at T1 (51.79 ± 9.10), and declined at T3 (50.33 10.84) and T4 (50.35 10.72), indicating a trend of rising first and then declining. The self-management level was the highest 1 month after the patient was discharged, consistent with the survey results on self-management of PCI patients by Xia Yaoyao et al. [30].

This improvement in self-management shortly after discharge may be because the medical staff provided discharge guidance before discharge, including disease-related knowledge and counseling about living a healthy lifestyle. However, we found that patients' self-management levels declined within 3 months after discharge, with minimal changes at 6 months and 1 year after discharge, which was consistent with the results of a longitudinal study on self-management of patients with newly diagnosed type 2 diabetes by Fu Adan et al. [31]. We speculate that, as patients' conditions improved and psychological pressures eased, their focus on disease management gradually faded, leading to poor adherence to ongoing treatment of diseases and prevention of complications. Three months after discharge is considered a critical timepoint for patient follow-up to provide health education and supervise patients' self-management behaviors. Hence, medical staff should strengthen continuing care at this stage and improve the patient's self-management abilities.

In this study, the total self-management score and scores for each dimension of heart failure were standardized. During hospitalization, the score for psychological and social adaptation management was the highest, while

Table 2 Self-management of older patients with chronic heart failure at different time points and dimension scores

Time	Item	Number of entries	Dimensional equipartition	Scoring average(%)	Rank
T0 (*n* = 213)	Pharmaceutical administration	5	12.71 ± 3.29	63.6	2
	Diet management	3	7.55 ± 2.71	62.9	3
	Psychological and social adaptation management	5	13.38 ± 2.88	66.9	1
	symptom management	7	13.55 ± 3.98	48.4	4
	Self-management score	20	47.13 ± 10.18	58.9	-
T1 (*n* = 206)	Pharmaceutical administration	5	14.02 ± 3.07	70.1	3
	Diet management	3	8.69 ± 2.20	72.4	1
	Psychological and social adaptation management	5	14.34 ± 2.66	71.7	2
	symptom management	7	14.73 ± 3.95	52.6	4
	Self-management score	20	51.79 ± 9.10	64.7	-
T2 (*n* = 201)	Pharmaceutical administration	5	13.18 ± 4.04	65.9	3
	Diet management	3	8.61 ± 2.52	71.8	2
	Psychological and social adaptation management	5	14.88 ± 2.96	74.4	1
	symptom management	7	13.67 ± 4.13	48.8	4
	Self-management score	20	50.33 ± 10.84	62.9	-
T3 (*n* = 189)	Pharmaceutical administration	5	12.85 ± 3.78	64.3	3
	Diet management	3	8.50 ± 2.58	70.8	2
	Psychological and social adaptation management	5	15.06 ± 2.94	75.3	1
	symptom management	7	13.94 ± 0.29	49.8	4
	Self-management score	20	50.35 ± 10.72	62.9	-
T4 (*n* = 173)	Pharmaceutical administration	5	13.23 ± 3.85	66.2	3
	Diet management	3	8.54 ± 2.30	71.2	2
	Psychological and social adaptation management	5	15.35 ± 2.90	76.8	1
	symptom management	7	13.98 ± 3.48	49.9	4
	Self-management score	20	51.10 ± 10.72	63.8	-

Table 3 Self-management of T0 ~ T3 patients and comparison of scores in each dimension (*n* = 189)

Time	Self-managemen	drug management	diet management	Psychological and social adaptation management	symptom management
T0	48.05 ± 10.17	13.03 ± 3.21	7.72 ± 2.71	13.55 ± 2.89	13.74 ± 4.05
T1	52.06 ± 9.20	14.13 ± 3.12	8.77 ± 2.25	14.56 ± 2.62	14.80 ± 3.95
T2	50.85 ± 10.88	13.236 ± 4.10	8.67 ± 2.57	15.08 ± 2.90	13.74 ± 4.14
T3	50.71 ± 10.70	12.92 ± 3.78	8.55 ± 2.61	15.22 ± 2.88	14.02 ± 3.89
T4	51.10 ± 10.72	13.23 ± 3.85	8.54 ± 2.30	15.35 ± 2.90	13.98 ± 3.48
F	15.606	9.313	14.171	32.511	6.005
P	< 0.001	< 0.001	< 0.001	< 0.001	0.001

Table 4 Barthel, quality of life, weakness, depression, social support, and chronic disease management self-efficacy scores ($\chi \pm s$)

Item	T0	T1	T2	T3	T4	F	*P*
Barthel Index	83.15 ± 10.29	91.82 ± 5.68	92.80 ± 5.56	93.67 ± 5.31	94.39 ± 4.68	162.192	< 0.001
living quality	45.56 ± 14.35	63.18 ± 12.38	65.68 ± 12.78	66.31 ± 13.08	65.91 ± 11.88	233.682	<0.001
Frail weakness scale	2.29 ± 1.15	1.94 ± 1.01	1.84 ± 1.03	1.65 ± 0.93	1.61 ± 0.95	28.941	<0.001
Depression	5.71 ± 3.87	5.26 ± 3.81	4.91 ± 4.06	4.24 ± 1.02	3.98 ± 3.74	19.257	<0.001
Social Support	31.31 ± 6.91	31.05 ± 7.10	31.05 ± 7.12	30.75 ± 7.08	30.58 ± 6.92	26.76	<0.001
Self-Efficacy for Managing Chronic Disease	38.37 ± 8.87	42.32 ± 9.38	43.32 ± 9.20	45.46 ± 9.64	45.94 ± 8.60	64.507	<0.001

symptom management scored the lowest. One month after discharge, diet management had the highest score, while the score for symptom management was the lowest. Three months after discharge, the score for psychological and social adaptation management peaked again, with symptom management still at the lowest.

One year after discharge, the score for psychological and social adaptation management remained the highest, while the score for symptom management remained the lowest. The consistently high scores for psychological and social adaptation management may be attributed to the characteristics of patients included in this study.

Table 5 Multiple linear regression of self-management in older patients with chronic heart failure (T0-T4)

Time	Variable	β	SE	Standardization coefficient	t	*P*
T0 (*n* = 213)	Course of disease	3.206	0.681	0.283	4.711	<0.001
	Social support	0.411	0.090	0.272	4.551	<0.001
	Charlson Comorbidity	2.754	0.851	0.189	3.236	0.001
	Education level	3.017	1.029	0.176	2.933	0.004
	Type of medication	3.671	1.259	0.176	2.916	0.004
	(constant)	12.595	3.800		3.315	0.001
T1 (*n* = 206)	Self-Efficacy	0.354	0.062	0.365	5.681	<0.001
	Social support	0.409	0.086	0.307	4.736	<0.001
	Course of disease	1.498	0.534	0.147	2.803	0.006
	Education level	1.902	0.830	0.123	2.292	0.023
	Type of medication	2.193	0.972	0.118	2.257	0.025
	(constant)	15.377	2.795		5.501	<0.001
T2 (*n* = 201)	Social support	0.614	0.100	0.393	6.119	<0.001
	Self-Efficacy	0.327	0.075	0.278	4.379	<0.001
	Type of medication	4.485	1.117	0.203	4.016	<0.001
	Personal monthly income	1.823	0.584	0.169	3.121	0.002
	(constant)	6.135	3.373		1.819	0.070
T3 (*n* = 189)	Self-Efficacy	0.506	0.069	0.464	7.371	<0.001
	Education level	2.887	1.000	0.160	2.888	0.004
	Social support	0.35	0.096	0.229	3.635	<0.001
	Personal monthly income	1.455	0.606	0.137	2.401	0.017
	(constant)	9.553	2.462		3.88	<0.001
T4 (*n* = 173)	Social support	0.472	0.104	0.306	4.533	0.000
	Self-Efficacy	0.422	0.081	0.339	5.186	0.000
	Personal monthly income	2.173	0.676	0.204	3.216	0.002
	Education level	2.373	1.099	0.134	2.159	0.032
	(constant)	9.019	3.097		2.912	0.004

In the study, patients with cardiac function class I and II accounted for 67.2% of the total. These patients have milder symptoms and only mild limitations in physical activity, enabling them to better engage in daily activities and social interactions. The consistently low scores in symptom management may be because the patients were mainly older people with relatively low education levels, poor ability to accept knowledge, and limited knowledge about diseases. Thus, as medical staff provide guidance on self-management, symptom management should be the focus in patients with CHF.

Factors influencing self-management in patients with CHF

The results of the single-factor and multi-factor analyses showed that the factors influencing self-management differed at different time points and were collectively affected by multiple factors.

Better social support and self-efficacy results and better self-management ability

The results of this study show that social support significantly influences patients' self-management behaviors during hospitalization and within 1 year after discharge. Higher levels of social support correlated with stronger self-management abilities, which aligns with the findings of a meta-analysis on the self-management experiences of patients with CHF conducted by Hui et al. [32]. Older patients with CHF often experience multiple health issues, physical decline, and limited self-care abilities, making it challenging to maintain effective self-management and requiring others to provide assistance and financial support. Therefore, medical staff should actively understand patients' family situation and available medical resources, educate patients' families on the importance of family support, facilitate family and caregiver education, help patients adopt healthier lifestyles, and assist and urge patients to maintain self-management. For older patients without family support, community health institutions can play a critical role by connecting patients with community medical resources and volunteers and conducting home visits to enhance compliance with self-management practices.

Additionally, self-efficacy in chronic disease management influences patients' self-management behavior within 1 year after discharge, as higher self-efficacy is associated with better self-management. Self-efficacy refers to patients' confidence in completing specific behaviors closely related to their self-management ability. Therefore, healthcare providers should emphasize patient health education, encourage active participation in

disease management, help with teaching disease-related knowledge and mastering self-management methods, establish patients' confidence in self-management, and stimulate effective self-management behaviors.

Factors that correlate with better self-management abilities in patients with CHF

The disease course influences self-management behavior during hospitalization and 1 month after discharge. A longer disease course was associated with improved self-management, consistent with the findings of Yue et al. [33]. This improvement may be due to increased health education and a better ability to master disease knowledge and self-management with time. On the other hand, a longer disease course correlates with worse heart function, more severe symptoms, and more concern about physical changes; consequently, the patient's self-management behavior may be better. Thus, the medical department should establish patient-friendly and peer support groups to provide opportunities for patients with different disease courses to communicate and help them acquire more self-management knowledge and skills, thus improving their self-management ability.

Our study findings also indicated that self-management behavior during hospitalization, 1 month after discharge, and 3 months after discharge was influenced by the type of medication and medication compliance. Patients with good medication compliance had relatively good self-management. On the other hand, long-term use of multiple medications suggests that the patient's condition is relatively more complicated, and the patient needs to master more disease and medication knowledge, thereby enhancing self-management abilities. Medical staff should pay attention to patients who take fewer medications to prevent them from discontinuing medication use due to subjective cognitive errors and thinking that their condition is relieved.

Furthermore, the self-management behavior of patients during hospitalization is influenced by complications, and higher complication indexes correlated with better self-management behaviors, which is contrary to the findings of Wenxin et al. [34], who found that multiple complications posed challenges to patient self-care. This study showed a significant positive correlation between complications and self-management behaviors. The common complications of CHF are diabetes, hypertension, and coronary heart disease, which require diet, exercise, and symptom management; therefore, patients with more complications may receive more health education, leading to greater participation in self-management. Hence, nurses should assist patients with various complications to actively cope with the disease, establish confidence, and develop targeted intervention measures based on the patient's situation.

Higher education levels and personal monthly income correlate with better self-management abilities in patients

This study showed that the self-management behavior of patients during hospitalization and within 1 year after discharge is influenced by education level and personal monthly income. Patients with higher education levels and personal income demonstrated better self-management behaviors. This is likely because they have a stronger understanding and acceptance of health education provided by medical staff, leading to the mastering and adoption of more self-management behaviors. CHF requires ongoing care, regular check-ups, long-term medication, and significant medical expenses. Patients with a higher monthly income may have more financial ability to access medical services and overcome the obstacles to self-management caused by economic issues (long-term medication and regular review), thereby achieving better self-management.

Medical staff should prioritize patients with lower education levels and monthly incomes, formulating personalized health education programs based on their education level and monthly income. Educational content should be easily understood and delivered through diverse methods such as videos, pictures, and written materials. Additionally, long-term follow-up for these patients should be strengthened to help them maintain effective self-management.

Depression, quality of life, and self-management are closely related

The results of the univariate analysis in this study showed that both depression and quality of life were associated with self-management scores, but the results of the multiple linear regression showed that both were not independent factors of self-management ability. This may have been related to the small sample size. Previous studies [35–36] have shown that depression is a risk factor associated with poor self-management, with higher depression scores associated with poorer self-management. Patients with depression often face the disease with a negative mindset and struggle with solving problems, and their self-management ability is at a low level. In clinical practice, healthcare professionals should formulate appropriate self-management programs based on the patients' psychological conditions, help them to take the initiative to implement self-management measures, and guide them to face the disease positively. Chronic disease self-management is closely related to quality of life. Effective self-management can alleviate the effects of the disease, delay its progression, and enhance the physical and mental health of patients, thereby improving life satisfaction. By consuming a nutritious diet, exercising regularly, taking medication as prescribed, and monitoring their

conditions, patients can better control their disease and enjoy a better quality of life [37].

Limitations

Our study has some limitations. First, this study may have a selection bias, as it only included patients from a single hospital in Yinchuan, which may limit the generalizability of the findings to other regions or types of hospitals. The population in this specific hospital might have unique characteristics that are not representative of all older patients with CHF. Second, the reliance on self-reported measures (e.g., the Self-management Scale, SECD6, SSRS, GDS-15) may introduce response bias. Patients might overestimate or underestimate their abilities or symptoms. Additionally, the validity and reliability of some translated scales in the specific cultural context of the study population may not be fully established.

Conclusions

The self-management ability of older patients with CHF is generally low and has a dynamic trend of initially improving and then declining. Self-management was at its lowest during hospitalization, improved 1 month after discharge, declined again 3 months after discharge, and stabilized 6 months after discharge. Symptom management, in particular, is lower than other aspects of self-management and requires special attention. Social support, self-efficacy, disease course, medication type, complications, education level, and personal monthly income were identified as factors influencing the self-management behavior of patients with CHF. Hence, medical staff should strengthen the management of patients for the first 3 months after discharge and continue regular follow-up, provide targeted interventions based on specific influencing factors, establish self-management awareness, improve self-management behaviors, reduce the occurrence of complications and the rate of readmission, and improve the quality of life for these patients.

Abbreviations

CHF	Chronic heart failure
ANOVA	Analysis of variance

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Author contributions

DW wrote the manuscript, provided technical guidance and made revision, responsible for system submissions and email responses. LJY collected information, performed the statistical analysis, co-wrote the paper. WF, BL, LJ, WR participated in the questionnaire survey and sample collection and gave technical support. DW s. All authors read and approved the final manuscript.

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Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study was approved by the Human Ethics Research Committee of Genenral Hospital of Ningxia Medicla University (No. KYLL-2021-463) and was conducted in accordance with the Declaration of Helsinki. All participants signed an informed consent form before being included in the study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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