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ORIGINAL ARTICLE

Observational Study

Effects of WeChat platform-based health management on health and self-management effectiveness of patients with severe chronic heart failure

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Abstract

BACKGROUND

Epidemiological studies have found that the prevalence of chronic heart failure in China is 0.9%, the number of people affected is more than 4 million, and the 5-year survival rate is even lower than that of malignant tumors.

AIM

To determine the impact of WeChat platform-based health management on severe chronic heart failure patients' health and self-management efficacy.

METHODS

A total of 120 patients suffering from chronic heart failure with cardiac function grade III-IV, under the classification of the New York Heart Association, were admitted to our hospital in May 2017. In January 2020, they were divided into two groups: A control group (with routine nursing intervention) and an observation group (with WeChat platform-based health management intervention). Changes in cardiac function, 6-min walking distance (6MWD), high-sensitivity cardiac troponin (hs-cTnT), and N-terminal pro B-type natriuretic peptide (NT-proBNP) were detected in both groups. The Self-Care Ability Scale (ESCA) score, Minnesota Living with Heart Failure Questionnaire score, and compliance score were used to evaluate self-management ability, quality of life, and compliance of the two groups. During a follow-up period of 12 mo, the occurrence of cardiovascular adverse events in both the groups was counted.

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RESULTS

The left ventricular ejection fraction, stroke output, and 6MWD increased, and the hs-cTnT and NT-proBNP decreased in both the groups, as compared to those before the intervention. Further, cardiac function during the 6MWD, hs-cTnT, and NT-proBNP improved significantly in the observation group after intervention ($P < 0.05$). The scores of self-care responsibility, self-concept, self-care skills, and self-care health knowledge in the observation group were higher than those of the control group before intervention, and their ESCA scores were significantly improved after intervention ($P < 0.05$). The Minnesota heart failure quality of life (LiHFe) scores of physical restriction, disease symptoms, psychological emotion, social relations, and other items were decreased compared to those of the control group before intervention, and the LiHFe scores of the observation group were significantly improved compared to those of the control group ($P < 0.05$). With intervention, the compliance scores of rational diet, regular medication, healthy behavior, and timely reexamination were increased, thereby leading to the compliance scores of the observation group being significantly improved compared to those of the control group ($P < 0.05$). During the 12 mo follow-up, the incidence rates of acute myocardial infarction and cardiogenic rehospitalization in the observation group were lower than those of the control group, and the hospitalization time in the observation group was shorter than that of the control group, but there was no significant difference between the two groups ($P > 0.05$).

CONCLUSION

WeChat platform-based health management can improve the self-care ability and compliance of patients with severe chronic heart failure, improve the cardiac function and related indexes, reduce the occurrence of cardiovascular adverse events, and enable the avoidance of rehospitalization.

Key Words: WeChat platform; Health management; Severe chronic heart failure; Self-care capacity; Cardiac function; Adverse cardiovascular events

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Core Tip: Through a set of retrospective studies, it was confirmed that health management based on the WeChat platform can improve the self-care ability and compliance of patients with severe chronic heart failure, improve the cardiac function and related indexes, reduce the occurrence of cardiovascular adverse events, and avoid rehospitalization.

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INTRODUCTION

Chronic heart failure is the final stage of various cardiovascular diseases. It is complex and involves multiple complications, a high case fatality rate, and a profoundly negative prognosis. Patients frequently need to be hospitalized, which may not only lead to deterioration of their condition, but also add an economic burden on them, causing medical resource waste. Therefore, maintaining a stable condition of chronic heart failure has become a key objective in clinical treatments[1]. However, the phenomena of worsening cardiac situations and repeated hospitalizations are currently very common given that there are no effective approaches to address the issues of health intervention subsequent to the discharge of patients and their poor self-management capabilities. Under the present conventional nursing model, interventions for patients outside the hospital consist of discharge guidance and

telephonic interviews, and their impacts are barely satisfactory[2].

Continuing nursing care is an emerging nursing model that is an extension of hospital care. It ensures that patients receive sustained and efficient care interventions and are able to solve health problems when they are discharged[3]. WeChat is a common and good real-time social application with high interactivity and is utilized frequently in the medical field[4]. In this study, we applied WeChat to continue nursing care outside the hospital for severe patients with chronic heart failure and observed the impact of the WeChat platform-based health management approach on the health of the patients and the efficiency of self-management.

MATERIALS AND METHODS

General information

One hundred and twenty patients with chronic heart failure with cardiac function of grade III-IV, under the New York Heart Association (NYHA), were admitted to our hospital in May 2017. In January 2020, they were divided into two groups: A control group (with routine nursing intervention) and an observation group (with WeChat platform-based health management intervention). The inclusion criteria for the patients were as follows: (1) Suiting the standard of chronic heart failure provided in the Chinese Guidelines for the Diagnosis and Treatment of Heart Failure; (2) being in the age group of 18-75 years; (3) having NYHA grade III-IV cardiac function; (4) having a good mastery over using WeChat and residing locally; (5) having an expected lifetime of 12 mo or more; and (6) providing their informed consent. The exclusion criteria were as follows: (1) Having an abnormal function of limbs; (2) suffering from valvular heart disease and/or Cor pulmonale; (3) being diagnosed as insane; (4) having severe infections; and (5) having uncontrollable diseases such as hypertension and diabetes.

There were 60 cases in the control group, with 36 patients being male and 24 being female. The age range was 40 years to 75 years and the average age (mean ± SD) was 58.69 ± 10.13 years. There were 60 cases in the observation group, with 32 patients being male and 24 being female. The age range was 40 years to 75 years and the average age was 59.41 ± 11.05 years.

Methods

The control group received conventional care intervention and discharge guidance, including reasonable diet, usage of drugs under instruction, proper exercise, and an appointment for the next visit to the hospital. Telephonic follow-ups were done regularly when they were discharged from the hospital.

The observation group received WeChat platform-based health management intervention. The WeChat health management group was composed of a doctor, a nurse, and an administrator on the network platform. The administrator built the group and the official accounts of health management, and ensured that both were maintained and run routinely. Medical staff regularly published relevant knowledge about self-management of chronic heart failure, including basic knowledge of cardiovascular diseases, a regular schedule to adhere to, diet and drug instructions, sports guidance, emotion management, *etc.* This content was issued in the form of pictures, texts, audio notes, and video notes, once a day. WeChat provided personalized instructions, propagated health behavior interventions, and instructed patients, whose conditions were getting worse, to obtain medical treatment instantly, and also assisted them with arranging hospitalization *via* private talks.

Measurements

The cardiac function indexes, left ventricular ejection fraction (LVEF) and stroke output (SV), were detected using an ultrasonic cardiogram before and after the 12-mo interventions. The detection equipment used was a Philips IE33 Color Doppler Ultrasound diagnostic instrument with a probe frequency of 3.0-7.5 MHz. Fasting venous blood (3 mL) was collected from the patients, and centrifuged for 10 min at 3500 *r*/min within 1 h after the blood collection. The serum was tested for high-sensitivity cardiac troponin (hs-cTnT) and N-terminal pro B-type natriuretic peptide (NT-proBNP) by enzyme-linked immunosorbent assay. The kit was manufactured by Shanghai Enzyme Link Biotechnology Co., Ltd., and the instrument used was the RT-96A enzyme label instrument manufactured by Shenzhen Mindray Medical Electronics Co., Ltd.

Evaluation standards

The Self-care Ability Scale (ESCA) score, Minnesota heart failure quality of life (LiHFe) score, and compliance score were used to evaluate the self-management ability, quality of life, and compliance of both groups.

The ESCA score includes 43 items of self-care responsibility, self-concept, self-care skills, and self-care health knowledge, and the score is positively correlated with self-management ability. The LiHFe score includes 21 items in total, including physical limitations, disease symptoms, psychological emotions, and social relationships. A 6-segment scoring method is applied, and the score is inversely proportional to the quality of life[5]. The compliance score includes a reasonable diet, regular medication, healthy behavior, and timely review. This scale is a self-designed score by the hospital, with a single score ranging from 0 to 10 points, which is proportionate to compliance by the patient.

Follow-up information

The occurrence and hospitalization time of cardiovascular adverse events (*i.e.*, aggravation of heart failure, acute myocardial infarction, severe arrhythmia, cardiogenic readmission, *etc.*) in both groups were recorded by the outpatient service or WeChat platform for 12 mo.

Statistical analysis

Statistical analyses were performed with SPSS19.0. Measuring index are expressed as the mean ± SD and were compared by the *t* test. Count data were compared by the χ^2 test. Statistical significance was defined as $P < 0.05$.

RESULTS

Comparison of baseline data between the two groups

There was no statistical significance when comparing the baseline data between the two groups ($P > 0.05$; Table 1).

Comparison of heart function between the two groups

The LVEF and SV rose after intervention in both groups. Further, the heart function after intervention of the observation group significantly increased compared to that of the control group ($P < 0.05$; Table 2).

Comparison of 6-min walking distance, hs-cTnT, and NT-proBNP between the two groups

After intervention, the 6-min walking distance (6 MWD) increased, and the hs-cTnT and NT-proBNP decreased in both groups; the 6MWD, hs-cTnT, and NT-proBNP after intervention of the observation group significantly increased compared to those of the control group ($P < 0.05$; Table 3).

Comparison of ESCA scores between the two groups

After intervention, ESCA scores of self-care responsibility, self-concept, self-care skills, self-care health knowledge, *etc.* increased in both groups and ESCA scores after intervention of the observation group significantly increased compared to those of the control group ($P < 0.05$; Table 4).

Comparison of LiHFe scores between the two groups

After intervention, LiHFe scores of physical limitations, disease symptoms, psychological emotions, social relationships, *etc.* decreased in both groups and the LiHFe scores after intervention of the observation group significantly increased compared to those of the control group ($P < 0.05$; Table 5).

Comparison of compliance scores between the two groups

After intervention, compliance scores of reasonable diet, regular medication, healthy behavior, timely review, *etc.* increased in both groups and compliance scores after intervention in the observation group significantly increased compared to those of the control group ($P < 0.05$; Table 6).

Table 1 Comparison of baseline data between the two groups, *n* (%)

Parameter	Control group (*n* = 60)	Observation group (*n* = 60)	χ^2/t	*P* value
Gender			0.543	0.461
Male	36 (75.00)	32 (53.33)		
Female	24 (35.00)	28 (46.67)		
Age (yr)	58.69 ± 10.13	59.41 ± 11.05	0.372	0.711
Course (yr)	6.36 ± 1.24	6.24 ± 1.57	0.465	0.643
History of smoking			1.234	0.267
Yes	22 (36.67)	28 (46.67)		
No	38 (63.33)	32 (53.33)		
NYHA classification			0.534	0.465
III	31 (51.67)	27 (45.00)		
IV	29 (48.33)	33 (55.00)		
Heart-based diseases			2.394	0.495
Dilated cardiomyopathy	5 (8.33)	9 (15.00)		
Rheumatic heart disease	10 (16.67)	12 (20.00)		
Coronary heart disease	18 (30.00)	19 (31.67)		
High blood pressure	27 (45.00)	20 (33.33)		
Combined diseases				
Hyperlipidemia	15 (25.00)	21 (35.00)	1.429	0.232
Hypertension	30 (50.00)	33 (55.00)	0.301	0.583
Diabetes	19 (31.67)	15 (25.00)	0.657	0.418
Education			1.295	0.523
Junior high school and below	12 (20.00)	9 (15.00)		
Secondary and tertiary	24 (40.00)	21 (35.00)		
Undergraduate and above	24 (40.00)	30 (50.00)		

Table 2 Comparison of heart function between the two groups (mean ± SD)

Group	Number of cases	LVEF (%)		SV (mL)	
		Pre-intervention	After intervention	Pre-intervention	After intervention
Control	60	34.23 ± 4.26	48.23 ± 4.63[a]	91.02 ± 5.87	103.22 ± 6.32[a]
Observation	60	33.97 ± 4.51	60.44 ± 4.58[a]	89.63 ± 6.87	112.02 ± 5.78[a]
t		0.325	14.522	1.191	7.959
P value		0.746	0.000	0.236	0.000

[a]$P < 0.05$ *vs* before intervention.
LVEF: Left ventricular ejection fraction; SV: stroke output.

Comparison of adverse cardiovascular events between the two groups

During the follow-up period of 12 mo, the observation group had lower acute myocardial infarction incidence and cardiogenic readmission rates, and also had shorter hospital stays compared to the control group. There was no statistical difference in the incidence rates of the aggravation of heart failure and severe arrhythmia between the two groups ($P > 0.05$; Table 7).

Table 3 Comparison of 6-min walking distance, high-sensitivity cardiac troponin, N-terminal pro B-type natriuretic peptide between the two groups

Group	Number of cases	6MWD (m)		hs-cTnT (μg/L)		NT-proBNP (μg/L)	
		Pre-intervention	After intervention	Pre-intervention	After intervention	Pre-intervention	After intervention
Control	60	352.69 ± 57.89	468.22 ± 67.41[a]	0.70 ± 0.22	0.48 ± 0.15[a]	3.85 ± 0.24	2.78 ± 0.16[a]
Observation	60	346.85 ± 62.08	519.36 ± 57.23[a]	0.72 ± 0.21	0.37 ± 0.12[a]	3.87 ± 0.25	1.95 ± 0.14[a]
t		0.533	4.480	0.509	4.436	0.447	30.240
P value		0.595	0.000	0.611	0.000	0.656	0.000

[a]*P* < 0.05 *vs* before intervention.

6MWD: 6-min walking distance; hs-cTnT: High-sensitivity cardiac troponin; NT-proBNP: N-terminal pro b-type natriuretic peptide.

Table 4 Comparison of Self-Care Ability Scale scores between the two groups (mean ± SD, subdivision)

Group	Number of cases	Self-care responsibility		Self-concept		Self-care skills		Self-care health knowledge	
		Pre-intervention	After intervention	Pre-intervention	After intervention	Pre-intervention	After intervention	Pre-intervention	After intervention
Control	60	19.16 ± 2.94	21.13 ± 2.32[a]	19.85 ± 3.56	22.34 ± 3.69[a]	27.84 ± 3.65	31.17 ± 4.69[a]	18.69 ± 3.85	23.12 ± 3.55[a]
Observation	60	18.97 ± 3.02	22.78 ± 3.17[a]	19.74 ± 3.62	24.87 ± 4.05[a]	28.01 ± 3.94	35.23 ± 4.47[a]	18.75 ± 4.05	25.78 ± 4.18[a]
t		0.349	3.254	0.168	3.577	0.245	4.854	0.083	3.757
P value		0.728	0.001	0.867	0.001	0.807	0.000	0.934	0.000

[a]*P* < 0.05 *vs* before intervention.

Table 5 Comparison of Minnesota heart failure quality of life scores between the two groups (mean ± SD, subdivision)

Group	Number of cases	Physical limitations		Symptoms of illness		Psychological mood		Social relations	
		Pre-intervention	After intervention	Pre-intervention	After intervention	Pre-intervention	After intervention	Pre-intervention	After intervention
Control	60	19.24 ± 2.46	15.63 ± 2.01[a]	13.56 ± 2.12	11.36 ± 1.75[a]	13.23 ± 1.85	11.47 ± 1.38[a]	8.78 ± 1.34	7.24 ± 1.03[a]
Observation	60	19.15 ± 2.73	11.67 ± 1.45[a]	13.61 ± 2.08	10.02 ± 1.51[a]	13.30 ± 1.76	9.58 ± 1.05[a]	8.83 ± 1.29	5.48 ± 0.87[a]
t		0.190	12.376	0.130	4.491	0.212	8.443	0.208	10.111
P value		0.850	0.000	0.896	0.000	0.832	0.000	0.835	0.000

[a]*P* < 0.05 *vs* before intervention.

DISCUSSION

WeChat platform-based health management carries out health education, drug instructions, management of health behaviors *etc.* by utilizing a social application called WeChat. It belongs to the field of continuing nursing care[6-8]. In recent years, WeChat platform interventions have been applied to various fields, such as chronic diseases, diabetes, coronary heart disease, chronic renal failure, and antenatal guidance[9].

A WeChat platform-based health management style was utilized in cases of severe chronic heart failure in this study, which could promote the capabilities of self-care responsibility, self-conception, self-care skills, self-care health knowledge, *etc.*, as well as moderate life qualities of physical limitations, disease symptoms, psychological emotions, social relationships, *etc.*; and improve compliance with a reasonable diet, regular medication, healthy behavior, and timely review. This is because official

Table 6 Comparison of compliance scores between the two groups (mean ± SD, subdivision)

Group	Number of cases	Reasonable diet		Regular drug use		Health behaviour		Review on time	
		Pre-intervention	After intervention	Pre-intervention	After intervention	Pre-intervention	After intervention	Pre-intervention	After intervention
Control	60	5.78 ± 1.32	7.23 ± 1.45[a]	6.23 ± 0.85	8.24 ± 0.63[a]	5.41 ± 0.96	7.58 ± 0.78[a]	5.32 ± 1.14	7.41 ± 0.82[a]
Observation	60	5.82 ± 1.07	8.69 ± 1.12[a]	6.21 ± 0.76	9.23 ± 0.57[a]	5.32 ± 1.05	8.75 ± 0.63[a]	5.37 ± 1.03	8.68 ± 0.67[a]
t		0.182	6.172	0.136	9.026	0.490	9.039	0.252	9.290
P value		0.856	0.000	0.892	0.000	0.625	0.000	0.801	0.000

[a]$P < 0.05$ *vs* before intervention.

Table 7 Comparison of adverse cardiovascular events between the two groups

Group	Number of cases	Increased heart failure	Acute myocardial infarction	Severe arrhythmia	Cardiogenic rehospitalization	
					Hospitalization rate	Hospitalization time
Control	60	5 (8.33)	8 (13.33)	6 (10.00)	17 (28.33)	16.25 ± 4.23
Observation	60	2 (3.33)	2 (3.33)	3 (5.00)	7 (11.67)	14.36 ± 3.12
χ^2/t		1.365	3.927	1.081	5.208	2.785
P value		0.243	0.048	0.298	0.022	0.006

accounts on the WeChat platform regularly published self-management-related intellectual property relating to chronic heart failure to help patients grasp the main points and skills of self-management. They also answered questions online on WeChat group communications to assist patients in mastering the main points of knowledge better through interaction, as well as urge them to engage in health management in order to improve self-care capability and treatment compliance. After building an electronic medical record, we required patients to report their self-measuring indexes every day to give medically accurate information on changes in their disease conditions and enable them to gain personalized intervention through private talks to recognize and deal with risk elements in time, control disease conditions effectively, and improve quality of life.

LVEF and SV are indicators of cardiac pumping function. A decrease in LVEF indicates myocardial contractility weakening[10-13]; and the 6MWD reflects the supportive force of cardiopulmonary function for exercise[14]. Hs-cTnT is a structural protein of cardiomyocytes, and its elevation in serum levels indicates myocardial injury and necrosis[15-19]. NT-proBNP is an endogenous hormone secreted by ventricular myocytes, and its serum level reflects the degree of myocardial damage, which is an important index for clinical evaluation of the degree of heart failure[20]. This study used indexes of ultrasound cardiograms and laboratory serum to estimate the condition of patients. The 6MWD was used to appraise exercise tolerance. We found that a health management style based on the WeChat platform in cases of severe chronic heart failure can promote the expression of heart function and related indicators, which favor disease control. During the 12-mo follow-up, we found that the WeChat platform-based health management style, in cases of severe chronic heart failure, reduced the acute myocardial infarction incidence and cardiogenic readmission rates and shortened hospital stays. Patients experienced the favorable effects of intervention in many aspects, such as healthy lifestyle, objecting to medical advice, and controlling their diseases during the interventions out of the hospital, by improved compliance with a reasonable diet, regular medication, healthy behavior, timely review, *etc*. In daily reports, in every self-measuring index, the medical staff and patient were able to easily note changes in disease condition in time, make relative adjustments in treatment, and prevent deterioration and relapse of the condition, which will ultimately have a better curative effect in the long term.

CONCLUSION

In summary, WeChat platform-based health management can improve the self-care ability and compliance of patients with severe chronic heart failure, improve the cardiac function and related indexes, reduce the occurrence of cardiovascular adverse events, and avoid rehospitalization.

ARTICLE HIGHLIGHTS

Research background

The prevalence of chronic heart failure in China continues to rise. Continuing nursing care is an emerging nursing model that is an extension of hospital care. WeChat is a common and good real-time social application with high interactivity and is utilized frequently in the medical field

Research motivation

This study explored the impact of WeChat platform-based health management on the treatment of patients with severe chronic heart failure.

Research objectives

The study aimed to explore the significance of health management based on WeChat platform in the treatment of patients with severe chronic heart failure.

Research methods

In May 2017, a group study of 120 patients with chronic heart failure grade III-IV heart function classified by the New York Heart Association was conducted at our hospital.

Research results

The left ventricular ejection fraction, stroke output, and 6-min walking distance (6MWD) increased, and the high-sensitivity cardiac troponin (hs-cTnT) and N-terminal pro B-type natriuretic peptide (NT-proBNP) decreased in both groups, as compared to those before the intervention. Further, cardiac function during the 6MWD, hs-cTnT, and NT-proBNP improved significantly in the observation group after intervention ($P < 0.05$).

Research conclusions

Health management based on the WeChat platform can improve the self-care ability and compliance of patients with severe chronic heart failure, reduce the occurrence of adverse cardiovascular events, and avoid rehospitalization.

Research perspectives

Health management based on the WeChat platform can play a greater role in the treatment of cardiovascular diseases.

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