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Application of Comprehensive Nursing Intervention in Chronic Heart Failure Care and Its Effect on Cardiac Function

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Abstract: *Objective*: To analyze the application of comprehensive nursing intervention in chronic heart failure care and its effect on cardiac function. *Methods*: The study subjects were 92 patients with chronic heart failure admitted to the hospital from January 2024 to March 2026. They were randomly divided into two groups using a random number table (46 cases per group). The control group received routine nursing care, while the study group received comprehensive nursing intervention. Cardiac function indicators and readmission rates were compared between the two groups. *Results*: Before the nursing intervention, there were no statistically significant differences in the observed indicators between the two groups ($p > 0.05$). After nursing, all indicators improved significantly ($p < 0.05$). The study group showed lower serum N-terminal pro-B-type natriuretic peptide, left ventricular end-diastolic diameter, and 3month readmission rate after discharge, and a higher left ventricular ejection fraction compared with the control group (all $p < 0.05$). *Conclusion*: Implementing comprehensive nursing intervention in chronic heart failure patients can effectively promote cardiac function improvement, reverse ventricular remodeling, enhance cardiac pumping function, alleviate somatic symptoms, and reduce readmissions.

Keywords: Comprehensive nursing intervention; Chronic heart failure; Cardiac function; Readmission rate

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1. Introduction

Chronic heart failure is the terminal stage of various cardiovascular diseases, characterized by a prolonged course and high readmission rates. Patients often present with myocardial injury and ventricular remodeling, along with reduced exercise tolerance, decreased quality of life, obvious negative emotions, insufficient self-management ability, and a tendency to become lax, which increases the risk of readmission and imposes a heavy healthcare burden [1,2]. Conventional nursing care is limited to symptom observation and health education, lacking individualized rehabilitation interventions, psychosocial support, and post-discharge continuity management, resulting in limited long-term effectiveness [3]. Therefore, it

is necessary to optimize nursing approaches. Comprehensive nursing intervention, with its core concepts of full-cycle, multidimensional, individualized, and collaborative empowerment, can address the shortcomings of traditional nursing. Based on this, the present study aims to analyze the application of comprehensive nursing intervention in chronic heart failure care and its effect on cardiac function, providing a clinical basis for standardized comprehensive nursing of chronic heart failure patients.

2. Materials and methods

2.1. General data

The study subjects were 92 patients with chronic heart failure admitted to the hospital from January 2024 to March 2026. They were randomly divided into two groups (46 cases per group) using a random number table: a control group and a study group.

2.1.1. Inclusion criteria

(1) Meeting the clinical diagnostic criteria for chronic heart failure;
(2) NYHA functional class II–IV;
(3) Conscious with good compliance;
(4) Complete clinical data.

2.1.2. Exclusion criteria

(1) Acute phase of heart failure or accompanied by severe arrhythmias, hepatic or renal failure, etc.;
(2) Combined with malignant tumors or psychiatric disorders;
(3) Accompanied by disabilities or bone and joint diseases;
(4) Withdrawal for various reasons during the study.

Control group: gender: 26 males and 20 females; age: 54–83 years, mean (68.63 ± 7.08) years; body mass index: 21.6–30.5 kg/m², mean (26.08 ± 2.11) kg/m²; disease duration: 3–8 years, mean (5.68 ± 1.02) years; NYHA functional class: class II in 18 cases, class III in 21 cases, class IV in 7 cases.

Study group: gender: 27 males and 19 females; age: 52–84 years, mean (68.02 ± 7.75) years; body mass index: 21.2–30.1 kg/m², mean (25.97 ± 2.05) kg/m²; disease duration: 3–8 years, mean (5.42 ± 1.19) years; NYHA functional class: class II in 15 cases, class III in 22 cases, class IV in 9 cases.

There were no statistically significant differences between the two groups ($P > 0.05$), indicating comparability. All subjects provided informed consent, and the study protocol followed the guidelines of the Declaration of Helsinki.

2.2. Methods

The control group received routine nursing care, including routine vital sign monitoring, cardiac function observation, medication education, basic psychological comfort, bed rest guidance, and low-salt diet guidance . At discharge, patients received routine health education and a checklist of precautions after discharge . Follow-up was conducted by telephone once a month after discharge.

The study group received comprehensive nursing intervention, as detailed below:

(1) Admission risk stratification

At the time of admission, data including age, cardiac function, comorbidities, psychological status,

sleep quality, and self-management ability were collected to comprehensively assess risk levels. Patients were categorized as low-risk (age < 65 years, NYHA class II, ≤ 1 comorbidity, no significant anxiety or depression, acceptable sleep, good self-management ability), moderaterisk (age 65–79 years, NYHA class III, ≤ 2 comorbidities, mild anxiety/depression, mild-to-moderate sleep disturbance, average self-management ability), or high-risk (NYHA class III or IV, ≥ 3 comorbidities, moderate-to-severe anxiety/depression, severe sleep disturbance, poor self-management ability). For low-risk patients, the primary goals were health empowerment and cultivation of self-management skills; for moderate and high-risk patients, the primary goals were symptom monitoring, volume load, emotional status, sleep, medication adherence, and enhanced rehabilitation protection.

(2) Comprehensive individualized in-hospital nursing care

① Symptom management: Dynamic monitoring of vital signs, intake/output, and body weight; maintenance of resting heart rate at 60–70 beats/min, blood pressure at 90–130/60–80 mmHg, and oxygen saturation ≥ 92%; for patients in decompensation, total fluid intake within 24 hours was limited to ≤ 1500 mL, with a daily negative fluid balance target of 200–500 mL. Body weight was measured uniformly in the morning on an empty stomach; weight gain > 2 kg within 3 days or > 3 kg within 1 week served as a warning of volume overload. For patients at high risk of volume overload, monitoring frequency was increased from once every 6 hours to once every 4 hours, with assessment of jugular venous distention, pulmonary rales, and edema each shift. Daily sodium intake did not exceed 2 g. Semi-recumbent or sitting positions were appropriately adopted to reduce cardiac load. Urine output, electrolytes, and renal function were dynamically monitored. If any of the following occurred—respiratory rate > 24 breaths/min, oxygen saturation < 92%, rapid short-term weight gain, or paroxysmal nocturnal dyspnea—physicians were immediately notified, and emergency preparations were initiated. According to the degree of dyspnea, for patients with mild dyspnea, positional interventions were intensified, low-flow oxygen was given as needed, and routine volume monitoring was performed; for patients with moderate-to-severe dyspnea, strict bed rest, semi-recumbent or sitting positions, oxygen therapy as needed, and passive limb exercises to prevent deep vein thrombosis were implemented. Targeted medication nursing supervision was carried out for drugs used, with monitoring of electrolytes, heart rhythm, and renal function. ② Diet management: Individualized nutritional intervention was provided based on the patient's edema severity, cardiac and renal function, and body mass index. Daily salt intake for patients with mild and moderate-to-severe heart failure was limited to ≤ 5 g and 2–3 g, respectively. Daily water intake was dynamically adjusted according to volume load; for patients with severe edema or pleural effusion, water intake was strictly controlled and recorded as part of intake/output. Patients were instructed to choose a low-fat, high-vitamin, high-quality protein diet. ③ Exercise rehabilitation: According to NYHA functional class, patients with class II received mainly low-intensity aerobic training such as bedside standing, slow indoor walking, Tai Chi, and yoga; patients with class III received respiratory training, active bed exercises, and sitting training ; patients with class IV received bed rest, passive limb activities, and respiratory training. Functional class was re-evaluated weekly, and the corresponding exercise rehabilitation plan was implemented accordingly. ④ Emotional intervention: Psychological assessments were conducted at admission, mid-hospitalization, and before discharge, with interventions based on the severity of negative emotions. Patients with mild emotional disturbance received mindfulness relaxation, music therapy, and illness acceptance interventions; patients with moderate disturbance received additional group interventions (motivation stimulation, self-reflection, peer recognition); patients with severe disturbance received professional

psychological counseling. ⑤ Disease cognition intervention: Through situational education, distribution of illustrated brochures, video demonstrations, and family education, patients and their families were helped to correct common misconceptions (e.g., excessive bed rest, arbitrary tonic use, self-discontinuation of medication, uncontrolled water intake, excessive exercise) and to understand triggers of heart failure, recognition of complications, emergency management, and indications for follow-up visits.

(3) Transitional care at discharge

Starting 3 days before discharge, an individualized discharge rehabilitation checklist was developed for each patient according to their recovery status, risk level, and home care capacity, specifying salt intake standards, water intake, exercise rehabilitation plans, weight monitoring charts, medication schedules, warning symptom lists, and emergency management methods. Theoretical and practical home care training was provided to family members.

(4) Intelligent home-based continuity care

Using the hospital's health management mini-program, patients were guided to upload daily basic data including heart rate, blood pressure, weight, medication adherence, and exercise status. The system automatically identified high-risk signals and generated intelligent alerts. Follow-up frequency was once a month for low-risk patients, once every 2 weeks for moderate-risk patients, and once a week for high-risk patients. A health communication group was established, with educational articles on heart failure rehabilitation and misconception correction pushed once a month, and live lectures once a month, with real-time online answers to patients' health questions.

2.3. Outcome measures

Assessments were conducted before the intervention and 3 months after the intervention.

(1) Cardiac function indicators

① Biochemical indicator: serum N-terminal pro-B-type natriuretic peptide; ② Echocardiographic indicators: left ventricular ejection fraction and left ventricular end-diastolic diameter.

(2) Readmission rate within 3 months after discharge was recorded.

2.4. Statistical methods

All statistical analyses were performed using SPSS 26.0 software. Measurement data conforming to normal distribution were expressed as mean ± standard deviation ($\bar{x} \pm s$). Paired *t*-tests were used for intra-group comparisons before and after intervention, and independent sample *t*-tests for inter-group comparisons. Categorical data were expressed as number (percentage) [n (%)] and analyzed using the chi-square test. A p-value < 0.05 was considered statistically significant.

3. Results

3.1. Comparison of cardiac function indicators

As shown in **Table 1**, before nursing intervention, there were no statistically significant differences in any cardiac function indicators between the two groups ($p > 0.05$). After nursing intervention, both groups showed significant improvement ($p < 0.05$). Specifically, the serum N-terminal pro-B-type natriuretic peptide level and left ventricular enddiastolic diameter in the study group were lower than those in the control group, while the left ventricular ejection fraction was higher in the study group than in the control group (all $p < 0.05$).

See **Table 1**.

Table 1. Comparative analysis of cardiac function indicators ($\overline{x} \pm s$)

Group	NT-proBNP (pg/mL)	NT-proBNP (pg/mL)	LVEF (%)	LVEF (%)	LVEDD (mm)	LVEDD (mm)
	Before intervention	Three months after the intervention	Before intervention	Three months after the intervention	Before intervention	Three months after the intervention
Control group (n = 46)	1773.49 ± 226.71	1261.77 ± 195.63[a]	36.58 ± 5.12	42.08 ± 3.44[a]	63.58 ± 5.66	57.06 ± 4.29[a]
Study group (n = 46)	1806.51 ± 219.49	1088.42 ± 171.71[a]	36.67 ± 5.06	47.49 ± 4.62[a]	64.61 ± 5.71	53.41 ± 4.04[a]
t value	0.710	4.517	0.085	6.370	0.869	4.201
p value	0.480	< 0.001	0.933	< 0.001	0.387	< 0.001

Note: [a] indicates $p < 0.05$ compared with before intervention within the same group.

3.2. Comparison of readmission rates

At 3 months after discharge, there were 7 readmissions in the control group and 1 in the study group, with readmission rates of 15.22% and 2.17%, respectively. The rate in the study group was significantly lower than that in the control group ($\chi^2 = 4.929$, $p = 0.026$, $p < 0.05$).

4. Discussion

Patients with chronic heart failure (CHF) often experience recurrent episodes and prolonged illness, commonly presenting with decreased activity tolerance, poor self-management ability, and limited family support. After short-term hospitalization for symptom relief, they are prone to exacerbation and readmission, which not only affects the quality of life but also imposes a burden on society [4]. Conventional nursing interventions are unidimensional, with insufficient transitional care, and their overall effectiveness needs improvement. Therefore, the present study, based on the concept of comprehensive nursing intervention, integrates multiple measures including physiological intervention, psychological support, graded management, and smart homebased transitional care throughout the entire process from pre-hospital and in-hospital to home settings, thereby constructing a holistic nursing model.

Our study showed that before intervention, there were no significant differences in cardiac function indicators between the two groups ($p > 0.05$); after intervention, both groups showed significant improvement ($p < 0.05$). In particular, the study group had lower serum N-terminal pro-B-type natriuretic peptide (NT-proBNP) and left ventricular end-diastolic diameter (LVEDD), and higher left ventricular ejection fraction (LVEF) compared with the control group (all $p < 0.05$). This indicates that comprehensive nursing intervention can effectively improve cardiac function in CHF patients. The reasons may be as follows: graded emotional intervention and individualized transitional care help patients maintain a positive mood and receive professional care at home, thereby reducing myocardial hypoxia and injury caused by fatigue, emotional stress, or improper disease management, and preventing continuous damage to cardiomyocytes. Strict control of fluid intake through graded water intake management, dynamic monitoring of body weight and fluid balance, and specialized medication supervision can achieve rigorous fluid retention control, reduce cardiac volume overload, and subsequently inhibit

neuroendocrine overactivation and decrease NT-proBNP release. Long-term standardized dietary and medication management can continuously alleviate cardiac preload and afterload [5,6]. Graded exercise rehabilitation intervention effectively improves myocardial contractile reserve and delays ventricular remodeling. Smart home-based transitional care enables timely monitoring of patients' daily behaviors, and online distribution of health education articles and lectures can correct unhealthy behaviors, preventing further deterioration of cardiac function, reversing ventricular enlargement, and improving pump function. In this study, the readmission rate at 3 months after discharge in the study group was lower than that in the control group ($p < 0.05$), suggesting that comprehensive nursing intervention effectively reduces the risk of readmission in CHF patients [7]. Possible explanations include: refined volume management, graded rehabilitation exercise, and specialized medication supervision effectively alleviate physical symptoms and improve daily activity tolerance [8]; stratified psychological and cognitive interventions reduce psychological distress, achieve simultaneous physical and mental improvement, encourage active self-management, and stabilize the condition [9]; transitional care extended to the home phase, combined with smart monitoring and online education, strengthens both family caregivers' abilities and patients' self-management capacity, effectively avoiding high-risk behaviors and reducing recurrent episodes, thereby lowering readmission rates [10].

5. Conclusion

In conclusion, the implementation of comprehensive nursing intervention in CHF patients can effectively promote cardiac function improvement, alleviate myocardial injury, reverse ventricular remodeling, and enhance cardiac pumping function, thereby relieving physical symptoms and reducing readmissions.

Disclosure statement

The author declares no conflict of interest.

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