

ORIGINAL RESEARCH

Effect of Cardiac Rehabilitation Nursing on Patients with Myocardial Infarction

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ABSTRACT

Background • Acute myocardial infarction is the myocardial necrosis caused by acute and persistent ischemia and hypoxia of coronary arteries. It can be complicated with arrhythmia, shock or heart failure, and often can endanger life. The disease is most common in Europe and the United States, where about 1.5 million heart attacks occur each year. China has shown a clear upward trend in recent years, with at least 500 000 new cases and at least 2 million new cases every year. Cardiac rehabilitation nursing is a kind of comprehensive nursing that aims to restore the body function of patients with myocardial infarction.

Objective • To explore the therapeutic effect of cardiac rehabilitation nursing in patients with myocardial infarction.

Design • This was a case-control retrospective study.

Setting • This study was conducted in the Department of Heart Center, Shanghai Sixth People's Hospital.

Participants • 86 patients with acute myocardial infarction admitted to the Heart Center of Shanghai Sixth People's Hospital from January 2019 to August 2022 were selected and randomly divided into observation and control groups, with 43 cases in each group. Patients aged from 40-79 years old and were confirmed to have acute myocardial infarction by examination and histopathological analysis.

Interventions • The observation group was given cardiac rehabilitation nursing, including psychological nursing, rehabilitation training, cardiac rehabilitation training, diet and defecation care and health education, and the control group was assigned routine nursing.

Primary Outcome measures • (1) anxiety and depression were assessed by Zung's self-rating anxiety scale and self-rating depression scale (2) cardiac function was assessed by left ventricular ejection fraction and left

ventricular end-diastolic volume (3) 6-minute walk distance (4) incidence of complications (5) length of hospital stay (6) levels of inflammatory factors and N-terminal pro-brain natriuretic peptide concentration (7) incidence of arrhythmia.

Results • After the intervention, there was still no significance in either group's left ventricular end-diastolic volume level [(72.24±8.47) vs (71.98±8.35)] ($P = .473$). However, the anxiety and depression scores [(42.10±5.17) and (44.01±4.53) vs (44.01±4.53) and (51.37±4.85)], complication rate (6.9% vs 16.2%), length of hospital stay [(18.66±7.03) vs (26.11±8.14)], inflammatory factor levels [(1.95±0.51) and (319.47±33.72) vs (2.71±0.45) and (451.07±39.54)], serum N-terminal pro-brain natriuretic peptide level [(2525.8±1236.5) vs (3064.4±859.0)], and incidence of arrhythmia (3 cases, 2 cases, 1 case and 1 case vs 5 cases, 6 cases, 8 cases and 7 cases) in the observation group were lower compared to the control group ($P = .000$, $P = .002$, $P = 0.023$, $P = .045$, $P = .032$, $P = .011$, and $P = .027$). The left ventricular ejection fraction level and 6-minute walk distance of the observation group [(60.39±5.38) and (347.31±21.01) vs (54.97±6.24) and (320.24±21.71)] were better relative to the control group ($P = .037$ and $P = .000$).

Conclusion • For patients with myocardial infarction, the implementation of cardiac rehabilitation nursing can effectively alleviate the anxiety and depression of patients, decrease the incidence of complications as well as inflammatory factors levels, and further shorten the hospital stay of patients, with high safety. Our study provides a clinical reference for patients with myocardial infarction who need nursing care. (*Altern Ther Health Med.* 2025;31(1):452-458).

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INTRODUCTION

Myocardial infarction (MI) generally refers to acute myocardial infarction (AMI), which develops rapidly.¹ AMI is the myocardial necrosis caused by acute and persistent ischemia and hypoxia in the coronary arteries.² The disease is most common in Europe and the United States, where about 1.5 million heart attacks occur each year. China has shown a clear upward trend in recent years, with at least 500 000 new

cases and at least 2 million new cases every year.³ Clinically, most MI patients have severe and persistent post-sternal pain, which cannot be completely relieved by rest and nitrates, accompanied by increased serum myocardial enzyme activity and progressive electrocardiogram changes, and may be complicated by arrhythmia, shock, or heart failure, which is often life-threatening.⁴ The occurrence of MI is also increasing year by year, which is easy to cause a variety of complications. When patients are in serious condition, they are prone to heart failure, malignant arrhythmia, and even shock and cardiac death. If the treatment is not timely, the mortality rate is very high.⁵ Nowadays, the main treatment methods used in clinical practice include thrombolytic therapy, drug treatment, interventional therapy, and lifestyle changes, among which interventional therapy is commonly used for patients with acute ST segment elevation myocardial infarction, which has a good effect and greatly reduces the

mortality of patients.⁶ However, after interventional therapy, patients still have cardiomyocyte damage, decreased cardiac function, and complications.⁷ Moreover, surgery causes great damage to the patient's body, resulting in a decrease in the patient's self-care ability, increased physical and mental pressure, and easily produces bad emotions such as anxiety and depression.⁸ Therefore, it is extremely important to implement symptomatic rehabilitation nursing measures according to the patient's situation, and it also has a positive influence on the postoperative rehabilitation of patients.⁹

Relevant studies have shown that cardiac rehabilitation nursing can improve AMI patients' heart function, exercise endurance, negative emotions and quality of life, and has been widely used.¹⁰ As an emerging nursing intervention for cardiovascular diseases in recent years, cardiac rehabilitation nursing sets the intensity of exercise therapy according to the patient's physical condition together with the rehabilitation stage to gradually improve the degree of cardiopulmonary adaptation, which is conducive to the postoperative rehabilitation of patients.¹¹ Cardiac rehabilitation nursing is a kind of comprehensive nursing, which aims to restore the body function of patients with myocardial infarction. Its main contents are rehabilitation assessment, rehabilitation exercise training, diet control, behavior restriction, and medical compliance.¹² As reported previously, cardiac rehabilitation nursing can improve health-related quality of life for people with coronary heart disease.¹³ Providing cardiac rehabilitation to patients with heart failure benefits the quality of life of these patients.¹⁴ However, the mechanism of its application in patients with MI after interventional therapy is not completely clear. Based on this, this study aimed to explore the clinical treatment effect of cardiac rehabilitation nursing in patients with MI, in order to provide clinical nursing reference for improving the negative emotions and accelerating the postoperative rehabilitation of MI patients undergoing PCI.

DATA AND METHODS

General data

86 patients with MI who were treated in the Heart Center of Shanghai Sixth People's Hospital from January 2019 to August 2022 were selected for the study. The 86 patients were randomly divided into two groups, with 43 cases in each group. One group was used as the control group (CG) to carry out routine nursing operations, and the other group was used as the observation group (OG) to implement cardiac rehabilitation nursing. The intervention was implemented for 4 weeks, and the related indicators were detected and evaluated. This study was reviewed and approved by our hospital's ethics committee, and informed consent was obtained from the patients and their family members. No difference was seen in the general data of patients in both groups ($P = .829$, $P = .930$, and $P = .872$, Table 1).

Inclusion criteria:¹⁵ (1) Complete clinical data; (2) MI was confirmed by examination and histopathological analysis; (3) No allergic reaction occurred during the

Table 1. General data of patients in both groups

Groups	Gender (male/female)	Age (years)	Course of disease (years)
Control group (n=43)	23/20	56.72±5.78	4.82±1.12
Observation group (n=43)	24/19	56.83±5.83	4.86±1.18
χ^2/t	0.047	0.088	0.161
P value	.829	.930	.872

treatment; (4) The treatment method was percutaneous coronary intervention. (5) Patients and their family members were familiar with the content of this study and signed informed consent.

Exclusion criteria:¹⁶ (1) Abnormal liver, kidney, and lung function such as liver cell damage, hepatitis, cirrhosis, liver cancer, kidney failure, nephrotic syndrome, renal insufficiency and lung cancer; (2) History of hypertension and hyperglycemia such as systolic blood pressure was greater than or equal to 140 mmHg, and diastolic blood pressure was greater than or equal to 90 mmHg or blood sugar was higher than 10 mmol; (3) Presence of motor, neurological, and other system diseases; (4) Patients with shock.

Methods

CG: The CG received routine nursing operations. Routine perioperative nursing intervention measures were implemented for patients, including routine vital signs monitoring, drug guidance, diet and exercise guidance, health education, psychological counseling, and discharge follow-up.

OG: The OG received cardiac rehabilitation nursing, and the specific nursing measures were as follows:

Psychological nursing: after patients were admitted to the hospital, the nursing staff helped patients to adapt to the ward environment, relieve patients' tension, fear and other bad psychology, and promote patients to accept treatment actively. Besides, the postoperative cardiac rehabilitation program was formulated according to patients' specific conditions.

Rehabilitation training: 12 hours after surgery, the nursing staff guided the patient to walk slowly according to the patient's condition, and the walking time should not be more than 10 minutes each time. Three days after the operation, the patients could carry out low-intensity rehabilitation training, such as walking slowly, and the nurses encouraged the patients to carry out autonomous activities. Motivational interview was used to help the patients analyze the causes of psychological anxiety and depression. The intensity of rehabilitation training should be reasonably increased based on the patient's condition. If the patient is uncomfortable, the activity should be stopped immediately, and the corresponding measures should be taken to deal with the symptoms.

Cardiac rehabilitation training: (a) Bed breathing exercises: the patients were kept supine elbow flexion, supine shoulder flexion, abdominal deep breathing, supine leg flexion, leg extension, cave-in, hip bridge. Each training time was 10 minutes, 2 ~ 3 times a day. (b) Seven-step exercise method: it mainly included breathing and cough training, active and

passive exercise of limbs in bed, active and passive exercise of sitting up in bed, warm up exercise of stepping in place, and long-term aerobic exercise after discharge. For breathing and cough training, the patient was instructed to maintain a comfortable position, relax the abdomen, breathe slowly and deeply, and then make a whistle-like slow breath through the mouth, once a day, 10 sets/times. For active and passive exercise of limbs in bed, patients were encouraged to roll over, change positions, and appropriately sit, once a day, 10 sets/times. For active and passive exercise of sitting up in bed, the patient was instructed to carry out the activity of leaving bed step by step, start from the bedside seat, and transition to the bedside position, foot support seat, auxiliary position, and independent activity, once a day, 10 sets/times. For warm up exercise of stepping in place, the patient was instructed to walk slowly, 3 times/day, 10 min/time, with a maximum distance of 200 m each time. For long-term aerobic exercise after discharge, the patient was instructed to begin to walk up and down the stairs slowly, taking 2 to 3 steps each time. After the patient could walk on his own, the walking distance and the number of steps were gradually increased, with 15 min/time, 3 times/day.

Diet and defecation care: the nurses urged patients to eat food that is easy to digest, has less sugar, and has high nutritional value. Meanwhile, the nurses urged patients to drink more water and promote defecation.

Guiding patients to the correct way of deep breathing: when the symptoms of myocardial infarction occur, patients can cough up the sputum with the help of the correct way of deep breathing, which could enhance the vibration frequency of the patient's heart tissue.

Health education: the nurses told patients, together with their families, about the risk factors of myocardial infarction such as heavy manual labor, eat and drink too much, intense emotional changes and smoking and heavy drinking, prevention, and treatment of disease recurrence such as taking medication on time and visiting doctors regularly, moderate physical exercise, stopping smoking, limiting alcohol and avoiding overeating, and gave all patients books related to the disease. The nurses instructed the patient to review regularly and take medication correctly according to the doctor's advice. Patients were told to avoid excessive anxiety and regulate their emotions. Medications were carried.

Before discharge, the nurses explained the matters for the attention of patients and their families after discharge, the range of activities after discharge, diet, drug use, etc., and taught patients and their families how to monitor their own heart rate through heart rate monitor (Polar, Finland), and the total number of normal heart beats in 24 h was 80 000 ~ 140 000 times. Bradycardia was considered when the total number of heart beats in 24 h was less than 86400. Tachycardia was considered when the total number of heart beats in 24 h > 140 000 times; the nurses developed rehabilitation training program outside the hospital.

Patients in both groups received nursing every day, and were treated for 4 weeks, the relevant indicators were examined and examined after 4 weeks.

Observation indicators. Anxiety and depression: Zung's self-rating anxiety scale (SAS)¹⁷ was adopted to assess the anxiety of patients before and after the intervention, and the self-rating depression scale (SDS)¹⁸ was utilized for assessing the depression of patients before and after the intervention. Each scale had a perfect score of 100. When the SAS score was not less than 50 points, it indicated that the patient had an anxiety tendency; The SDS score was not less than 50, indicating that the patient was prone to depression.

Cardiac function index and 6-minute walk distance: The left ventricular ejection fraction (LVEF) and left ventricular end-diastolic volume (LVEDV) in the two groups were observed before and after the intervention. 6-minute walking distance (6MWD)¹⁹ was measured after intervention. The patient was asked to walk up and down a 30 m corridor, walking as far as possible within 6 minutes. If the patient felt tired within 6 minutes, they could be allowed to slow down or rest, and told to resume walking as soon as possible. The cumulative distance walked by the patient was recorded, that is, 6MWD.

Complications and length of hospital stay: The complications in the intervention process and the hospitalization time of the two groups were observed.

Inflammatory factor levels: Before and after the intervention, the blood of patients in the two groups was collected by vein, and the serum inflammatory factor high sensitivity C-reactive protein (hs-CRP) was detected. After that, 5 ml of the above blood sample was left for centrifugation at 3000 rpm for about 15 minutes, and then the upper plasma was retained to be stored at -80°C environment. After that, the serum interleukin-18 (IL-18) level in the blood was detected by enzyme-linked immunosorbent assay (ELISA, Beijing Wantai Bio-Pharmaceutical Co., LTD). The serum levels of hs-CRP and IL-18 were recorded before and after intervention in the two groups.

N-terminal forebrain natriuretic peptide (NT-proBNP) concentration: Before and after the intervention, blood was collected to detect the concentration of NT-proBNP, the bladder was emptied, and the blood pressure of the right upper limb was measured. ELISA determined the concentration of NT-proBNP determined the concentration of NT-proBNP, and the concentration of NT-proBNP was detected by the FIA8000 series immunoquantitative analyzer.

Occurrence of arrhythmia: A multi-parameter monitor and 12-lead electrocardiogram machine were used to collect the arrhythmia of patients, and the electrocardiograph (ECG) waveform was used to determine whether there was sinus arrhythmia, atrial arrhythmia, atrioventricular junctional arrhythmia,²⁰ ventricular arrhythmia and so on.

Statistical analysis

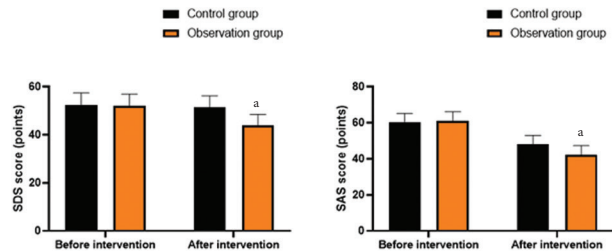
SPSS 20.0 software (IBM Corporation, Chicago, IL, USA) was implemented for data analysis. Continuous data were exhibited as mean $\pm$ standard deviation ($\bar{x} \pm s$), and *t* test was used for comparison. Categorical data were exhibited as number and rate, and χ^2 test was used for comparison. *P* < .05 was statistical significance.

Table 2. SDS scores and SAS scores between the two groups before and after intervention ($\bar{x} \pm s$)

Groups		SDS scores	SAS scores
Control group (43 cases)	Before intervention	52.41±4.99	60.07±5.10
	After intervention	51.37±4.85	48.01±5.01
Observation group (43 cases)	Before intervention	52.07±4.79	60.89±5.23
	After intervention	44.01±4.53	42.10±5.17
t_{before}		1.113	0.375
P_{before}		.324	.972
Effect size (r) _{before}		0.034	-0.079
t_{after}		10.232	15.735
P_{after}		.000	.000
Effect size (r) _{after}		0.617	0.502

Abbreviations: SAS, self-rating anxiety scale; SDS, self-rating depression scale.

Figure 1. SDS scores and SAS scores between the two groups before and after intervention.



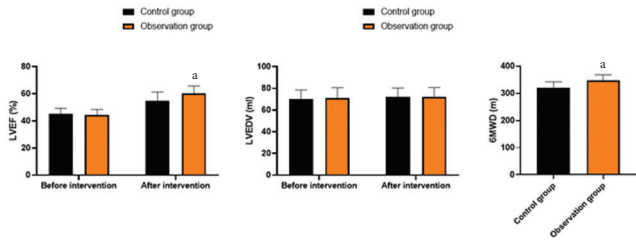
^a $P < .05$.

Table 3. Cardiac function indexes and 6MWD between both groups before and after intervention ($\bar{x} \pm s$)

Groups	LVEF (%)		LVEDV (ml)		After intervention 6MWD
	Before intervention	After intervention	Before intervention	After intervention	
Control group (43 cases)	45.11±4.17	54.97±6.24	70.23±8.28	71.98±8.35	320.24±21.71
Observation group (43 cases)	44.29±4.21	60.39±5.38	71.21±9.41	72.24±8.47	347.31±21.01
t	1.113	2.223	0.034	0.032	25.152
P value	.324	.037	.971	.473	.000
Effect size (r)	0.097	-0.422	-0.055	-0.015	-0.535

Abbreviations: LVEF, left ventricular ejection fraction; LVEDV, left ventricular end-diastolic volume; 6MWD, 6-minute walking distance.

Figure 2. Cardiac function indexes and 6MWD between both groups before and after intervention.



^a $P < .05$.

Table 4. Complications and hospitalization time of the two groups [$(\bar{x} \pm s)$, N (%)]

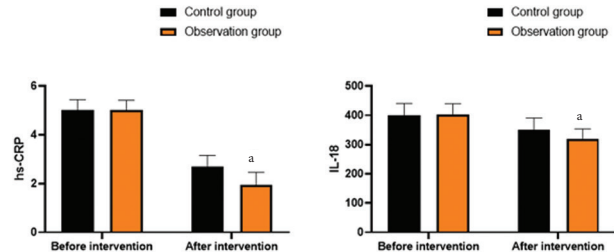
Groups	Arrhythmia	Cardiac failure	Angina	Complication rate (%)	Length of hospital stay (d)
Control group (43 cases)	1 (2.33)	2 (4.65)	4 (9.30)	7 (16.2)	26.11±8.14
Observation group (43 cases)	1 (2.33)	0 (0)	2 (4.65)	3 (6.9)	18.66±7.03
χ^2/t		3.337			8.369
P value		.002			.000

Table 5. Inflammatory factors of both groups before and after intervention ($\bar{x} \pm s$)

Groups	hs-CRP		IL-18	
	Before intervention	After intervention	Before intervention	After intervention
Control group (43 cases)	5.02±0.42	2.71±0.45	400.43±39.79	351.07±39.54
Observation group (43 cases)	5.01±0.41	1.95±0.51	401.56±38.11	319.47±33.72
t	1.191	4.823	0.035	15.797
P value	.378	.000	.972	.000
Effect size (r)	0.012	0.620	-0.015	0.873

Abbreviations: hs-CRP, high sensitivity C-reactive protein; IL-18, interleukin-18.

Figure 3. Inflammatory factors of both groups before and after intervention.



^a $P < .05$.

RESULTS

Psychological Outcomes

Table 2 and Figure 1 show that, before intervention, there was no significant difference in SDS and SAS scores between both groups ($P = .324$ and $P = .972$). After intervention, the scores of SAS (42.10 ± 5.17) and SDS (44.01 ± 4.53) in the OG were lower compared to the CG ($P = .000$), indicating that the anxiety and depression of MI patients were improved after cardiac rehabilitation nursing.

Cardiac Function

Table 3 and Figure 2 show that there was no obvious difference in LVEF and LVEDV levels between both groups before intervention ($P = .324$ and $P = .971$). There was no significant difference in LVEDV levels between both groups after intervention ($P = .473$). However, the LVEF level and 6MWD of the OG were better than the CG after intervention ($P = .037$ and $P = .000$). All these outcomes suggested that cardiac rehabilitation nursing could improve the cardiac function and promote the exercise tolerance of MI patients. However, we did not follow-up, and the long-term impacts of cardiac rehabilitation on the cardiac function and the exercise tolerance of MI patients.

Complications

Table 4 shows that the incidence of complications in the OG was lower relative to the CG ($P = .002$). The length of hospital stay in the OG declined compared to the CG ($P = .000$). All these outcomes suggested that cardiac rehabilitation nursing could reduce the incidence of complications and accelerate the postoperative recovery of MI patients.

Inflammatory Factors

Table 5 and Figure 3 show that there was no significant difference in the levels of inflammatory factors between both

groups before intervention ($P = .378$ and $P = .972$). After intervention, the levels of hs-CRP and IL-18 in the OG were reduced compared to the CG ($P = .000$). All these outcomes suggested that cardiac rehabilitation nursing could reduce the inflammatory response of MI patients.

NT-proBNP

Table 6 and Figure 4 show that there was no significant difference in serum NT-proBNP between both groups before intervention ($P = .067$). After intervention, the serum NT-proBNP in both groups was decreased compared with before, and the serum NT-proBNP in the OG was reduced compared to the CG ($P = .023$). All these outcomes suggested that cardiac rehabilitation nursing could reduce the risk of heart failure of MI patients.

Arrhythmia

Table 7 revealed that, before the intervention, there was no significant difference in arrhythmia between both groups ($P = .574$, $P = .698$, $P = .613$, and $P = .548$). After intervention, the incidences of sinus arrhythmia (3 cases), atrial arrhythmia (2 cases), atrioventricular junctional arrhythmia (1 case), and ventricular arrhythmia (1 case) in the OG, which were less than those in the CG ($P = .045$, $P = .032$, $P = .011$, and $P = .027$). All these outcomes suggested that cardiac rehabilitation nursing could reduce the risk of arrhythmia of MI patients.

DISCUSSION

Introduction of AMI

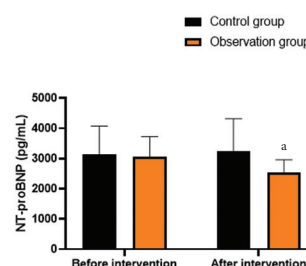
As one of the common acute and severe cardiovascular diseases, the occurrence of AMI is increasing year by year, and it is one of the common causes of sudden cardiac death.²¹ The cause of AMI is the blockage of the blood supply to the heart so the blood supply is insufficient.²² However, the body still needs to consume oxygen continuously, and then the supply and demand are out of balance, resulting in myocardial necrosis. Generally, people with past medical history such as heart disease, diabetes, and hyperlipidemia have a higher incidence rate. In addition, frequent smokers, overweight people, frequent overeating people, and excited and irritable people may also cause AMI.²³ The bigger problem of this disease is that it is easy to cause malignant arrhythmia, such as ventricular fibrillation, and may also cause shock or even death. When acute myocardial infarction occurs, the whole body organs may cause changes, and one or more diseases may appear. AMI is one of the critical and severe cases with a high incidence of cardiovascular diseases,²⁴ which may often cause sudden cardiac death and myocardial infarction and easily causes negative emotions in patients and their families, which greatly decreases the quality of life of patients as well as elevates the burden of life.²⁵ At present, the main treatment of MI is still through drugs and surgery, and the emergence of cardiac rehabilitation nursing mode plays a vital role for patients with AMI.²⁶

Table 6. Comparison of NT-proBNP index between the two groups before and after intervention ($\bar{x} \pm s$, pg/mL)

Groups	NT-proBNP	
	Before intervention	After intervention
Control group (43 cases)	3135.5±942.0	3064.4±659.0
Observation group (43 cases)	3235.2±1082.0	2525.8±436.5
<i>t</i>	3.013	4.867
<i>P</i> value	.067	.023
Effect size (<i>r</i>)	-0.042	0.245

Abbreviation: NT-proBNP, N-terminal forebrain natriuretic peptide.

Figure 4. Comparison of NT-proBNP index between the two groups before and after intervention.



^a $P < .05$

Table 7. Arrhythmia in both groups before and after intervention (Cases)

Groups	Sinus arrhythmia		Atrial tachyarrhythmia	
	Before intervention	After intervention	Before intervention	After intervention
Control group (43 cases)	6	5	7	6
Observation Group (43 cases)	7	3	8	2
χ^2	3.107	3.587	2.338	3.897
<i>P</i> value	.574	.045	.698	.032

Groups	Atrioventricular junctional arrhythmia		Ventricular arrhythmias	
	Before intervention	After intervention	Before intervention	After intervention
Control group (43 cases)	10	8	12	7
Observation Group (43 cases)	11	1	11	1
χ^2	2.541	5.013	3.210	4.527
<i>P</i> value	.613	.011	.048	.027

Cardiac rehabilitation nursing relieves AMI patient's anxiety and depression

It has been reported that depression and anxiety are common among patients who have a major cardiovascular event.²⁷ The improvements of depression and anxiety in MI patients contribute to the overall well-being and quality of life of patients.²⁸ This study showed that after cardiac rehabilitation nursing intervention, the OG's SAS and SDS scores declined compared with the CG ($P < .05$). It could be seen that cardiac rehabilitation nursing could improve the patient's bad mood and relieve the patient's anxiety and depression. This is because nurses provide adequate psychological counseling to patients, build strong self-confidence for patients, assist patients to participate in treatment actively, and let patients fully understand the root cause of their disease, treatment methods, and postoperative rehabilitation treatment content, and also improve the quality of life of patients.²⁹ Previous study has also showed that the implementation of cardiac rehabilitation nursing for patients with MI after interventional therapy can effectively improve the psychological state of patients,³⁰ which further shows that cardiac rehabilitation nursing has a significant improvement

effect on patients' negative emotions, which is in accordance with our results.

Cardiac rehabilitation nursing improves AMI patient's cardiac function and reduces the incidence of complications

In addition, cardiac rehabilitation nursing can promote the cardiac function of patients and effectively reduce the incidence of patient complications. In comparing cardiac function indexes in this study, it was found that the LVEF and 6MWD of patients after cardiac rehabilitation nursing were significantly better than those of patients in the routine nursing group. This is due to the gradual recovery of patients' cardiac function after cardiac rehabilitation nursing, which fully demonstrates that cardiac rehabilitation nursing plays a positive role in recovering patients' cardiac function.³¹ Also, with the implementation of cardiac rehabilitation nursing, the number of postoperative complications was less, and the length of hospital stay was significantly shortened in patients. This is because cardiac rehabilitation nursing can effectively improve the cardiac function of patients by urging them to exercise and speeding up their blood circulation, thus dissolving the atherosclerotic plaque, increasing the cross-sectional area of the coronary artery, and increasing the amount of myocardial oxygen and blood supply.³² In turn, it is conducive to the postoperative rehabilitation of patients, reduces the occurrence of complications, and shortens the length of hospital stay, which also relieves part of the economic burden for the family members of patients. Similarly, Marco Pizzorno et al. have indicated that cardiac rehabilitation effectively improves physical performance after cardiac procedures in patients aged ≥ 75 years, reducing the length of stay.³³ It has been documented that the implementation of cardiac rehabilitation nursing for patients with AMI can reduce the incidence of complications and significantly improve the cardiac function indicators of patients, which is conducive to the prognosis of patients and worthy of promotion and application.³⁴ It fully shows the positive effect of cardiac rehabilitation nursing on patients with myocardial infarction, which is consistent with our finding.

Cardiac rehabilitation nursing reduces inflammatory reactions in AMI patients

The inflammatory reaction runs through the whole process of the occurrence and development of AMI, and can stimulate the migration and proliferation of smooth muscle cells, causing arterial wall thickening, fiber cap instability, leading to atherosclerotic plaque rupture, blood vessel formation, and so on, leading to artery blockage.³⁵ hs-CRP is a sensitive index reflecting the body's inflammatory response, which can promote the expression of local adhesion molecules, reduce the bioavailability of nitric oxide in endothelial cells, change the uptake of LDL by macrophages, and promote vascular inflammation and thrombosis.³⁶ IL-18 is an inflammatory factor, mainly derived from mononuclear macrophages and vascular endothelial cells, which can

promote the inflammatory cascade involving a variety of cytokines and play an important role in the occurrence and development of AMI.³⁷ The results also showed that the levels of hs-CRP and IL-18 in the OG were significantly lower compared to the CG after intervention, indicating that after cardiac rehabilitation nursing, the physical quality of patients was improved, the immunity was enhanced, and the risk of inflammatory diseases such as myocarditis and pericarditis was greatly reduced. Consistent with our finding, cardiac rehabilitation has been reported to promote greater improvements in inflammatory biomarkers for women with coronary heart disease.³⁸

Cardiac rehabilitation nursing reduces the risk of heart failure of AMI patients

NT-proBNP is a sensitive index for the diagnosis of AMI. The level of cardiac function biomarkers gradually decreased after surgery.³⁹ The results of this study revealed that the decrease of serum NT-proBNP level in the OG was more significant compared to the CG ($P < .05$), and the adverse events of malignant arrhythmia were significantly reduced ($P < .05$). This is because the quality of cardiac rehabilitation nursing is high, which improves the phenomenon of ventricular remodeling and reduces the risk of cardiovascular restenosis, which is more conducive to the reduction of NT-proBNP level and indicates that the cardiac function of patients is significantly improved.⁴⁰ The study of Gong Yanhui⁴¹ et al. showed that the NT-proBNP level of patients with AMI after PCI is reduced more significantly by routine nursing combined with early cardiac rehabilitation nursing. It shows that cardiac rehabilitation nursing has a positive significance in reducing the level of NT-proBNP in patients with MI, which is consistent with our finding.

Limitations

There are some limitations in this study. First, the sample size is small, which may affect the reliability of results. Second, the selected patients have not been long-term observation, so the impact of cardiac rehabilitation nursing on the long-term prognosis of patients remains to be further observed. Third, our study inferred causality from observational data. In addition, our study subjects were all Chinese, which limit the applicable population. Our study will carry out large-scale, multiracial population and long-term studies in the near future to further validate our findings.

CONCLUSIONS

In summary, cardiac rehabilitation nursing can reduce the length of hospital stay of patients with AMI, promote the recovery of cardiac function, reduce the level of inflammatory factors, improve the negative emotions of patients, thereby reducing the incidence of complications, and then improve the quality of life and survival rate of patients. It has high clinical application value and is worth promoting. Our study will further explore the methods of cardiac rehabilitation training in cardiac rehabilitation nursing to expand our

understanding and improve patient outcomes. In addition, health care providers or institutions should implement cardiac rehabilitation care through rehabilitation intervention, dietary intervention, psychological intervention, etc., according to the specific conditions of patients.

CONFLICT OF INTEREST

None.

ACKNOWLEDGMENT

None.

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