Journal of Clinical and Nursing Research, 2026, Volume 10, Issue 5
http://ojs.bbwpublisher.com/index.php/JCNR
Online ISSN: 2208-3693
Print ISSN: 2208-3685

# Research on the Impact of Cardiac Rehabilitation Nursing Based on Five-Level Early Activity on Cardiac Function, Exercise Tolerance, and Quality of Life in Patients with Coronary Heart Disease

**Wang Xu, Yuan Yuan***

Department of Cardiology, Suzhou BenQ Medical Center, Suzhou 215011, Jiangsu, China

***Author to whom correspondence should be addressed.***



**Abstract:** *Objective*: To investigate the application effect of cardiac rehabilitation nursing based on five-level early activity in patients with coronary heart disease. *Methods*: A total of 86 patients with coronary heart disease admitted from January 2025 to January 2026 were selected and randomly divided into a control group receiving conventional nursing and a study group receiving cardiac rehabilitation nursing based on five-level early activity, with 43 cases in each group. The intervention effects of the two groups were compared. *Results*: After intervention, the cardiac function indicators in the study group were significantly better than those in the control group ($p < 0.05$); after intervention, the 6-minute walk test (6MWT) and peak oxygen uptake ($VO_2$ peak) in the study group were significantly higher than those in the control group ($p < 0.05$); after intervention, the quality of life score in the study group was significantly higher than that in the control group ($p < 0.05$). *Conclusion*: Cardiac rehabilitation nursing based on five-level early activity can effectively improve cardiac function, enhance exercise tolerance, and elevate the quality of life in patients with coronary heart disease.

**Keywords:** Coronary heart disease; Cardiac rehabilitation; Five-level method; Cardiac function

**Online publication:** May 31, 2026

## 1. Introduction

Coronary heart disease (CHD) is the leading cardiovascular disease-causing death and disability worldwide, with its incidence rate continuing to rise in China [1]. Percutaneous coronary intervention (PCI) can rapidly alleviate myocardial ischemia symptoms but cannot reverse the pathological process of coronary atherosclerosis or fully improve issues such as reduced cardiac function, decreased exercise tolerance, and

lowered quality of life after surgery [2]. Cardiac rehabilitation is a core component of secondary prevention for CHD, and early standardized activity is a key link in inpatient cardiac rehabilitation, effectively reducing bed-related complications and promoting the recovery of cardiac and physical functions in patients [3]. In traditional clinical interventions, activity guidance for patients after PCI for CHD often relies on the clinical experience of nursing staff, leading to problems such as delayed activity timing, imprecise intensity control, and homogeneous plans, which affect patient rehabilitation outcomes [4]. The five-level early activity model divides early activity into five progressive levels based on the patient's postoperative recovery process and develops personalized activity plans by considering the individual tolerance of patients, achieving precise and stepwise control of activity intensity. However, systematic application research on this model in cardiac rehabilitation nursing after PCI for CHD remains relatively insufficient. Based on this, this study explores the application effect of cardiac rehabilitation nursing based on five-level early activity in patients with CHD, providing evidence-based support for improving the quality of rehabilitation nursing for CHD in clinical practice.

# 2. Materials and methods

## 2.1. General information

A total of 86 patients with CHD admitted from January 2025 to January 2026 were selected and randomly divided into a control group and a study group, with 43 cases in each group. The general information of the two groups was comparable ($p > 0.05$), as shown in **Table 1**.

**Table 1.** Comparison of general information between the two groups

| Group | Number of cases | Gender | | Age (years) | Lesion type | |
|---|---|---|---|---|---|---|
| | | Male | Female | | Stable angina | Unstable angina |
| Control group | 43 | 27 (62.79) | 16 (37.21) | 63.25 ± 6.18 | 20 (46.51) | 23 (53.49) |
| Study group | 43 | 26 (60.47) | 17 (39.53) | 62.84 ± 6.32 | 19 (44.19) | 24 (55.81) |
| $\chi^2/t$ | | 0.049 | 0.311 | | 0.047 | |
| $p$ | | 0.825 | 0.756 | | 0.829 | |

## 2.2. Inclusion and exclusion criteria

### 2.2.1. Inclusion criteria

(1) Meeting the diagnostic criteria for coronary heart disease [5];
(2) Undergoing PCI treatment for the first time;
(3) Aged between 40 and 75 years;
(4) Having clear consciousness and normal cognitive function, able to cooperate in completing rehabilitation training and research follow-up;
(5) Signing an informed consent form.

### 2.2.2. Exclusion criteria

(1) Complicated with acute myocardial infarction, cardiogenic shock, or severe malignant arrhythmia;
(2) Complicated with severe liver and kidney dysfunction, malignancy, coagulation dysfunction, or severe pulmonary disease;

(3) Complicated with mental illness, cognitive dysfunction, or limb movement disorders, unable to cooperate in rehabilitation training;
(4) Having a history of cardiac surgery or stroke.

## 2.3. Methods

The control group received routine cardiac rehabilitation nursing in the cardiology department: continuous electrocardiographic monitoring for 24 hours postoperatively, absolute bed rest for 24 hours postoperatively, assisting patients with turning over and defecating in bed during bed rest, and providing skin and oral care. Patients were informed about the effects, usage, dosage, adverse reactions, and precautions of medications. After 24 hours postoperatively, patients were guided to sit up in bed based on their subjective feelings, and from days 3 to 5 postoperatively, they were guided to stand and walk beside the bed, with the amount of activity adjusted according to the patient's comfort level. Routine discharge guidance was provided upon discharge.

The study group received cardiac rehabilitation nursing based on the five-level early activity method in addition to the control group's care: Level I (Bed Rest Period): Absolute bed rest, assisting patients with turning over and passive limb movements in bed, guiding patients in abdominal breathing training, avoiding strenuous activities, and focusing on preventing pressure ulcers and venous thrombosis. Level II (Bedside Activity Period): Patients primarily rested in bed; after stability, they were assisted to sit up with their legs dangling beside the bed, gradually transitioning to standing beside the bed. Vital signs were closely monitored during standing, and if dizziness, fatigue, or other discomfort occurred, patients were immediately assisted back to bed. Level III (Indoor Activity Period): After patients stood beside the bed without discomfort, they were guided to walk slowly indoors, gradually increasing walking time and distance. Simple limb stretching exercises could be incorporated, avoiding brisk walking and bending with heavy loads. Level IV (Outdoor Activity Period): After patients tolerated indoor activities well, they were guided to engage in walking training outdoors at a speed of 30 to 40 meters per minute. Activity intensity could be appropriately increased, such as alternating between slow and brisk walking, while guiding patients in simple aerobic exercises. Level V (Regular Exercise Period): Based on the patient's physical tolerance, a regular exercise plan was formulated, including brisk walking, jogging, and cycling, with exercise intensity controlled at 50% to 60% of the maximum heart rate, exercised 5 to 6 days per week. Patients were also guided in breathing and relaxation training to avoid overexertion.

Both groups of patients were followed up in the outpatient clinic 4 weeks postoperatively.

## 2.4. Observation indicators

### 2.4.1. Cardiac function indicators

Left ventricular ejection fraction (LVEF), left ventricular end-diastolic diameter (LVEDD), and cardiac output (CO) were measured using a color Doppler ultrasound diagnostic instrument.

### 2.4.2. Exercise tolerance indicators

The 6-minute walk test (6MWT) was conducted, and peak oxygen uptake ($VO_2$peak) was measured using a cardiopulmonary exercise testing instrument.

### 2.4.3. Quality of life

Assessed using the 36-Item Short Form Health Survey (SF-36), which includes 8 dimensions, each with a maximum score of 100. Higher scores indicate better quality of life in that dimension for the patient.

## 2.5. Statistical methods

Measurement data and count data were expressed as (mean ± standard deviation) (n, %) and analyzed using statistical software (SPSS 24.0) with *t*-tests and chi-square tests, respectively. A $p$-value < 0.05 was considered statistically significant.

# 3. Results

## 3.1. Cardiac function indicators

After intervention, the cardiac function indicators in the study group were significantly better than those in the control group ($p < 0.05$). See **Table 2**.

**Table 2.** Cardiac function indicators ($\overline{x} \pm s$)

| Group | Number of cases | LVEF (%) | | LVEDD (mm) | | CO (L/min) | |
|---|---|---|---|---|---|---|---|
| | | Before intervention | After intervention | Before intervention | After intervention | Before intervention | After intervention |
| Study group | 43 | 52.36 ± 4.52 | 58.72 ± 3.85 | 56.83 ± 3.71 | 52.15 ± 3.24 | 4.25 ± 0.63 | 5.12 ± 0.71 |
| Control group | 43 | 51.89 ± 4.71 | 53.28 ± 4.12 | 57.12 ± 3.85 | 55.46 ± 3.52 | 4.31 ± 0.65 | 4.58 ± 0.68 |
| *t* | | 0.483 | 6.472 | 0.364 | 4.641 | 0.445 | 3.685 |
| *p* | | 0.630 | < 0.001 | 0.717 | < 0.001 | 0.658 | < 0.001 |

## 3.2. Exercise tolerance indicators

After the intervention, both the 6MWT and $VO_2$peak in the study group were significantly higher than those in the control group ($p < 0.05$). See **Table 3**.

**Table 3.** Exercise tolerance indicators ($\overline{x} \pm s$)

| Group | Number of cases | 6MWT (m) | | $VO_2$ peak (mL/(kg·min)) | |
|---|---|---|---|---|---|
| | | Before intervention | After intervention | Before intervention | After intervention |
| Study group | 43 | 302.54 ± 45.28 | 456.82 ± 52.37 | 16.25 ± 2.34 | 22.36 ± 2.58 |
| Control group | 43 | 298.76 ± 43.65 | 382.45 ± 48.69 | 16.08 ± 2.29 | 19.12 ± 2.41 |
| *t* | | 0.403 | 6.977 | 0.348 | 6.156 |
| *p* | | 0.688 | < 0.001 | 0.728 | < 0.001 |

## 3.3. Quality of life scores

After the intervention, the quality-of-life scores in the study group were significantly higher than those in the control group ($p < 0.05$). See **Table 4** and **5**.

**Table 4.** Quality of life scores (Bodily pain, Physiological function and Role-physical) ( $\overline{x}$ ± s, points)

| Group | Number of cases | Bodily pain | | Physiological function | | Role-physical | |
|---|---|---|---|---|---|---|---|
| | | Pre-intervention | Post-intervention | Pre-intervention | Post-intervention | Pre-intervention | Post-intervention |
| Study group | 43 | 45.63 ± 6.53 | 91.45 ± 7.35 | 47.35 ± 5.63 | 89.23 ± 7.33 | 43.32 ± 9.32 | 91.06 ± 5.52 |
| Control group | 43 | 45.62 ± 6.34 | 81.02 ± 8.32 | 47.53 ± 5.45 | 81.03 ± 6.35 | 43.63 ± 9.42 | 82.42 ± 6.42 |
| *t* | | 0.007 | 6.161 | 0.151 | 5.545 | 0.153 | 6.692 |
| *p* | | 0.994 | < 0.001 | 0.881 | < 0.001 | 0.878 | < 0.001 |

**Table 5.** Quality of life scores (General health, Vitality social function, Role emotional, Mental health)

| Group | No. cases | General health | | Vitality | | Social function | | Role emotional | | Mental health | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Before intervention | After intervention | Before intervention | After intervention | Before intervention | After intervention | Before intervention | After intervention | Before intervention | After intervention |
| Study group | 43 | 45.13 ± 6.23 | 90.11 ± 8.36 | 47.14 ± 6.62 | 92.02 ± 8.52 | 44.24 ± 6.73 | 93.52 ± 9.42 | 46.24 ± 8.35 | 93.22 ± 8.25 | 43.53 ± 9.42 | 92.89 ± 3.35 |
| Control group | 43 | 45.24 ± 6.35 | 82.78 ± 6.35 | 47.46 ± 6.21 | 83.25 ± 7.35 | 44.32 ± 6.35 | 85.01 ± 8.35 | 46.44 ± 8.31 | 85.62 ± 6.35 | 43.63 ± 9.22 | 84.98 ± 6.33 |
| *t* | | 0.081 | 4.579 | 0.231 | 5.111 | 0.057 | 4.433 | 0.111 | 4.787 | 0.050 | 7.242 |
| *p* | | 0.936 | < 0.001 | 0.818 | < 0.001 | 0.955 | < 0.001 | 0.912 | < 0.001 | 0.960 | < 0.001 |

## 4. Discussion

Cardiac rehabilitation for patients with coronary heart disease (CHD) after percutaneous coronary intervention (PCI) is a long-term and systematic process, with early rehabilitation during hospitalization serving as the foundation of the entire rehabilitation process and directly influencing the patient's long-term prognosis [6]. As a crucial component of comprehensive CHD treatment, cardiac rehabilitation nursing can improve cardiac function, enhance exercise tolerance, and promote physical and mental rehabilitation in patients through scientific interventions [7]. Research by Pei Limin et al. has shown that early personalized aerobic exercise cardiac rehabilitation training after PCI can improve exercise capacity and skeletal muscle functional anti-sympathetic activity in patients [8].

The results of this study indicate that, after intervention, the cardiac function indicators in the study group were significantly better than those in the control group. The stepwise early activity program can improve myocardial microcirculation perfusion through moderate exercise load, promote the establishment of myocardial collateral circulation, reduce myocardial cell apoptosis, and inhibit the process of ventricular remodeling. Meanwhile, regular early activity can decrease sympathetic nervous system excitability, increase vagal nerve tone, improve autonomic nervous system dysfunction, reduce myocardial oxygen consumption, and alleviate cardiac load, thereby improving cardiac function in patients. Exercise tolerance is an important indicator for evaluating the rehabilitation effectiveness and long-term prognosis of CHD patients. The results of this study show that, after intervention, exercise tolerance was significantly higher in the study group than in the control group. The five-stage early activity program, through progressive exercise training, can effectively enhance skeletal muscle strength and endurance, improve skeletal muscle aerobic metabolism

capacity, reduce peripheral circulation resistance, and decrease cardiac load during exercise. Additionally, regular aerobic exercise can improve patients' pulmonary ventilation and gas exchange functions, enhance cardiopulmonary synergy, and thereby improve their cardiopulmonary reserve function and exercise tolerance. As a chronic cardiovascular disease, CHD not only impairs patients' physical function but also significantly affects their psychological state, social function, and quality of life [9]. Research by Ge Shuping et al. has shown that individualized early cardiac rehabilitation after surgery can improve cardiac function and quality of life in patients. The results of this study indicate that, after intervention, the quality-of-life scores in the study group were significantly higher than those in the control group [10]. The five-stage early activity program can effectively improve patients' cardiac function and physical exercise capacity, help them gradually regain daily activity abilities, and reduce the impact of the disease on their physiological function. Additionally, achieving goals provides patients with positive psychological feedback, effectively enhancing their self-efficacy and rehabilitation confidence. Furthermore, systematic rehabilitation nursing interventions can improve patients' disease awareness and self-management abilities, helping them establish healthy lifestyles and thereby improving their overall quality of life.

## 5. Conclusion

In summary, cardiac rehabilitation nursing based on the five-stage early activity program can effectively improve cardiac function, significantly enhance exercise tolerance, and improve quality of life in CHD patients after PCI, demonstrating clinical value. This study was a single-center, small-sample randomized controlled trial with a relatively short follow-up period and did not conduct long-term follow-up observations on patients' long-term prognosis. Future research should involve multi-center, large-sample, long-term follow-up clinical studies to further validate the long-term application effects of this intervention model.

## Disclosure statement

The authors declare no conflict of interest.

## References


[1] Xue D, Zhuang R, Lv D, et al., 2024, The Development History and Current Status of Cardiac Rehabilitation for Coronary Heart Disease. China Medicine, 19(8): 1241–1245.

[2] Chang Y, Li H, 2025, Bibliometric Analysis of Research Literature on Cardiac Rehabilitation for Coronary Heart Disease at Home and Abroad in the Past 10 Years Based on CiteSpace. Chinese Journal of Evidence-Based Cardiovascular Medicine, 17(12): 1409–1415.

[3] Liu Y, Wu J, Tang W, et al., 2025, Research Progress on the Role of Cardiac Rehabilitation in the Management of Coronary Heart Disease. Medical Recapitulate, 31(10): 1218–1222.

[4] He Y, Lu Q, Zhao H, et al., 2025, Research Progress on the Application of High-Intensity Intermittent Exercise in Cardiac Rehabilitation for Elderly Patients with Coronary Heart Disease. Chinese Journal of Modern Nursing, 31(1): 89–94.

[5] Writing Group of the Chinese Guidelines for the Prevention of Cardiovascular Diseases, Editorial Board of the Chinese Journal of Cardiovascular Diseases, 2018, Chinese Guidelines for the Prevention of Cardiovascular

Diseases (2017). Chinese Journal of Cardiovascular Diseases, 46(1): 10–25.

[6] Zhang N, Zhou T, Tang M, et al., 2024, Construction and Application of an Exercise Rehabilitation Program for Elderly Patients with Coronary Heart Disease Complicated by Frailty. Journal of Nursing Science, 39(23): 30–35.

[7] Su Y, Huang Y, Liu L, et al., 2025, Analysis of the Current Status and Influencing Factors of Perceived Barriers to Cardiac Rehabilitation in Patients with Coronary Heart Disease After PCI. China Medical Herald, 22(33): 28–33 + 46.

[8] Pei L, Liu G, Li Y, 2024, Effects of Early Personalized Aerobic Exercise Cardiac Rehabilitation Training on Skeletal Muscle Functional Anti-Sympathetic Activity and Exercise Capacity in Elderly Patients with Acute Coronary Syndrome After PCI. Chinese Medical Journal, 59(7): 784–789.

[9] He Q, Xu D, Wei L, et al., 2025, Risk Factors for Quality of Life in Elderly Hospitalized Patients with Coronary Heart Disease and Their Correlation with Exercise Tolerance. Chinese Journal of Multiple Organ Diseases in the Elderly, 24(3): 166–171.

[10] Ge S, Chen W, Jia X, et al., 2024, Effects of a Cardiac Rehabilitation Program Centered on Individualized Exercise Training on Rehabilitation Outcomes in Patients with Coronary Heart Disease After Percutaneous Coronary Intervention. Journal of Practical Medicine, 40(18): 2607–2611.