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Original Article

Application of comprehensive cardiac rehabilitation intervention based on King's goal attainment theory in middle-aged and elderly patients after percutaneous coronary intervention

Bao Zhang[1*], Qiuting Dai[1*], Fanke Huang[2*], Jianfeng Lv[1]

[1]*Second Clinical Medical College of China Three Gorges University, Yichang 443000, Hubei, China;* [2]*China Three Gorges University, Yichang 443000, Hubei, China.* [*]*Equal contributors and co-first authors.*

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Abstract: Objective: To evaluate the effects of a comprehensive cardiac rehabilitation intervention based on King's Goal Attainment Theory on exercise endurance, cardiac function, anxiety, depression, and sleep quality in middle-aged and elderly patients following percutaneous coronary intervention (PCI). Method: A total of 72 middle-aged and elderly post-PCI patients were enrolled and equally randomized into a control group and an intervention group (34 cases in the control group and 38 cases in the intervention group). Both groups received conventional pharmacotherapy. The control group underwent standard cardiac rehabilitation, whereas the intervention group received a 6-month comprehensive cardiac rehabilitation program grounded in King's Goal Attainment Theory. Outcome measures included the 6-minute walk test (6MWT), left ventricular ejection fraction (LVEF), cardiac index (CI), Patient Health Questionnaire-9 (PHQ-9), Generalized Anxiety Disorder-7 (GAD-7), and Pittsburgh Sleep Quality Index (PSQI). Assessments were performed at baseline and at 3 and 6 months post-intervention. Results: The intervention group showed a significantly higher overall response rate than the control group ($P < 0.05$). At both 3 and 6 months, all outcome measures improved significantly from baseline in both groups. Compared with the control group, the intervention group demonstrated significantly greater improvements in 6MWT, LVEF, PSQI, and PHQ-9 scores at both time points ($P < 0.05$). Conclusion: Compared with conventional cardiac rehabilitation, the comprehensive cardiac rehabilitation intervention based on King's Goal Attainment Theory is more effective in enhancing exercise endurance and cardiac function and in alleviating depressive symptoms and sleep disturbances among middle-aged and elderly patients after PCI.

Keywords: Coronary heart disease, percutaneous coronary intervention, comprehensive cardiac rehabilitation intervention, King's Goal Attainment Theory, applied research

Introduction

As the global population ages, the morbidity and mortality of cardiovascular diseases (CVD) continue to rise. Coronary artery disease (CAD), responsible for approximately 17.8 million deaths annually, is the third leading cause of death worldwide [1]. The incidence of CAD increases with age among individuals over 45 years, rendering this population the most affected by CAD [2]. PCI remains the primary treatment for CAD; however, post-PCI patients remain at elevated risk for adverse cardiovascular events [3, 4] and exhibit a significantly higher likelihood of developing mood disorders compared to the general population [5]. Mood disorders, including anxiety and depression, are independent risk factors for increased all-cause mortality in postoperative patients [6]. Cardiac rehabilitation has been demonstrated to substantially improve prognosis in patients undergoing PCI [7].

King's Goal Attainment Theory, developed in 1981 by nursing theorist Imogene M. King, comprises four interrelated components: interactive assessment, mutual goal setting, therapeutic interaction, and outcome evaluation [8]. Central to this framework is the dynamic process of perception, judgment, and action be-

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tween patients and healthcare providers, which facilitates shared decision-making and collaborative goal pursuit. Effective perceptual congruence enhances communication and enables the co-construction of individualized rehabilitation plans, ultimately improving disease prognosis [9]. Emphasizing a patient-centered approach, the theory actively involves patients in their own health management and underscores the therapeutic value of continuous, reciprocal interaction between patients and clinicians [10].

The applicability of King's theory has been demonstrated across diverse clinical populations. In patients with Parkinson's disease, theory-guided motor rehabilitation training has been shown to improve motor and balance function as well as quality of life [11]. Among stroke survivors, Zhang and colleagues reported that rehabilitation interventions based on King's framework facilitated neurological recovery, alleviated psychological distress, enhanced cognitive and daily living abilities, and improved limb motor function, with high patient adherence [12]. Similarly, continuous rehabilitation informed by interactive goal attainment theory improved self-management, glycemic control, visual acuity, and overall quality of life in diabetic patients [13]. Existing studies have provided preliminary evidence supporting the application of King's theory in cardiovascular care. It has been shown to enhance treatment adherence and reduce adverse event rates in patients with cardiovascular disease. Specifically, King's Goal Attainment Theory improves anticoagulation therapy adherence and lowers the risk of cardiovascular adverse events in elderly patients with coronary heart disease complicated by atrial fibrillation [14]. In patients with coronary heart disease and arrhythmias, nursing interventions based on this theory contribute to improved self-management and greater psychological resilience [15]. Additionally, an intervention model guided by Goal Attainment Theory enhances disease management capacity and improves prognosis in patients with unstable angina, with a favorable safety profile [16].

Despite these promising findings, no studies to date have applied King's Goal Attainment Theory to the postoperative rehabilitation of middle-aged and elderly patients following PCI - a population characterized by age-related physiological decline and heightened psychological vulnerability that necessitates an integrated approach addressing both physical recovery and psychosocial support. Accordingly, the present study aims to investigate the effects of a comprehensive cardiac rehabilitation intervention grounded in King's theory on exercise tolerance, cardiac function, anxiety, depression, and sleep quality in middle-aged and elderly patients after PCI for coronary heart disease.

Subjects and methods

Patients

This prospective randomized controlled trial was conducted in accordance with the ethical principles of the Declaration of Helsinki. The study protocol was approved by the Ethics Committee of our hospital (Approval No. 2023-19) and registered with the Chinese Clinical Trial Registry (Registration No. ChiCTR2400093404). Written informed consent was obtained from all participants prior to enrollment.

A total of 90 middle-aged and elderly patients who underwent PCI at the Department of Cardiology, Second Clinical Medical College of China Three Gorges University, between August 2023 and June 2024 were enrolled in this study. Participants were randomly assigned to either a control group or an intervention group, with 45 patients in each group.

Inclusion and exclusion criteria

Inclusion criteria: Participants were eligible for inclusion if they: (1) met the diagnostic criteria for acute coronary syndrome (ACS) as specified in the 2019 Guidelines for the Emergency Treatment of Acute Coronary Syndrome, including ST-segment elevation myocardial infarction (STEMI), non-ST-segment elevation myocardial infarction (NSTEMI), and unstable angina (UA); (2) underwent emergency or elective PCI with stent implantation during hospitalization; (3) were aged ≥40 years, conscious, and able to read and communicate normally; (4) were classified as low-to-moderate risk for cardiac rehabilitation; (5) had New York Heart Association (NYHA) functional class I-III; and (6) provided written informed consent. Exclusion criteria: Patients were excluded from the study if they: (1) presented with other severe complications; (2) had significant impairment of major

organ function; (3) had serious comorbid conditions such as malignancy; (4) exhibited severe cognitive impairment or psychiatric disorders that precluded cooperation; (5) had a history of long-term use of psychotropic medications (e.g., anxiolytics or antidepressants); or (6) were concurrently participating in other clinical trials.

Methods

All patients received routine postoperative care and pharmacotherapy following PCI. Medications were selected based on individual clinical indications and included: (1) antiplatelet agents; (2) statins; (3) angiotensin-converting enzyme inhibitors, angiotensin II receptor antagonists, or angiotensin receptor-neprilysin inhibitors; (4) beta-blockers; (5) nitrates; and (6) calcium channel blockers.

Control group: The control group received standard cardiac rehabilitation, which included medical history collection, baseline patient assessment upon admission, and routine perioperative care. Throughout hospitalization, cardiology staff delivered bedside health education covering disease risk factors, medication, exercise, and dietary precautions, while encouraging participation in cardiac rehabilitation.

Prior to discharge, patients underwent a 6MWT to evaluate exercise capacity. An individualized, progressive exercise plan was then developed based on the patient's clinical status, medical history, nutritional assessment, and 6MWT results.

In-hospital phase I rehabilitation began one day post-procedure. Activities included active bed exercises (focusing on joint mobility) and breathing regulation (abdominal breathing), performed while the puncture site remained compressed and bandaged. From postoperative day two until discharge, patients completed sitting balance training once or twice daily, along with supervised slow walking (5-10 minutes per session, once or twice daily, with duration adjusted based on individual tolerance).

Following discharge, patients entered phase II cardiac rehabilitation. Each patient was equipped with a cardiac monitor, and a long-term exercise regimen was selected based on individual capability. Options included: (1) low-intensity activities such as slow walking or tai chi; (2) aerobic exercise (e.g., square dancing, brisk walking, jogging); and (3) resistance training (e.g., dumbbells, elastic bands). Exercise frequency was prescribed at 2-3 sessions per week, each lasting 30 minutes, with adjustments permitted following physician consultation. Follow-up evaluations at the cardiovascular rehabilitation outpatient clinic were scheduled for 3 and 6 months post-discharge.

Intervention group: Participants in the intervention group received the following additional components integrated into the conventional cardiac rehabilitation program: (1) Interactive assessment: Prior to initiating cardiac rehabilitation, the rehabilitation physician conducted three systematic interactive evaluations of each elderly post-PCI patient, focusing on: 1) Personal system: Knowledge of cardiac rehabilitation, exercise habits, dietary patterns, and smoking history. 2) Interpersonal interactions, family members' attitudes toward the patient's rehabilitation, and communication skills. 3) Social system: Family circumstances, occupational status, and social support. (2) Mutual goal setting: Cardiac rehabilitation physicians and nurses, in collaboration with the patient and attending physician, developed five core cardiac rehabilitation prescriptions tailored to the patient's needs and identified problems: medication, exercise, nutrition, smoking cessation, and psychological prescriptions. During goal setting, special attention was given to eliciting the patient's concerns, alleviating apprehensions, and reinforcing confidence in the rehabilitation process. (3) Therapeutic interaction: Patients adhered to the jointly formulated cardiac rehabilitation prescriptions. The intervention schedule comprised two in-hospital sessions, two telephone follow-ups (at weeks 1 and 3 post-discharge), and two outpatient rehabilitation visits (at months 3 and 6 post-discharge), totaling six structured interactions. Additionally, a dedicated WeChat group was established for enrolled patients, with a designated coordinator responsible for regularly disseminating evidence-based health information, assisting in rehabilitation planning, monitoring patient progress in real time, and providing timely feedback. (4) Outcome evaluation: Following each intervention session, the rehabilitation physician communicated the assessment results and identified areas requiring improve-

ment directly with the patient. The physician also explored difficulties encountered by the patient during implementation of the prescriptions and jointly revised the rehabilitation plan accordingly, informing subsequent intervention priorities.

Outcome measures

(1) Fasting blood samples were collected from the cubital vein on the morning of the second day after admission and sent to the hospital's Department of Clinical Laboratory for routine analysis, including blood glucose, cardiac injury markers, and a four-parameter lipid profi.

(2) Exercise endurance was evaluated using the 6MWT. All assessments were conducted by the same cardiac rehabilitation physician prior to discharge and at 3 and 6 months post–intervention. Cardiac rehabilitation nurses measured blood pressure and oxygen saturation, explained the procedure, and assisted patients in donning electrocardiographic monitoring equipment. The test was performed in a quiet, unobstructed hospital corridor along a clearly marked 30-meter straight course. Patients were instructed to walk as rapidly as possible within the allotted time, and the total distance covered was recorded by an observer.

(3) Echocardiography was performed on all participants at admission and at 3 and 6 months post-rehabilitation. All measurements were obtained by the same experienced attending physician from the Department of Ultrasound using a Philips EPIQ5 system, with patients in the supine position. The parameters recorded included LVEF, left ventricular end-diastolic volume (LVEDV), and left ventricular end-systolic volume (LVESV).

(4) Anxiety and depression were assessed using the PHQ-9 and the GAD-7 scale before and after rehabilitation. Both instruments use a four-point Likert scale (0-3), with total scores ranging from 0 to 27 for the PHQ-9 and 0 to 21 for the GAD-7; higher scores reflect greater symptom severity. For the PHQ-9, scores of 0-4, 5-9, 10-14, 15-19, and 20-27 indicate no, mild, moderate, moderately severe, and severe depression, respectively. For the GAD-7, scores of 0-4, 5-9, 10-14, and 15-21 indicate no, mild, moderate, and severe anxiety, respectively [17, 18].

(5) Sleep quality: Sleep quality over the preceding month was assessed using the PSQI. Total scores range from 0 to 21, with higher scores indicating poorer sleep quality [19].

(6) Major adverse cardiovascular events (MACE): Documented events during the 6-month follow-up included recurrent myocardial infarction, new-onset arrhythmia, heart failure, angina pectoris, and sudden cardiac death.

Statistics

SPSS version 26.0 (IBM Corp., Armonk, NY, USA) was used for statistical analysis. Normally distributed continuous data are presented as mean ± standard deviation ($\bar{x} \pm s$) and were compared using the t-test; non-normally distributed continuous data are expressed as median with interquartile range (M [Q1, Q3]) and were analyzed using the Mann-Whitney U test. Categorical data are reported as frequencies and percentages and were compared using the chi-square test. Within-group comparisons of 6MWT, LVEF, CI, PHQ-9, GAD-7, and PSQI scores before and after intervention were performed using paired-sample t-tests. Between-group differences in post-intervention outcomes were assessed using independent-sample t-tests. Cumulative MACE incidence curves over the 6-month follow-up were estimated using Kaplan-Meier survival analysis, and between-group differences were evaluated with the log-rank test. Graphs and histograms were generated using GraphPad Prism 10 (GraphPad Software, USA). A two-sided *P*-value < 0.05 was considered statistically significant.

Flow diagram of the study

A total of 90 patients who met the inclusion criteria, did not meet any exclusion criteria, and underwent PCI were enrolled in the study. They were randomly assigned in a 1:1 ratio to the conventional cardiac rehabilitation (CCR) group or the goal attainment theory-based cardiac rehabilitation (GCR) group. In the CCR group (n = 45), 11 patients (24.4%) discontinued the intervention during the 6-month follow-up period: 7 (15.6%) were lost to contact, 3 (6.7%) withdrew consent, and 1 (2.2%) died. In the GCR group (n = 45), 7 patients (15.6%) withdrew, including 5 (11.1%) lost to follow–up and 2 (4.4%) who declined continued participation; no deaths occurred in this group. All partici-

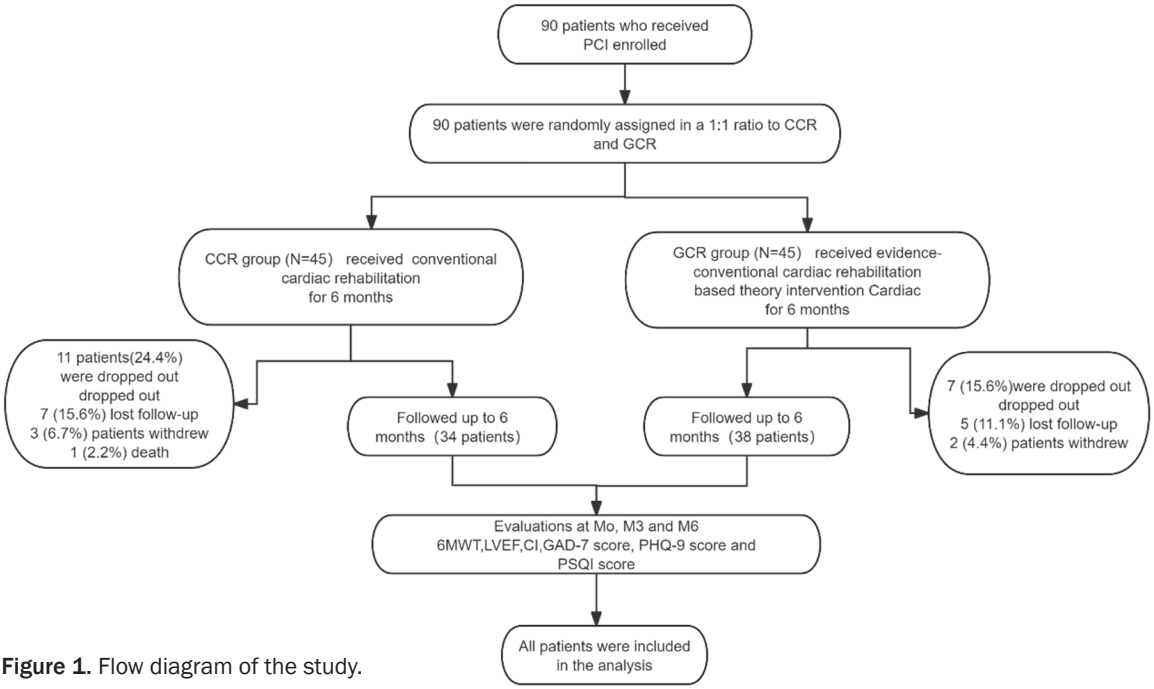

Figure 1. Flow diagram of the study.

pants provided written informed consent. Follow-up assessments were conducted at discharge and at 3 and 6 months post-discharge. The study flow diagram is presented in **Figure 1**.

Results

Clinical characteristics of the CCR and GCR groups

Table 1 presents the baseline characteristics of the two groups. The mean age was 58.9 ± 11.6 years in the CCR group and 64.4 ± 12.2 years in the GCR group (P = 0.056). Regarding sex distribution, the CCR group included 5 women (14.7%) and 29 men (85.3%), whereas the GCR group comprised 10 women (26.3%) and 28 men (73.7%) (P = 0.226). No significant differences were observed in any other clinical characteristics between the groups (all P > 0.05).

Comparison of observation indexes between the two groups of patients after rehabilitation

Table 2 During in-hospital rehabilitation, 6MWT distances did not differ significantly between groups at baseline. After 3 and 6 months, both groups showed significant increases in walking distance from baseline. At 6 months, the GCR group demonstrated a significantly greater improvement in walking distance compared to the CCR group. No significant between-group differences were observed at baseline in LVEF, CI, PHQ-9, GAD-7, or PSQI scores. At 3 months, rehabilitation outcomes remained comparable across all measures. By 6 months, however, the GCR group exhibited significantly greater improvements in LVEF, PHQ-9, and PSQI scores than the CCR group.

Comparison of cumulative MACE rates between the CCR group and the GCR group

During the 6-month follow-up, the cumulative MACE rate was 20.6% in the CCR group and 10.5% in the GCR group. This difference was not statistically significant (P = 0.254) (**Figure 2**).

Discussion

Although PCI temporarily restores perfusion in narrowed or high-risk vessels, it does not address the underlying pathophysiological changes, risk factors, psychological contributors, or lifestyle habits that precipitate coronary disease. Consequently, patients remain at risk for restenosis, slow flow, and no-reflow, increasing the likelihood of hospital readmission and adverse cardiovascular events [20]. The GCR

Table 1. Baseline characteristics table

Features	CCR (*N* = 34)	GCR (*N* = 38)	$t/x^2/Z$	*P* value
Age (years)	58.9 ± 11.6	64.4 ± 12.2	1.942	0.056
Gender (%)			1.467	0.226
Male	29 (85.3)	28 (73.7)		
Female	5 (14.7)	10 (26.3)		
BMI (kg/m^2)	25.13 ± 3.67	24.09 ± 8.90	1.331	0.188
Smoker (%)	17 (50.0)	20 (52.6)	0.05	0.824
Education level (%)			0.227	0.634
High school and above	9 (26.5)	12 (31.6)		
Other	25 (73.5)	26 (68.4)		
Location (%)			0.611	0.435
Urban	13 (38.2)	18 (47.4)		
Rural	21 (61.8)	20 (52.6)		
Sport mode (%)			2.723	0.436
Respiratory adjustment	11 (32.4)	14 (36.8)		
Aerobic exercise	5 (14.7)	3 (7.9)		
Anaerobic exercise	8 (23.5)	5 (13.2)		
No exercise	10 (29.4)	16 (42.1)		
Complication (%)				
Hypertension	19 (55.9)	23 (60.5)	0.159	0.690
Diabetes	7 (20.6)	10 (26.3)	0.326	0.568
Heart failure	2 (5.9)	5 (13.2)	1.082	0.298
Arrhythmia	11 (32.4)	9 (23.7)	0.672	0.412
Triglyceride (mmol/L)	1.52 (1.22, 2.49)	1.40 (1.02, 1.75)	-1.675	0.094
Low-density lipoprotein (mmol/L)	2.83 ± 0.81	2.68 ± 0.81	0.759	0.450
Total cholesterol (mmol/L)	4.30 ± 1.06	4.55 ± 1.11	0.977	0.332
Blood glucose (mmol/L)	5.7 (5.27, 6.67)	5.63 (5.35, 6.12)	-0.886	0.376
Number of stents implanted (%)			0.086	0.770
1	24 (70.6)	28 (73.7)		
2	10 (29.4)	10 (26.3)		
Risk stratification in cardiac rehabilitation (%)			0.022	0.883
Low risk	14 (41.2)	15 (39.5)		
Medium risk	20 (58.8)	23 (60.5)		
NYHA cardiac function classification (%)			1.216	0.545
Grade I	7 (20.6)	10 (26.3)		
Grade II	12 (35.3)	16 (42.1)		
Grade III	15 (44.1)	12 (31.6)		

group integrated interactive goal attainment theory into conventional rehabilitation to enhance exercise efficiency, restore motor function, improve patient engagement, and optimize adherence to the rehabilitation plan. Physiologically, individualized exercise programs co-developed by physicians and patients led to greater improvements in exercise tolerance (6MWT) and cardiac function (LVEF, CI). Psychologically, the dynamic interactive process reduced symptoms of anxiety and depression (PHQ-9, GAD-7) and improved sleep quality (PSQI). Ongoing communication also alleviated patient concerns, reinforced confidence in recovery, and mitigated the detrimental effects of negative emotions on rehabilitation outcomes. These benefits were substantiated by the study findings in post-PCI patients.

Improvement in physical function following GCR in middle-aged and elderly post-PCI patients

The present study demonstrated that 6MWT, LVEFand CI were significantly improved at 3 and

Table 2. Baseline characteristics table

Time Points	CCR	GCR	*p*-Value
6-min walk test (m)			
At baseline	411.65 ± 89.38	409.05 ± 82.73	0.998
M3	457.68 ± 62.53	491.34 ± 68.45	0.128
M6	466.74 ± 59.13	509.58 ± 54.68	0.032
Ejection fraction (%)			
At baseline	44.89 ± 7.30	45.04 ± 6.64	0.770
M3	54.96 ± 5.36	57.67 ± 4.97	0.121
M6	57.18 ± 4.78	61.08 ± 4.08	0.011
Cardiac index (L/min·m^2)			
At baseline	2.17 ± 0.22	2.24 ± 0.27	0.775
M3	2.85 ± 0.36	2.93 ± 0.31	0.695
M6	3.16 ± 0.46	3.28 ± 0.40	0.369
PHQ-9 score (points)			
At baseline	7.41 ± 4.81	7.89 ± 4.76	0.591
M3	5.68 ± 3.97	5.92 ± 3.54	0.606
M6	6.29 ± 3.27	3.95 ± 2.05	0.031
GAD-7 score (points)			
At baseline	8.12 ± 4.99	7.50 ± 4.84	0.879
M3	6.26 ± 4.13	6.21 ± 4.04	0.725
M6	6.09 ± 4.13	5.55 ± 3.49	0.198
PSQI score (points)			
Before treatment	13.68 ± 1.65	14.11 ± 1.67	0.577
After treatment	11.91 ± 2.04	10.68 ± 2.29	0.016

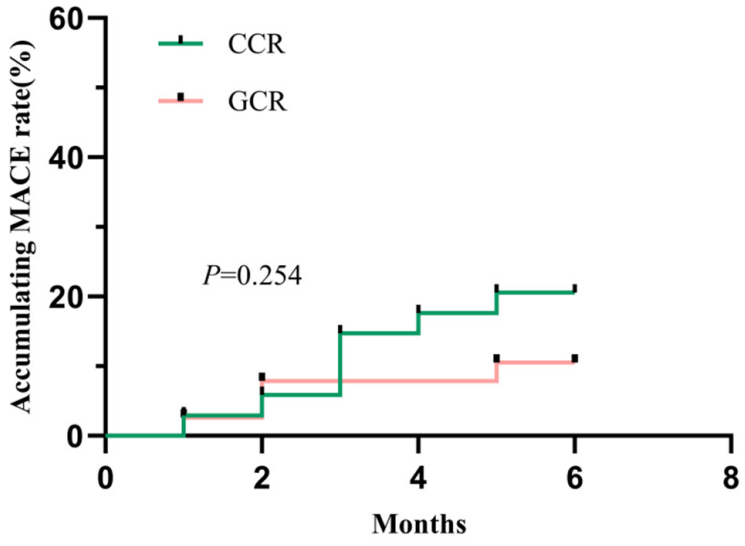

Figure 2. Accumulating MACE in the CCR group and the GCR group. The comparison of accumulating MACE between the two groups was assessed by log-rank test.

6 months postoperatively in both groups compared with baseline values during hospitalization. However, the GCR group exhibited greater improvements at 6 months ($P < 0.05$). The mechanism underlying this difference lies in the GCR model's departure from the passive, instruction-based execution logic characteristic of conventional cardiac rehabilitation (CCR). Individualized exercise plans, developed jointly by physicians and patients, were more closely aligned with patients' daily activity capacities and tolerance thresholds, thereby substantially enhancing the continuity and standardization of exercise training. Moreover, regular interactive feedback enabled timely correction of exercise misconceptions and strengthened patients' confidence in their recovery. Regular physical exercise can induce adaptive changes in the cardiovascular system, improve patients' cardiopulmonary function, stabilize coronary artery plaques, promote the establishment of collateral circulation, improve quality of life, and reduce the risk of adverse cardiovascular events [21, 22]. A planned and efficient exercise program can significantly reduce the short-term (6-12 months) myocardial infarction rate and readmission rate in CAD patients [23]. Consistent with the findings of this study. GCR, by optimizing exercise adherence, amplified this pathophysiological improvement effect, which was ultimately translated into quantifiable enhancements in physical function - improvements in 6MWT directly corresponded to the recovery of patients' daily activity capacity, whereas increases in LVEF and CI reflected improved cardiac function. Some studies have reported that the effect of exercise-based cardiac rehabilitation in patients after PCI is related to factors such as age and gender [24]. At 3 months, no difference in improvement in cardi-

ac function was observed between the two groups This may be related to the fact that the average age of the GCR group is higher, and there are more women, which requires further research and analysis.

The positive regulatory effect of GCR on the psychosomatic interactive cycle in middle-aged and elderly post-PCI patients

Patients undergoing PCI frequently experience substantial preoperative psychological burden and postoperative stress, often accompanied by emotional disturbances such as anxiety, depression, and poor sleep quality [25]. These negative emotions tend to interact reciprocally with somatic conditions, forming a vicious cycle that impedes recovery. Because such emotional states are largely subjective, they are difficult to detect and are frequently overlooked in routine clinical practice, significantly compromising physical rehabilitation [5, 26].

Notably, sleep disturbance is not only a behavioral manifestation of anxiety and depression but also an independent predictor of adverse cardiovascular events, mediated in part by oxidative stress pathways. Emerging evidence indicates that sleep quality in patients with generalized anxiety disorder fluctuates in circadian synchrony with oxidative stress levels, and that chronic sleep disruption may potentiate oxidative stress - induced myocardial injury [27, 28].

To address this clinical challenge, the present study compared the effects of comprehensive cardiac rehabilitation based on King's Goal Attainment Theory (GCR) with those of conventional cardiac rehabilitation (CCR). Both groups showed improvements in postoperative depression (PHQ-9), anxiety (GAD-7), and sleep quality from baseline to discharge. However, at six months post-surgery, the GCR group demonstrated significantly greater improvements in mood and sleep than the CCR group ($P < 0.05$). This finding is consistent with previous research indicating that interactive rehabilitation models confer superior benefits in psycho-cardiological management [29, 30].

The present findings demonstrate the superiority of the GCR model in psycho-cardiological management. Through sustained patient-provider interaction, phased goal setting, and performance feedback, GCR facilitates emotional catharsis and cognitive restructuring, gradually reducing disease-related fear and uncertainty. This process effectively disrupts the vicious cycle of negative emotion and delayed physical recovery. Concurrently, regular moderate-intensity exercise under GCR guidance enhances endogenous antioxidant capacity and stabilizes circadian oxidative stress rhythms [31, 32], thereby improving sleep quality. Enhanced sleep, in turn, alleviates anxiety and strengthens rehabilitation adherence, ultimately establishing a positive feedback loop - emotional intervention → sleep improvement → physical recovery → enhanced confidence. This mechanism represents a key pathway through which GCR achieved superior rehabilitation outcomes.

These findings indicate that post-PCI rehabilitation should extend beyond physical recovery to include routine assessment and management of both psychological and physiological status. By applying interactive rehabilitation models to deliver targeted interventions for psycho-cardiological comorbidities, substantial improvements in patients' long-term prognosis can be achieved.

No significant between-group difference in MACE incidence was observed in this study, likely due to the relatively short follow-up period (6 months), which did not capture the typical window for event occurrence, and the limited sample size, which reduced statistical power. The potential benefit of GCR on MACE requires further validation through extended follow-up (1-2 years) and larger-scale trials. Short-term rehabilitative gains may require prolonged observation before translating into reductions in hard endpoints. In summary, the effect of GCR on MACE in post-PCI patients remains inconclusive.

Conclusion

In summary, a comprehensive cardiac rehabilitation intervention based on King's Goal Attainment Theory represents a promising treatment strategy for middle-aged and elderly patients following PCI for coronary heart disease. This approach significantly restores exercise capacity and cardiac function, alleviates emotional disturbances and sleep disorders, and contributes to improved long-term prognosis. A whole-process cardiac rehabilitation interven-

tion based on King's compliance theory is expected to be a treatment strategy with a better prognosis for middle-aged and elderly patients after PCI for coronary heart disease. It can significantly restore the exercise capacity and cardiac function of patients after PCI, improve their emotional disorders and sleep quality, and help improve their prognosis.

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Disclosure of conflict of interest

None.

Address correspondence to: Jianfeng Lv, Second Clinical Medical College of China Three Gorges University, No. 410, Yiling Avenue, Yichang 443000, Hubei, China. E-mail: ljfzxm@163.com

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