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Original Article

Effectiveness of 'Internet Plus' remote management in improving cardiac rehabilitation outcomes in acute myocardial infarction patients

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Abstract: Objectives: This study evaluated the effectiveness of "Internet Plus" remote management in enhancing cardiac rehabilitation outcomes for patients with acute myocardial infarction (AMI) following percutaneous coronary intervention (PCI). Methods: A total of 101 AMI patients post-PCI from Sir Run Run Shaw Hospital were included between December 2021 and November 2022. Patients were retrospectively categorized into two groups based on the type of care they received: the control group receiving standard post-PCI rehabilitation, and the observation group receiving remote management via "Internet Plus" for six months. Assessed outcomes included the 6-minute walk test (6MWT), Duke Activity Status Index (DASI) scores, exercise rehabilitation compliance, mental health scores using the Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS), and rates of major cardiovascular events and unplanned rehospitalizations. Results: No significant baseline differences were observed between the two groups. The observation group exhibited significantly longer 6MWT distances and higher DASI scores at subsequent follow-ups (all $P < 0.05$). Rehabilitation compliance was also higher in the observation group, with 91.49% achieving excellent compliance compared to 72.34% in the control group ($P < 0.05$). Mental health improvements were also noted, with the observation group showing lower SAS and SDS scores at the three-month follow-up (both $P < 0.05$). The incidence of major cardiovascular events was 11.11% in the observation group, significantly lower than 27.66% in the control group ($P = 0.034$). The incidence of unplanned rehospitalization rates was 7.41% in the observation group, also significantly lower than 23.40% in the control group ($P = 0.024$). Conclusion: The "Internet Plus" remote management significantly enhances exercise tolerance, cardiac rehabilitation compliance, and mental health while reducing the incidences of adverse cardiovascular events and rehospitalizations in AMI patients post-PCI. These findings suggest that integrating digital technology into cardiac rehabilitation programs can effectively improve patient outcomes.

Keywords: Internet plus, acute myocardial infarction, cardiac rehabilitation, continuous care, remote management model

Introduction

Acute myocardial infarction (AMI) is a leading cause of mortality and morbidity worldwide, imposing substantial emotional and economic burdens on patients and healthcare systems alike [1, 2]. While the acute phase of AMI is typically managed with percutaneous coronary intervention (PCI) and pharmaceutical interventions, successful recovery requires a comprehensive approach, including cardiac rehabilitation (CR) to mitigate long-term risks and foster sustained improvement in health outcomes [3]. Despite well-established benefits of CR, such as improved survival rates, quality of life, and reduced recurrence of cardiovascular events, the global adherence to these rehabilitation programs remain suboptimal. Barriers such as geographical accessibility, socioeconomic factors, and differences in healthcare delivery systems often hinder effective engagement in conventional CR programs, necessitating innovative solutions to broaden access and participation [4, 5].

The rapid advancement of telemedicine and digital health technologies presents unprecedented opportunities to bridge this gap through

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remote management models [6]. "Internet Plus", a concept describing the integration of internet-based technologies with traditional industries, offers promising avenues for transforming CR by enhancing accessibility and continuity of care. Digital interventions, characterized by their adaptability and potential for personalization, can help overcome geographic and temporal constraints associated with in-person CR programs [7]. Prior studies have demonstrated that tele-rehabilitation models can yield outcomes comparable or even superior to traditional modalities, particularly in terms of exercise compliance, patient satisfaction, and reduction of recurrent cardiovascular incidents [8-10].

Internet-based platforms can deliver a diverse array of CR components, including individualized exercise programs, dietary and lifestyle counseling, and psychological support. These integrated platforms facilitate continuous monitoring and feedback, empowering patients to engage actively in their rehabilitation and fostering adherence to prescribed regimens. The broad reach and real-time capabilities of internet tools also enable healthcare providers to offer timely interventions and alterations in treatment plans as required, possibly improving clinical outcomes [11, 12].

Despite these advantages, uptake of internet-assisted CR interventions has been inconsistent, largely due to variations in program design and implementation. Comprehensive evaluations comparing the effectiveness of remote management models with conventional care in specific populations, such as post-AMI patients, are therefore critical. Furthermore, studies delineating the components of internet-based interventions, the extent of healthcare provider involvement, and patient engagement levels are crucial for refining and optimizing these models in clinical practice [13-15].

This study explores the effectiveness of the "Internet Plus" remote management model in improving CR outcomes for AMI patients undergoing PCI. We hypothesize that remote management will provide superior results concerning exercise tolerance, rehabilitation adherence, and mental health indicators compared to standard care protocols.

Materials and methods

Study subjects

Patients who underwent PCI treatment for AMI at Sir Run Run Shaw Hospital Affiliated to Zhejiang University School of Medicine from December 2021 to November 2022 were selected as the study subjects and were retrospectively divided into the observation group and the control group based on the nursing measures received. This study was approved by the Institutional Review Board and Research Ethics Committee of Sir Run Run Shaw Hospital Affiliated to Zhejiang University School of Medicine (No. 20211116-31) and was conducted in accordance with the tenets of the Declaration of Helsinki.

Inclusion criteria: (1) Patients diagnosed with first-onset AMI and with successful PCI; (2) Patients aged between 18 and 70, with a heart function NYHA (New York Heart Association) classification of ≤ III; (3) Patients able to operate smartphone applications; (4) Patients with normal communication abilities; (5) Patients who received continuous care for 6 months.

Exclusion criteria: (1) Patients with other concomitant neurological diseases; (2) Patients with large area myocardial infarction, NYHA class IV, cardiogenic shock, malignant arrhythmia, or other high-risk conditions; (3) Patients with bone and joint diseases, rheumatic diseases, etc.; (4) Patients unable to receive outpatient follow-up; (5) Previous participation in similar cardiac rehabilitation management programs.

The sample size was calculated using the formula for comparing two independent means. Assuming a power of 80% and a significance level of 5%, a minimum of 46 patients per group was required to detect a clinically meaningful difference in the primary outcome (6-minute walk test distance). Based on the available medical records and the inclusion/exclusion criteria, we identified 47 patients in the observation group and 54 in the control group. The patient selection procedures are shown in **Figure 1**.

Methods

Control group: Patients in the control group were managed according to routine post-PCI

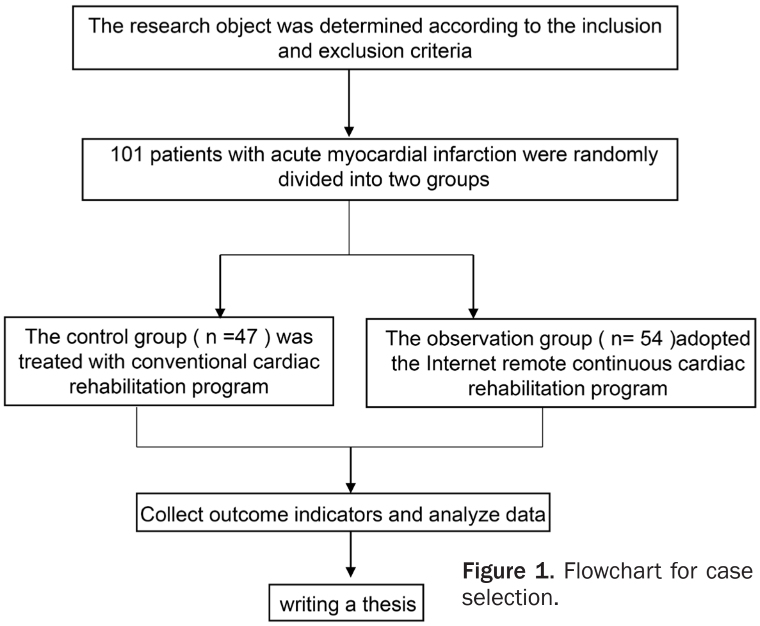

Figure 1. Flowchart for case selection.

nursing measures and cardiac rehabilitation programs, including guidance on daily activities, early exercise rehabilitation, and before discharge, routine health guidance provided by the responsible nurse, covering postoperative medication, diet, activity and rest, and disease-related precautions. A self-made postoperative rehabilitation manual was distributed, and a follow-up call was made one week after the operation to assess the patient's recovery. At the one-month postoperative review, patients underwent a cardiopulmonary exercise test (CPET) and were given an exercise prescription. This prescription primarily included aerobic exercises such as brisk walking, with moderate to low intensity. The target heart rate = (maximum heart rate during exercise test - resting heart rate) × (40-60)% + resting heart rate. The exercise plan recommended a frequency of 3-5 times per week, with each session reaching the target heart rate ≥ 30 minutes, and a target cumulative weekly exercise time of ≥ 150 minutes. Patients in the control group were provided with an exercise log to record their at-home exercise rehabilitation and were informed about regular check-ups, with continuous care for 6 months.

Observation group: Patients in the observation group were managed using a continuous cardiac rehabilitation management model based on "Internet Plus" remote model for 6 months. The specific contents were as follows:

(1) Team Formation and Internet Platform: A dedicated cardiac rehabilitation management team was established, consisting of one deputy chief physician of cardiology, two nurses with more than 5 years of cardiology work experience, one rehabilitation therapist, and two nurses. The researcher served as the team leader, responsible for overall coordination, formulating cardiac rehabilitation nursing programs, training and assessing the capabilities of team members, and real-time supervision of the implementation of the nursing program. The deputy chief physician was responsible for treatment plans, follow-up work, and participated in the formulation and review of patient cardiac rehabilitation nursing programs. The rehabilitation therapist was responsible for adjusting the post-discharge exercise rehabilitation plan for patients, while the nurses were responsible for implementing the program guidance and providing answers by WeChat, establishing cardiac rehabilitation files for patients before discharge, updating and retaining them in a timely manner during the nursing period based on changes in the patient's condition, and entering the data into the database. The team created a WeChat public account, allowing patients and their families to join and communicate. The WeChat account offered modules on disease knowledge, exercise guidance, dietary prescriptions, psychological support, lifestyle adjustments, and medication guidance, enabling users to access information as needed. All health-related videos and graphic materials were reviewed and confirmed by cardiologists before sharing in the patient's WeChat group, ensuring the scientific rigor and reliability of the information.

(2) Preparation on the day of discharge: On the day of discharge, patients completed a 6-minute walk test (6MWT) under the guidance of a physician and electrocardiographic monitoring. Cardiovascular risk factors were analyzed to develop individualized cardiac rehabilitation prescriptions. A cardiac rehabilitation health punch card manual was distributed, containing

follow-up records, exercise, medication, blood pressure monitoring, and dietary punch cards. Medication instructions were also provided, and health education implementation sessions involved family caregivers to ensure joint learning. During these sessions, on-site evaluations were conducted to confirm that both patients and family caregivers understood the exercise prescription, tracking methods, disease monitoring, and emergency response techniques. Before discharge, the nurse added the patient and their primary caregiver to a WeChat group, introducing them to the team members responsible for daily communication and follow-up.

(3) Cardiac Rehabilitation Program: ① Exercise Rehabilitation: Exercise Intensity = 6MWT Test Distance/6 × Training Intensity (60%-80%) × Prescription Time, Target Heart Rate = (220 - Age) × Training Intensity (60%-80%). Exercise Forms: Outdoor aerobic exercises such as brisk walking and jogging, along with resistance exercises (using elastic bands) and flexibility exercises (stretching). Exercise Frequency: Aerobic exercises were scheduled 3-5 times per week; resistance exercises began at least 5 weeks after discharge, with 8-10 sets per time, alternating upper and lower body muscle groups, initially once a week, gradually increasing to 2-3 times per week or every other day. Flexibility exercises were recommended 3-5 times per week, with each stretch lasting 6-15 s, gradually increasing to 30 s, and if tolerated, up to 90 s repeated 3-5 times for each movement. Exercise Duration: Each session included a total exercise time of 30-60 minutes per session (5-10 minutes warm-up, 20-40 minutes of exercise, 5-10 minutes stretching and relaxation). ② Nutritional Care: Patients underwent dietary, physical, and biochemical assessments. Nurses develop personalized dietary plans based on the assessment results, aiming to reduce saturated fatty acids, trans-fatty acids, and sodium intake while increasing fruit and vegetable consumption. Overweight and obese individuals were encouraged to aim for a 5%-10% weight reduction within 6-12 months, with a target body mass index (BMI) of 18.5-23.9 kg/m^2. Patients were advised to monitor their weight regularly and keep a dietary record. ③ Psychological Support: Patients were taught relaxation techniques (such as diaphragmatic breathing), and encouraged to use music therapy and exercise therapy (e.g., Ba Duan Jin) for psychological support. Patients were empowered to self-regulate emotions, while family members were educated to foster understanding of the disease, stabilize emotions, and maintain a positive mindset. ④ Medication Guidance: Healthcare professionals emphasized the importance of medication adherence through WeChat groups and public accounts. Patients or their caregivers were instructed to upload daily medication records to the WeChat group, allowing for the timely identification of any issues related to medication adherence, side effects, or patient understanding of the medication.

(4) Outpatient Home Cardiac Rehabilitation Implementation: Following discharge, patients were scheduled for outpatient follow-ups at 1 month, 3 months, and 6 months. Weekly follow-ups were conducted via WeChat groups, where patients could seek consultation regarding their exercise prescription and participate in regular Q&A sessions for remote healthcare guidance. Medication reminders and notifications for regular hospital check-ups were sent through WeChat to support adherence. The cardiac rehabilitation management team monitored and analyzes the weekly reading volume, providing phone reminders to patients who have not participated. During follow-ups, physicians and nurses assessed the execution of the cardiac rehabilitation punch card and addressed any issues, making necessary revisions to rehabilitation program as needed. Monthly patient support group meetings and health education lectures were organized, and records of these events were shared on the WeChat platform.

Data extraction and outcome measures

(1) Exercise tolerance: Exercise tolerance for both groups was assessed using the 6-minute walk test (6MWT) before and after nursing care. A 30-meter straight line was marked in a flat corridor, and patients were instructed to walk back and forth along this line as quickly as possible within a 6-minute timeframe. The total distance covered was recorded. Measurements were taken at discharge and at 1, 3, and 6 months post-discharge.

(2) Cardiac rehabilitation effectiveness: The Duke Activity Status Index (DASI) was used to

assess cardiac rehabilitation effectiveness of the two groups after nursing care. This index comprises 12 items related to activities of daily living, household chores, and leisure activities, each with "yes" or "no" options. "No" indicates 0 points, while "yes" implies metabolic expenditure, with different scores assigned based on the content of each item. The total score ranges from 0 to 58.2, with higher scores indicating better physical activity status and greater cardiac rehabilitation effectiveness [16].

(3) Exercise rehabilitation compliance: Compliance with the exercise prescription was assessed according to the Chinese Cardiac Rehabilitation/Secondary Prevention Guidelines: ① Poor compliance: exercise frequency < 3 days/week; ② Good compliance: exercise frequency ≥ 3 days/week and exercise duration < 30 minutes; ③ Excellent compliance: exercise frequency ≥ 3 days/week and exercise duration ≥ 30 minutes. The rates of good and excellent compliance were calculated for both groups.

(4) Mental health: The Self-Rating Anxiety Scale (SAS) and the Self-Rating Depression Scale (SDS) were used to evaluate the anxiety and depression levels among patients. SAS uses a 4-tier rating system, with a standard cutoff score of 50 points; scores between 50 and 59 indicate mild anxiety, scores between 60 and 69 indicate moderate anxiety, and scores of 70 or above indicate severe anxiety [17]. SDS scores range from 0 to 100, with higher scores indicating a greater degree of negative emotions [18]. SAS and SDS scores for both groups were recorded at discharge and 3 months post-discharge.

(5) Occurrence rates of major cardiovascular events and unplanned re-hospitalization: The occurrence rates of major cardiovascular events and unplanned re-hospitalizations were documented and compared between the two groups at 6 months post-discharge.

Statistical methods

Data analysis was conducted using SPSS 27.0 statistical software. Continuous data were presented as mean ± standard deviation and compared using t-tests. Categorical data were presented as "n (%)" and compared using chi-square tests. For the analysis of DASI scores and 6MWT at different time points, One-way ANOVA with repeated measures was employed to determine the significance of changes over time. A significance level of $P < 0.05$ indicated statistical significance.

Results

Comparison of baseline data between two groups

Baseline characteristics were compared between the observation group and the control group. Baseline data comparison, including age, gender, and medical history, showed no significant differences between the two groups (all $P > 0.05$), as shown in **Table 1**.

Comparison of 6MWT between the two groups before and after nursing care

There was no significant difference in the baseline 6MWT levels between the two groups before intervention ($P > 0.05$). However, compared to the control group, the observation group showed significantly longer 6MWT distances at 1-, 3-, and 6-months post-surgery (all $P < 0.05$), as presented in **Table 2**.

Comparison of DASI scores between the two groups after nursing care

There was no significant difference in DASI scores at 1-month post-surgery between the two groups ($P > 0.05$). However, at 3- and 6-months post-surgery, the observation group exhibited significantly higher DASI scores compared to the control group (both $P < 0.05$), as shown in **Table 3**.

Comparison of cardiac rehabilitation compliance between two groups

The rate of excellent compliance with cardiac rehabilitation in the observation group was 91.49%, significantly higher than the 72.34% in the control group ($P < 0.05$), as illustrated in **Table 4**.

Comparison of mental health levels between the two groups

As shown in **Table 5**, there were no significant differences in SAS and SDS scores between the two groups at discharge (SAS: $t = 0.488$, P

Table 1. Comparison of baseline data between the two groups

	Observation group (n = 54)	Control group (n = 47)	χ^2/t	P
Gender (n, %)			0.025	0.875
Male	33 (61.11)	28 (59.57)		
Female	21 (38.89)	19 (40.43)		
Age (Years, $\bar{x}\pm s$)	57.63±5.65	57.21±5.92	0.366	0.715
Preoperative NYHA Grading (n, %)			0.736	0.692
I	17 (31.48)	12 (25.53)		
II	22 (40.74)	23 (48.94)		
III	15 (27.78)	12 (25.53)		
Smoking (n, %)			0.364	0.546
Yes	10 (18.52)	11 (23.40)		
No	44 (81.48)	36 (76.60)		
Comorbidities (n, %)			0.169	0.681
Yes	13 (24.07)	13 (27.66)		
No	41 (75.93)	34 (72.34)		
Medication use (n, %)				
Aspirin	52 (96.29)	46 (97.87)	0	1
Clopidogrel	43 (80.00)	36 (76.60)	0.136	0.713
Calcium channel blockers	2 (3.70)	2 (4.26)	0	1
ACEI/ARB	38 (70.37)	36 (76.60)	0.497	0.481
Beta-blockers	47 (87.04)	37 (78.72)	1.241	0.265
Nitrates	14 (25.93)	14 (29.79)	0.187	0.665

NYHA: New York Heart Association; ACEI/ARB: Angiotensin-Converting Enzyme Inhibitor/Angiotensin II Receptor Blocker.

Table 2. Comparison of 6MWT between the two groups before and after nursing care (m, $\bar{x}\pm s$)

	n	At discharge	1 month	3 months	6 months
Observation group	54	266.59±38.97	302.97±25.67	356.34±24.51	474.21±35.43
Control group	47	264.12±41.55	280.25±34.88	303.19±30.56	409.88±40.97
t		0.308	3.681	9.693	8.463
P		0.759	< 0.001	< 0.001	< 0.001

6MWT: 6-Minute Walk Test.

Table 3. Comparison of DASI scores between the two groups before and after nursing care (points, $\bar{x}\pm s$)

	n	1 month	3 months	6 months
Observation group	54	20.05±1.87	29.88±3.67	36.79±2.18
Control group	47	19.88±2.15	21.05±4.01	28.44±4.97
t		0.414	11.536	10.652
P		0.680	< 0.001	< 0.001

DASI: Duke Activity Status Index.

= 0.627; SDS: t = 0.063, P = 0.95). However, at the three-month follow-up, the observation group exhibited significantly lower SAD and SDS scores compared to the control group (SAS: 41.63±5.32 vs. 44.08±4.76, t = 2.422, P = 0.017) (SDS: 45.62±3.39 vs. 48.26±3.09, t = 4.058, P < 0.001).

Comparison of major cardiovascular event and unplanned rehospitalization rates between two groups

Following surgery, 6 cases (11.11%) in the observation group experienced major cardiovascular events, significantly lower than 13 cases (27.66%) in the control group (χ^2 = 4.506, P = 0.034), as depicted in **Figure 2A**. Additionally, four cases (7.41%) in the observation group experienced

Table 4. Comparison of cardiac rehabilitation compliance between the two groups (n, %)

	n	Excellent	Good	Poor	Compliance rate
Observation group	54	33 (61.11%)	16 (29.63%)	5 (9.26%)	49 (90.74%)
Control group	47	15 (31.91)	19 (40.43)	13 (27.66)	34 (72.34)
χ^2					5.809
P					0.016

Table 5. Comparison of mental health between the two groups

	Time	Observation group (n = 54)	Control group (n = 47)	t	P
SAS Score	At discharge	57.43±4.43	57.85±4.31	0.488	0.627
	3 months	41.63±5.32	44.08±4.76	2.422	0.017
SDS Score	At discharge	61.78±5.37	61.85±5.39	0.063	0.95
	3 months	45.62±3.39	48.26±3.09	4.058	< 0.001

SAS: Self-Rating Anxiety Scale; SDS: Self-Rating Depression Scale.

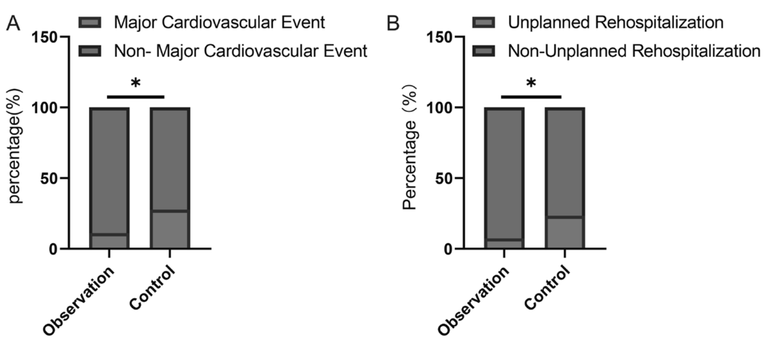

Figure 2. Comparison of major cardiovascular event and unplanned rehospitalization rates between the two groups. A: Major cardiovascular event rates; B: Unplanned rehospitalization rates; *: P < 0.05.

Table 6. Correlation analysis between outcome measures and intervention mode

	rho	*p* value
6MWT-1 month	0.325	P < 0.001
6MWT-3 months	0.717	P < 0.001
6MWT-6 months	0.67	P < 0.001
DASI-3 months	0.771	P < 0.001
DASI-6 months	0.757	P < 0.001
Cardiac rehabilitation compliance	0.24	0.016
SAS-3 months	-0.246	0.013
SDS-3 months	-0.363	P < 0.001
Major cardiovascular event rates	-0.211	0.034
Unplanned rehospitalization rates	-0.224	0.024

6MWT: 6-Minute Walk Test; DASI: Duke Activity Status Index; SAS: Self-Rating Anxiety Scale; SDS: Self-Rating Depression Scale.

unplanned rehospitalizations, also significantly lower than 11 cases (23.40%) in the control group (χ^2 = 5.085, P = 0.024), as shown in **Figure 2B**.

Correlation analysis between outcome measures and remote management intervention of continuous cardiac rehabilitation based on "Internet Plus"

Correlation analysis revealed that the 6MWT at 1-, 3-, and 6-months post-intervention was positively correlated with the remote management intervention based on "Internet Plus" protocol (rho = 0.325, P < 0.001; rho = 0.717, P < 0.001; rho = 0.67, P < 0.001, respectively, **Table 6**). The DASI scores at 3 and 6 months also showed a significant positive correlation with the intervention (rho = 0.771, P < 0.001; rho = 0.757, P < 0.001, respectively). Cardiac rehabilitation compliance was modestly but significantly positively correlated with the intervention (rho = 0.24, P = 0.016). In contrast, the SAS scores and SDS scores at 3 months, major cardiovascular event rates, and unplanned rehospitalization rates were negatively correlated with the intervention (SAS-3 months: rho = -0.246, P = 0.013; SDS-3 months: rho = -0.363, P < 0.001; Major Cardiovascular Event Rates: rho = -0.211, P = 0.034; Unplanned Rehospitalization Rates: rho = -0.224, P = 0.024). Overall, these findings indicate that the "Internet Plus"-based remote management intervention was beneficial in improving physical performance and activity capability while reducing anxiety, depression, and adverse clinical outcomes.

Discussion

This study aimed to assess the effectiveness of the "Internet Plus" remote management model in enhancing cardiac rehabilitation outcomes for patients with AMI who underwent PCI. Our findings illustrate the ability of these of digital health approaches to enhance cardiac rehabilitation, exercise tolerance, compliance, and overall health compared to standard care protocols.

The improved outcomes observed in the study seem to stem from a combination of technological and personalized healthcare interventions. A key factor contributing to the enhanced exercise tolerance and cardiac rehabilitation effectiveness in the observation group was the structured and individualized nature of the rehabilitation program. By implementing a comprehensive remote management system, including exercise prescriptions based on each patient's 6MWT data, patients received tailored and dynamic care. The greater customization of rehabilitation plans, supported by real-time monitoring, allowed for adjustments based on continuous feedback, optimizing the rehabilitation process. This immediacy and relevance of data-driven decisions are challenging to achieve in standard practice, which often relies on generalized protocols [19-22].

The structured use of the WeChat platform played a crucial role in integrating personalization into routine self-monitoring and remote supervision. It allowed seamless dissemination and ingestion of tailored exercise regimens, dietary advice, psychological support content, and medication adherence guides. Patients were not just passive recipients of care; they became active participants and collaborators in their recovery and ongoing health management [23, 24]. The ongoing interaction with healthcare providers, facilitated by digital platforms, likely encouraged the patients in the observation group to engage more actively with their rehabilitation program, as reflected by favorable exercise compliance.

Exercise is a critical component of cardiac rehabilitation, directly influencing physical fitness and cardiovascular health. The frequency and customized nature of the exercise program, guided remotely by the established cardiac rehabilitation team, promoted regular and adequate physical activity, facilitating the transition from recovery to sustained health improvements and stability within the observation group [25-27]. Notably, the high excellent compliance rate in the observation group (91.49%) compared to the control group (72.34%) underscores the potential of technology-assisted programs to foster habitual exercise patterns, possibly due to constant motivation and oversight by trained professionals.

The role of remote psychological support was essential in achieving significant differences in mental health outcome at the three-month. Leveraging video content, therapeutic exercises like Ba Duan Jin, and consistent counseling may have contributed to the reductions in anxiety and depression in the observation group. A well-managed psychological domain not only promotes a healthier mental state but is also linked to better adherence and engagement in physical health behaviors. Psychological support, often underemphasized in conventional rehabilitation, was effectively integrated into our ongoing care model, suggesting that accessible remote psychological interventions can enhance overall rehabilitation outcomes [28-30].

This study also highlighted a significant reduction in major cardiovascular events and unplanned rehospitalizations in the observation group. These reductions can be attributed to improvements in both physiological and psychological health facilitated by the "Internet Plus" model. The real-time tracking and quick intervention capabilities allowed healthcare providers to preemptively address warning signs and adjust care plans as needed, possibly averting severe complications and rehospitalizations. The nuanced care approach ensures continued engagement and monitoring, which may be overlooked during intervals between in-person consultations in traditional setups. Such a holistic intervention minimizes risk factors and fosters environments for healing and adaptation, significantly altering post-discharge trajectories [31, 32].

Furthermore, the correlation analyses revealed strong positive relationships between exercise performance, DASI scores, and the remote management intervention, indicating that internet-facilitated rehabilitation enhances activity levels and physical capabilities over time. Conversely, negative correlations highlighted the mitigation of anxiety and depression levels as well as the incidence of adverse clinical outcomes, which are crucial to understanding why this model substantially benefits patient outcomes.

These results provide compelling evidence that combining patient engagement through Internet with continuous professional oversight improves the efficiency and satisfaction of rehabilitation programs. For healthcare systems, while implementing such integrated approaches may require initial resource investments, the potential for long-term cost savings, by reducing readmissions and preventing inappropriate escalations of care, makes it a worthwhile endeavor.

While this study provides valuable insight into the effectiveness of the "Internet Plus" remote management model in cardiac rehabilitation, several limitations must be acknowledged. Firstly, the study's sample size was relatively small, and participants were recruited from a single hospital, which may limit the generalizability of the findings to broader or more diverse populations. Secondly, the reliance on self-reported compliance and psychological assessments may introduce bias, as patients might overestimate adherence to prescribed regimens or underreport their mental health issues. Additionally, the follow-up duration was relatively short, restricting the ability to assess long-term outcomes and sustainability of the interventions. Finally, while digital literacy was included as an eligibility criterion, the study did not extensively explore barriers to technology access or variations in comfort levels with remote tools, which could affect the effectiveness of the intervention. Future studies should aim to address these limitations by including larger, more diverse cohorts, longer follow-up periods, and comprehensive assessments of participants' technological engagement levels.

In summary, the "Internet Plus" remote management model demonstrates substantial potential in improving cardiac rehabilitation outcomes through integrating personalized care, sustained interaction, and comprehensive engagement strategies within digital health ecosystems. This research underscores the promising future of technology-assisted rehabilitation in post-AMI care and advocates for a paradigm shift towards embracing digital interventions to complement and extend traditional care models.

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Disclosure of conflict of interest

None.

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