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REVIEW

Adherence to Cardiac Rehabilitation in Patients with Acute Myocardial Infarction After PCI: A Scoping Review

Peiru Li[1,*], Wenjie Zhang[1,*], Beibei Wu[2]

[1]Health Management Center, Affiliated Hospital of Jiangsu University, Zhenjiang, People's Republic of China; [2]Department of Respiratory and Critical Care Medicine, Affiliated Hospital of Jiangsu University, Zhenjiang, People's Republic of China

*These authors contributed equally to this work

Correspondence: Wenjie Zhang; Beibei Wu, Affiliated Hospital of Jiangsu University, 438 Jiefang Road, Jingkou District, Zhenjiang, Jiangsu Province, 212001, People's Republic of China, Email zhangwj7878@163.com; 13775538037@163.com

Purpose: Cardiac rehabilitation (CR) is a multidisciplinary intervention program aimed at enhancing the physical, psychological, and social functioning of patients with cardiovascular disease. Although CR is cost-effective and reduces mortality and readmission rates, and many patients with acute myocardial infarction (AMI) after percutaneous coronary intervention (PCI) do not adhere to CR. This review aimed to synthesize the evidence on adherence to CR in patients with AMI after PCI (AMI-PCI).

Patients and Methods: The review was conducted using the methodology proposed by the Joanna Briggs Institute (JBI) to guide reviews and reporting using the Preferred Reporting Items for Systematic Reviews and Meta-analyses Extended for Scoping Reviews (PRISMA-ScR). We searched PubMed, Web of Science, CINAHL, Embase, Ovid, and Scopus databases, and two reviewers independently screened the abstracts and full texts of eligible studies against the inclusion and exclusion criteria. Disagreements were resolved in consultation with a third reviewer.

Results: A total of 10 studies were included in the analysis. The results demonstrated that CR reduces the incidence of complications and improves the quality of life of patients with AMI-PCI. However, the CR adherence rate was low, and the factors affecting it are complex and varied, including age, sex, and employment status. Furthermore, interventions to improve adherence in patients with AMI-PCI mainly combined the internet-based interventions, including videoconferencing tele-training, with wearable device monitoring and intelligent management platform follow-up. All these interventions have shown promising results compared with routine care.

Conclusion: Adherence to CR in patients with AMI-PCI is generally low, and CR adherence is affected by many factors; however, relevant research designs are rare and simple. Healthcare professionals should pay more attention to adherence to CR in this population and use a variety of interventions to improve it.

Keywords: cardiac rehabilitation, adherence, acute myocardial infarction, PCI, scoping review

Introduction

Acute myocardial infarction (AMI) is the most severe type of coronary heart disease (CHD), and it has high prevalence and mortality rates. The American Heart Association recently reported that the prevalence rate of myocardial infarction in the United States among adults 20 years and older, as measured by National Health and Nutrition Examination Survey (NHANES)between 2017 and 2020, is 3.2%.[1] Furthermore, it was estimated that 109,199 people in America died from myocardial infarction in 2020.[1] Meanwhile, the number of patients with cardiovascular disease (CVD) in China is increasing, with the prevalence of AMI being projected to increase to 22.6 million by 2030.[2] In addition, the AMI mortality rate is also rising and has been consistently higher in rural than urban areas in recent years.[3] In 2020, the mortality rate of patients with AMI was 78.65/100,000 in rural areas and 640.29/100,000 in urban areas.[3]

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Percutaneous coronary intervention (PCI) is a therapeutic approach to improve myocardial perfusion by unblocking narrowed or occluded coronary artery lumens using cardiac catheterization.[4] Several guidelines recommend it as the primary treatment for AMI patients.[5,6] In 2021, 1,164,117 cases of PCI were registered in China, representing a 20.18% increase from 2020.[3] Although the total number of PCI procedures is increasing, PCI alone does not consistently and effectively improve the prognosis of patients. Major adverse cardiovascular events (MACEs) are commonly used as indicators of prognosis after PCI in patients with AMI and include death from cardiovascular causes, non-fatal myocardial infarction, non-fatal stroke, and significant bleeding. According to a Japanese study, the incidence of MACEs in patients with AMI after PCI (AMI-PCI) was 7.4%.[7] More importantly, a Chinese study revealed that the incidence of MACEs among 1362 patients who were followed after an AMI-PCI was 18.5%.[8] Therefore, taking appropriate measures to minimize the occurrence of MACEs in patients and improve their prognosis is essential.

Cardiac rehabilitation (CR) is an essential supplementary treatment for patients with cardiovascular disease, especially those with AMI-PCI.[9] Several studies have shown that CR improves cardiac function, reduces the incidence of MACEs, and enhances the health-related quality of life in patients with AMI-PCI.[10–12] The World Health Organization (WHO) defines CR as the

> set of activities and interventions necessary to ensure optimal physical, mental, and social conditions, allowing individuals with chronic or post-acute cardiovascular disease to regain their rightful place in society and lead active lives.[13]

Its objectives are to manage disease symptoms, decrease the probability of sudden death and reinfarction, and stabilize or reverse the advancement of atherosclerosis.[14]

CR is an interdisciplinary, comprehensive model of secondary preventive care. According to the European Society for Preventive Cardiology document, its core components include patient assessment, physical activity counseling, exercise training, diet and nutritional counseling, weight management, lipid management, blood pressure management, smoking cessation, and psychosocial management.[15] CR has traditionally been divided into Phase I (inpatient rehabilitation), Phase II (outpatient rehabilitation), and Phase III (lifelong maintenance phase).[16] During phase I, patients discuss their health status and goals with their primary care provider and receive education about rehabilitation and cardiovascular risk factors. Emphasis is placed on early mobilization to prepare for discharge and return to simple activities of daily living. Phase II, typically carried out in a hospital outpatient facility, incorporates the secondary prevention model to create a personalized treatment plan for the patient. This includes prescribing exercises, providing educational sessions, modifying risk factors (such as smoking, hypertension, diabetes, cholesterol levels, obesity, and malnutrition), and offering psychological counseling. In Phase III, patients continue risk factor modification and physical activity on their own without cardiac monitoring and are regularly evaluated by their physicians.[16]

Although many studies have demonstrated the benefits of CR,[17–19] adherence to CR by patients with AMI-PCI is still not ideal. Adherence was defined by the WHO as

> the extent to which a person's behavior, such as taking medications, controlling diet, and/or making lifestyle changes, is consistent with the recommendations of a health care provider.[20]

Moreover, patient adherence plays a critical role in clinical care, and improving adherence can reduce healthcare costs while improving the quality of care and patient safety.[21] A study in the USA revealed that despite improved referral rates, only one-third of patients with AMI participated in phase II and III CR.[22] Additionally, a Korean study found that only 17% of patients in 12 regional cardiovascular centers adhered to outpatient CR.[23] Similarly, according to a study in China, the phase II CR adherence rate among patients with AMI was only 7.05%,[24] and another study showed that only 29.96% of patients with AMI participated in phase I CR.[25] Furthermore, research has indicated that nonadherence to CR is more likely among patients with AMI-PCI than among other patients.[26]

However, existing studies have paid less attention to CR adherence in patients with AMI-PCI; therefore, we conducted a scoping review of the existing evidence on CR adherence in patients with AMI-PCI to address this critical knowledge gap. Our study aimed to provide a comprehensive understanding of the specifics of CR adherence among patients with AMI-PCI and help healthcare professionals develop appropriate strategies to improve patient awareness and adherence to cardiac rehabilitation, thereby improving patient health outcomes.

Material and Methods

This study was a scoping review, which is a flexible methodological approach for exploring new and rapidly evolving issues.[27] The goal was to synthesize research in this area by mapping or elucidating critical concepts from various sources, including research findings, and expert opinion.[27] The review protocol was registered in the "open science framework", and the registration DOI is 10.17605/OSF.IO/CUHXD. Moreover, this scoping review was developed using the framework proposed by the Joanna Briggs Institute (JBI)[28] and is reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guidelines (Supplementary Table 1).[29]

Review Questions

This review seeks to address the following questions: What is the current status of CR adherence among patients with AMI-PCI? What are the factors affecting adherence to CR in patients with AMI-PCI? We will also review the impact of CR on the health outcomes of patients with AMI-PCI and existing coping strategies.

The research questions were formulated according to the PCC (Population, Concept, and Context) principles of the JBI evidence synthesis manual.[28] The present study considered only articles published in the English language between the establishment of the database and February 2024.

Inclusion Criteria

Participants

The participants of this review were adults aged 18 years and older. Studies in which the age was less than 18 years were excluded. Furthermore, patients diagnosed with AMI, including those with ST-segment elevation myocardial infarction (STEMI) and non-ST-segment elevation myocardial infarction (NSTEMI), who underwent PCI were included in the analysis, and studies that included other modes of revascularization were excluded.

Concept

Adherence is a widely used concept in healthcare systems. The WHO defines adherence as

> the extent to which a person's behavior, such as taking medications, controlling diet, and/or making lifestyle changes, is consistent with the recommendations of a health care provider.[20]

Context

Any place (eg, hospital or community) where CR can be offered to patients. There were no geographical limitations to the context.

Types of Evidence Sources

In accordance with the research question, the following types of studies were considered for inclusion: qualitative studies (including focus group discussions and qualitative interviews), primary quantitative studies (both observational and experimental studies), and mixed-methods studies. Published research protocols, comments on articles, reviews, conference abstracts, and dissertations were excluded from the study. Additionally, gray literature was excluded because they have a lower methodological quality than peer-reviewed published studies.[30]

Search Strategy

In this review, a three-step approach was used to identify the relevant published studies. First, the researchers carried out a preliminary search in MEDLINE (PubMed) and Web of Science and analyzed the subject words or keywords in the headings and summaries of the retrieved articles. Second, after consultation with the subject librarian, a MEDLINE (PubMed) search strategy was developed based on the recommendations of the initial search. The detailed PubMed search procedure is shown in Table 1. The strategy includes all identified keywords and index terms connected with the Boolean terms "AND" and "OR." Simultaneously, the sources of information for each inclusion were adjusted. The databases that were ultimately searched for relevant literature included PubMed, CINAHL, Web of Science, EMBASE,

Table 1 Search Strategy for PubMed Electronic Databases

Date	Search Strategy
03/2024	**Search**: (((**Percutaneous coronary intervention) AND (Myocardial infarction)) AND (cardiac rehabilitation)) AND (((((adher*) OR (participat*)) OR (attend*)) OR (persist*)) OR (complet*))** ("percutaneous coronary intervention" [MeSH Terms] OR ("percutaneous" [All Fields] AND "coronary" [All Fields] AND "intervention" [All Fields]) OR "percutaneous coronary intervention" [All Fields]) AND ("myocardial infarction" [MeSH Terms] OR ("myocardial" [All Fields] AND "infarction" [All Fields]) OR "myocardial infarction" [All Fields]) AND ("cardiac rehabilitation" [MeSH Terms] OR ("cardiac" [All Fields] AND "rehabilitation" [All Fields]) OR "cardiac rehabilitation" [All Fields]) AND ("adher*" [All Fields] OR "participat*" [All Fields] OR "attend*" [All Fields] OR "persist*" [All Fields] OR "complet*" [All Fields])

Ovid, and Scopus. Third, the reference lists of the finally selected studies were screened for other eligible studies. The EndNote reference manager was used to sort and screen the related articles.

Study Selection

Following electronic database searches, all identified articles were imported into EndNote, and duplicate articles were deleted. Two researchers independently assessed the headings and abstracts of all identified articles to determine eligibility for inclusion and classified the literature into "inclusion" and "exclusion" categories. Finally, the articles in the "inclusion" category were subjected to a full text search and evaluation. We attempted to contact the authors by Email for the full-length articles where the full text was unavailable. Full-text articles that did not reach the inclusion criteria were also excluded, and reviewers were asked to state the specific reasons for the exclusion in a pre-designed Excel spreadsheet. In addition, we trained screeners before the formal start of article screening, and screeners independently prescreened five articles after training to ensure the reliability of screening. If the two screeners could not reach a consensus during the study screening process, the issue was addressed at a meeting or by a third evaluator. The PRISMA flow chart was used to report the article selection process.[31]

Data Extraction

Data was extracted through a proprietary data extraction tool designed by the research team, which included details of (1) the study characteristics, including the name of the first author, year of publication, country/region of study, and purpose of study; (2) research methods, including the study design, study participants, and sample size; and (3) outcomes measured, such as the identified influencing factors and the adherence status. The data extraction tool underwent independent testing by two reviewers on the first five articles from each source of evidence to ensure consistency.[32] Disagreements between extractors were resolved by consultation or a third extractor. The data extraction tool could be modified during the process if necessary.

Data Analysis and Presentation

The outcomes of this review were presented in the form of a narrative summary, and the characteristics of the different studies and their significant findings were summarized in tables. The narrative summaries and tables discussed the scoping review results and their relevance to the main research questions and objectives. Based on the research questions and data analysis, we identified and classified the prevalence and influencing factors of CR adherence in the patients with AMI-PCI, as well as the effect of CR programs on the prognosis of patients with AMI-PCI patients and the effect of existing intervention strategies. Gaps identified in the literature were fully acknowledged, and suggested future directions were fully summarized.

Quality Appraisal

Scoping reviews do not require evaluating the quality of the selected articles.[28] However, to improve the reliability of the evaluation and reflect the quality of the included studies, we have done the following: After the full-text screening, the methodological quality of the included articles was evaluated using several JBI critical appraisal checklists and the

Mixed Studies Assessment Tool. These included (1) the JBI quality assessment tool for observational studies (including cohort studies, case-control studies, and cross-sectional studies);[33] and (2) the JBI critical assessment tool for experimental research for randomized controlled trials (RCTS) and quasi-experimental studies.[34,35] Two evaluators independently assessed the included literature to prevent bias. Disagreements were resolved through a discussion or a third assessor.

Results

Results of the Literature Screening

A total of 1650 articles were obtained following the search. Nine hundred and ninety-two duplicates were deleted, and 631 articles were excluded following the screening of titles and abstracts based on the inclusion criteria, including the study population, language, and other relevant factors. Twenty-seven more articles were excluded for four reasons. These included inconsistency in the study population (n = 12), being conference abstracts (n = 2), abstracts with titles in English with non-English full texts (n = 2), and failing to pass the JBI quality assessment (n = 1). Thus, 10 studies were finally included. The detailed screening process is depicted in Figure 1.

Characteristics of the Included Literature

A total of ten papers were included in this scoping review, and the characteristics of the studies are detailed in Table 2. The studies were conducted in six countries, including the Netherlands (n = 1), Australia (n = 1), China (n = 4), South Korea (n = 2), Egypt (n = 1), and Japan (n = 1). Four, four, and two studies were cohort studies, randomized controlled trials, and quasi-experimental studies, respectively. All the studies included patients with AMI-PCI. However, some study participants were only included if they had STEMI; some were patients who underwent PCI for the first time, and others were patients with STEMI after primary percutaneous coronary intervention (PPCI).

Quality Assessment of the Included Studies

This review employed the JBI assessment tool to evaluate the quality of each of the included studies. Following this assessment, one study with a JBI score of < 70% was excluded. The remaining information is presented in Table 2.

Current Status of CR Adherence in Patients with AMI-PCI

Among the included studies, three addressed CR adherence in patients with AMI-PCI. One study[36] found that although 96% of patients undergoing PPCI for STEMI were referred for CR prior to discharge, only 36% of them participated in CR after four weeks, and only 1% participated in nine to fourteen CR sessions. Conversely, approximately half of the patients participated in CR sessions at the six-month follow-up. Another study[37] indicated that 39% of patients participated in the CR program following an AMI and PPCI. Despite a higher completion rate (80%), the proportion of patients with AMI after PPCI who completed the CR program was approximately 31%. Furthermore, Lee[17] discovered that only 30% of 254 patients with STEMI participated in a CR program that included exercise training. In conclusion, adherence to CR among patients with AMI-PCI remains poor.

Factors Influencing CR Adherence in Patients with AMI-PCI

In all analytical studies, six variables that influenced CR adherence in patients with AMI-PCI were identified.[36,37] These included (1) demographic factors such as age, sex, socioeconomic status, and employment status. Advanced age significantly influenced CR adherence. This may be attributed to the lower anticipated benefit of participating in CR programs in older patients and the fact that older adults are more likely to have comorbidities and other systemic diseases that limit CR participation.[38] In terms of sex, women were less likely to participate in CR than men. The reasons for this may be multifaceted and may be because women are less likely to be transported or that physicians' judgements of women's benefit from CR are biased, leading to reduced female participation in CR.[39] Furthermore, patients with a lower socioeconomic status were less likely to participate in CR. This may be due to a lack of awareness about the advantages of CR among such patients.[40] Similarly, employment status is a significant factor that influences CR adherence. This may

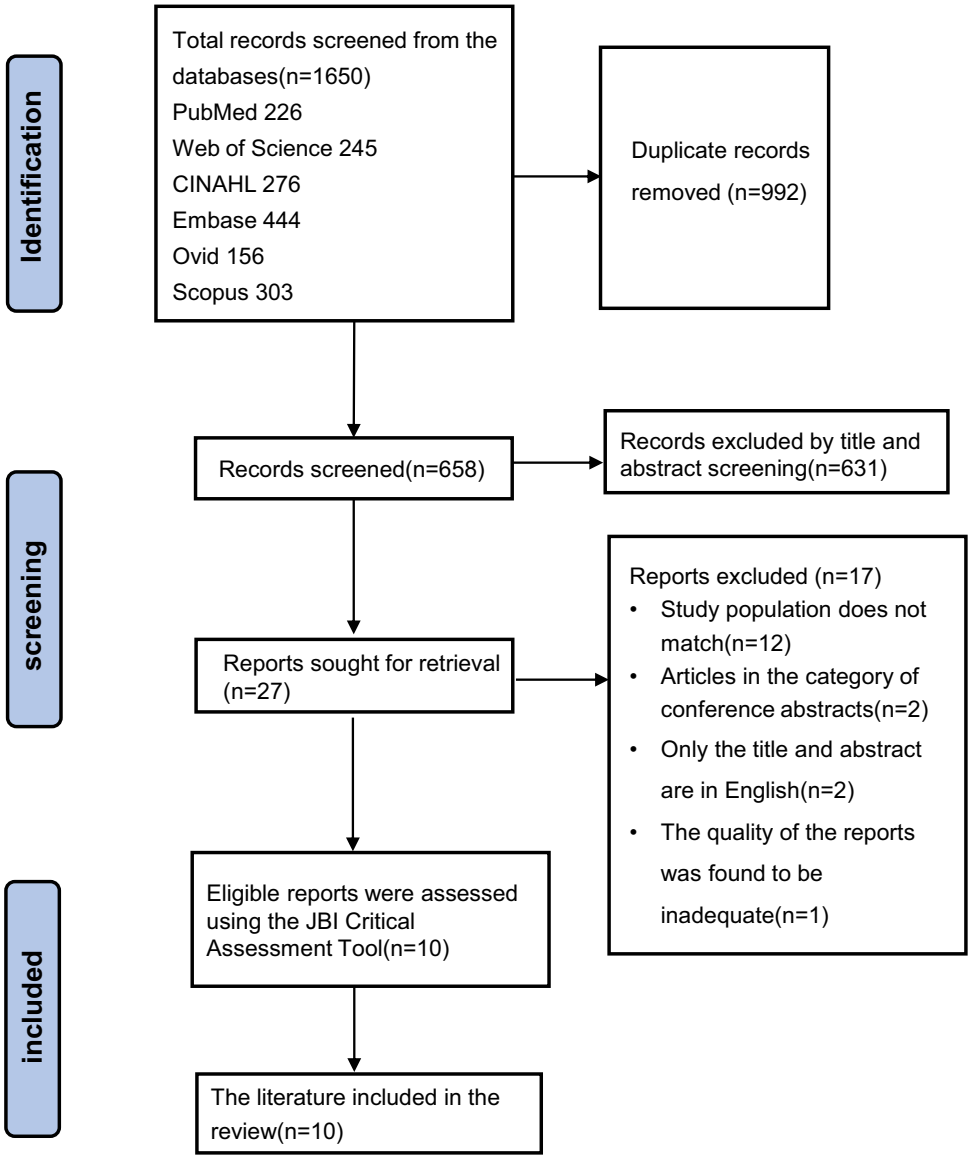

Figure 1 The literature screening process and results.

be because the advantages of participating in CR are not fully appreciated by patients when considering unemployment or a delayed return to work following PCI.[36] (2) Disease-related factors: A study demonstrated that patients with a first diagnosis of STEMI are approximately two and a half times more likely to participate in CR than patients with NSTEMI.[36] (3) Other factors: Other factors that influence CR participation include receipt of a post-discharge health visit. A post-discharge health visit was a significant predictor of CR in patients with AMI-PCI, indicating that healthcare professionals should prioritize discharge support to facilitate patients' physical recovery following an acute cardiac event.[36]

Impact of CR on Patients with AMI-PCI on Health Outcomes

Six studies investigated the impact of CR on health outcomes in patients with AMI-PCI. 1) The impact of CR on the reduction of adverse complications associated with readmission: A study of patients with AMI-PCI enrolled in a nosocomial CR program demonstrated a 20% reduction in the risk of re-vascularization, a 15% reduction in the risk of all-cause readmission, and a 19% reduction in the risk of heart-related readmission.[19] Another study demonstrated that patients with AMI-PCI who underwent CR exhibited a lower incidence of MACEs, including mortality, myocardial

Table 2 Detailed Description of the Included Studies

Authors	Date	Country	Type of Study	Study Participants	Purpose	Sample Size	Outcomes Measured	JBI
Natsuko et al[19]	2020	Japan	Retrospective cohort study	Patients with AMI who underwent PCI	To verify the associations between participation in an in-hospital CR program and clinical outcomes among patients with AMI after PCI	13,697	The relationship between early in-hospital CR and clinical outcomes in patients with AMI after PCI	9/11
Kanazawa et al[37]	2017	Netherlands	Retrospective cohort study	Patients with AMI treated with PPCI	To identify the factors associated with CR participation and CR completion in patients with AMI/PPCI	3871	The CR participation rate, the CR completion rate, and the associated risk factors in patients with AMI/PPCI	8/11
Soon Yeng et al[36]	2016	Australia	Prospective cohort study	Patients with STEMI who underwent PPCI	To investigate the predictors of CR attendance after PPCI in patients with STEMI	268	The CR participation rate and its related predictors	10/11
Ma et al[41]	2021	China	Prospective cohort study	Patients with STEMI who underwent PPCI	To investigate the relationship between CR and MACEs in patients with STEMI after PCI	473	CR is a beneficial option to reduce MACEs in patients with STEMI who underwent PPCI.	10/11
Kamel et al[45]	2021	Egypt	RCT	Patients with STEMI who underwent PPCI	To evaluate the role of telemedicine during short-term medical follow-up after the discharge of patients who underwent primary PCI for AMI	200	Telemedicine can benefit patients with STEMI during short-term regular care after primary PCI.	11/13
Xu et al[44]	2016	China	RCT	Patients with STEMI after PCI	To assess the efficacy of an early, short-term CR program in improving the global and segmental myocardial function of patients with AMI after PCI	52	An early, home-based CR program can significantly improve the left ventricular function of patients with AMI within a short period of time.	12/13
Zhang et al[12]	2018	China	RCT	Patients with STEMI patients after PCI	To explore exercise rehabilitation program's safety, effectiveness, and feasibility and to establish a simple and operable technology	130	In this study, the exercise rehabilitation program was safe and effective, and its applicability in the community was highly feasible.	10/13
Li et al[46]	2023	China	RCT	Patients with AMI after PCI	To verify if using 5G information transmission technology and internet of things technology can better improve the prognosis of patients	60	During CR, the use of ultra-low latency 5G technology combined with wearable smart devices improved patient outcomes.	11/13
Kim et al[43]	2011	Korea	Quasi-experimental study	Patients with AMI after PCI	To investigate the effects of a regular cardiac rehabilitation program that began from the 14th day (mean) after AMI onset on myocardial remodeling by reviewing the echocardiography results	34	The implementation of an early regular cardiac rehabilitation program after AMI may be relatively safe.	8/9
Lee et al[17]	2019	Korea	Quasi-experimental study	Patients with STEMI after PPCI	To evaluate whether exercise-based CR improves MACEs in patients with STEMI undergoing primary PCI and to find subsets of patients that would benefit the most from exercise-based CR	254	CR that included exercise training was associated with fewer MACEs.	8/9

Abbreviations: AMI, acute myocardial infarction; PCI, percutaneous coronary intervention; CR, cardiac rehabilitation; STEMI, ST elevation myocardial infarction; PPCI, primary percutaneous coronary intervention; RCT, randomized controlled trial; MACEs, major adverse cardiovascular events.

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infarction, and revascularization, than those who did not undergo CR. This was particularly evident in patients with low preoperative thrombolysis in myocardial infarction (TIMI) flow.[17] A similar conclusion was reached in another study, which demonstrated that CR could significantly reduce N-terminal pro-B-type natriuretic peptide (NT-proBNP) levels and significantly improve the 6-minute walking distance (6-MWD) and left ventricular ejection fraction (LVEF), thereby reducing the occurrence of MACEs in patients with STEMI after PCI.[41] 2) The effect of CR on cardiac function: In a study of patients who underwent echocardiography at the onset of AMI and six months later, the LVEF increased at six weeks and six months in patients with AMI-PCI who underwent CR compared with those who did not undergo CR (the LVEF is the most commonly used clinical measure to assess cardiac function[42]). Other parameters, including the stroke volume (SV), left ventricular end-diastolic diameter (LVEDD), and left ventricular end-systolic diameter (LVESD), remained unchanged. This suggests that the CR program has no adverse effect on myocardial function in these patients.[43] Some scholars have evaluated the impact of an early home-based CR program on myocardial function in patients with AMI-PCI. The results demonstrated that the CR program can significantly enhance left ventricular function in patients with AMI-PCI within a relatively short time frame (the difference in LVEF between the intervention and control groups was statistically significant).[44] Furthermore, another study demonstrated that CR can enhance the LVEF and facilitate a New York Heart Association (NYHA) functional class improvement from below class III to class II in most patients. Therefore, CR is safe and has a positive effect in patients with AMI-PCI.[12]

Intervention Methods for CR Adherence in Patients with AMI-PCI

Remote CR Combined with the Internet

A study employed videoconferencing teleconsultation to deliver educational content to patients with AMI-PCI and reinforce the fundamentals of CR.[45] Additionally, patients were encouraged to adhere to healthy lifestyle measures, with a particular focus on smoking cessation, exercise, and healthy diets for smokers. Although there was no significant difference in the incidence of MACEs between the two groups within four months of discharge, there were improvements in medication adherence (83.7% vs 60%) and CR adherence (62% vs 29%). Furthermore, 87% of patients expressed satisfaction with the telemedicine approach.[45] Another study reported an intervention based on 5G internet monitoring in which patients were managed remotely using a wearable smart device and a 5G CR smart platform on the basis of an exercise protocol.[46] Patients used wearable devices to monitor their vital signs and uploaded the data to the application. Rehabilitation therapists could modify the exercise training mode, intensity, and duration for patients based on the fluctuations in vital signs during exercise, thus enabling the delivery of personalized rehabilitation. The results demonstrated that the overall rehabilitation adherence rate of the intervention group (80.8%) was significantly higher than that of the control group (29.2%). Additionally, improvements were observed in various physiological indicators, including high-density lipoprotein cholesterol (HDL-C) levels and body mass index (BMI). Furthermore, reductions in depression and anxiety were noted.[46]

Discussion

Attention Should Be Paid to High-Risk Groups and Early Identification to Promote CR Uptake

The findings of this review indicate that although CR offers numerous benefits, including a reduction in cardiovascular risk and an improvement in patients' quality of life, adherence to CR by patients with AMI-PCI remains low. Adherence to CR in patients with AMI-PCI is influenced by a multitude of factors. Age and sex are the most commonly reported factors that influence CR adherence in patients with AMI-PCI. As individuals age, the prevalence of cardiovascular disease tends to increase. Concurrently, the long-term effects of risk factors for cardiovascular disease, such as hypertension, hypercholesterolemia, and hyperglycemia, render older adults even more susceptible to cardiovascular disease.[47] However, older adults frequently present with multimorbidity, frailty, cognitive impairment, and other conditions that make adherence to CR difficult. It has been postulated that physicians may be less inclined to refer older patients with multiple comorbidities for CR because these patients are perceived to have a shorter life expectancy and are less likely to benefit from or meaningfully participate in CR. This may also be related to older

people's physical conditions, which may limit physical activity or movement.[48] Second, sex differences in CR adherence should not be overlooked, as men tend to have a higher prevalence of AMI than women, but female patients are less likely to adhere to CR than men. This may also be related to women's lack of time because they have greater caring responsibilities.[49] Therefore, on the one hand, it is essential to increase the knowledge of healthcare professionals to enable to them identify patients with the above risk factors in advance and promote adherence to CR programs while improving referral rates, long-term follow-up, and targeted interventions. On the other hand, it is essential to focus on health education for these patients and their caregivers using strategies such as organizing lectures to emphasize the importance and benefits of adherence to CR, mobilize caregiver support, and encourage patients' adherence to CR.

Intervention Strategies for CR Adherence in Patients with AMI-PCI Need to Be Developed

First, more intervention studies for CR adherence in patients with AMI-PCI are currently required, and problems such as single-center management and insufficient follow-up time persist. With the development of the internet, intervention studies at this stage have primarily focused on out-of-hospital, remote interventions for CR adherence in patients with AMI-PCI using mobile devices. However, there are specific barriers to the use of mobile devices by the elderly. Older adults are slower than the younger generation to accept new technologies,[50] therefore, the application of telemedicine for intervention in this group of patients is still a significant challenge. In addition, some studies have shown that the use of the AMI managed care model improved CR adherence in patients with AMI, suggesting that a variety of interventions could be used to improve CR adherence in patients with AMI-PCI in the future. Second, in-hospital interventions to improve CR adherence in these patients are still needed. If in-hospital interventions are implemented in the future, multi-center study protocols and larger sample sizes could be used to improve the reliability of the results.

Types of Study Design for CR Adherence in Patients with AMI After PCI Needs Enrichment

From the results of the review, most of the existing studies investigating the prognostic impact of CR in patients with AMI-PCI lack correlation and causation analyses for CR adherence. In addition, the statistical analysis methods of existing studies are relatively uniform. CR is a long-term process, but there are no longitudinal, in-depth exploration studies on the trajectory of changes in patients' adherence to CR and the differences in influencing factors. There are also fewer existing intervention studies aimed at improving CR adherence in patients with AMI-PCI, which is particularly important given the benefits of CR in patients with AMI-PCI. In the future, we should improve the study designs for investigating CR adherence in patients with AMI-PCI by combining theoretical models and factors influencing CR adherence in this population and additionally performing longitudinal studies, qualitative studies, and studies with other designs. Appropriate assessment tools can also be constructed according to the connotation of CR, or qualitative interviews could be performed to understand the factors that influence CR adherence in these patients. Furthermore, appropriate targeted interventional studies can be conducted to fill the gaps in existing relevant studies and enrich the study content.

Limitations

We only included studies published in English; there may be many other potential studies that were published in other languages. Furthermore, gray literature was not included in the literature search. Therefore, potential gray literature may have been missed.

Conclusion

CR can reduce the incidence of complications and improve cardiac function. However, the rate of adherence to CR by patients with AMI-PCI is generally low and is influenced by various factors, such as age, sex, and employment status,

suggesting that healthcare professionals should pay attention and focus on high-risk groups. In addition, there are relatively few studies on CR adherence in patients with AMI-PCI; therefore, measurement tools and different types of studies should be designed, and we should conduct appropriate diverse preventive and interventional studies to fill the research gaps to promote CR adherence and meet the health care needs of patients with AMI-PCI.

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Disclosure

The authors report no competing interests in this research.

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