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Benefits of Cardiac Rehabilitation After Myocardial Infarction: A Literature Review

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Abstract. *Cardiac rehabilitation is an essential component of secondary prevention after myocardial infarction, providing multidimensional benefits beyond pharmacological therapy and coronary revascularization. This literature review aims to examine the clinical, functional, psychological, and preventive benefits of cardiac rehabilitation in patients after myocardial infarction. This study employed a narrative literature review design using secondary data from scientific articles obtained through databases such as PubMed, Google Scholar, ScienceDirect, SpringerLink, Elsevier, and other reputable journal sources. Articles were selected based on their relevance to post myocardial infarction cardiac rehabilitation, including outcomes related to cardiac function, left ventricular ejection fraction, exercise capacity, recurrent cardiovascular events, hospitalization, mortality, quality of life, and rehabilitation delivery models. A total of 15 scientific articles met the inclusion criteria and were analyzed in this review. The findings indicate that cardiac rehabilitation after myocardial infarction improves left ventricular function, exercise capacity, and health related quality of life. It also contributes to reducing major adverse cardiovascular events, recurrent myocardial infarction, rehospitalization, and long-term cardiovascular mortality. Home based cardiac rehabilitation, tele rehabilitation, and mobile health-based rehabilitation were found to have comparable effectiveness to conventional center based rehabilitation, particularly in improving access, adherence, and continuity of care. The review also highlights the importance of early initiation, patient adherence, gender sensitive approaches, and program standardization to optimize rehabilitation outcomes. In conclusion, cardiac rehabilitation should be recognized as an integral and evidence-based strategy in the comprehensive management of post myocardial infarction patients. Its implementation should be expanded through flexible, accessible, and patient centered models to improve long term cardiovascular outcomes.*

Keywords: *Cardiac Rehabilitation, Myocardial Infarction, Secondary Prevention, Exercise Capacity, Quality Of Life, Tele Rehabilitation*

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INTRODUCTION

Acute myocardial infarction (AMI) is one of the primary manifestations of coronary heart disease and remains a leading cause of cardiovascular death and disability worldwide (Gonzalez-Ramirez et al., 2022; Zhakhina et al., 2023). Despite significant advances in early reperfusion strategies, antithrombotic therapy, and guideline-based pharmacotherapy optimization, the incidence of long-term complications and recurrent cardiovascular events after myocardial infarction remains high (Pedretti et al., 2026; Rout et al., 2020; Reddy et al., 2015; Mehta et al., 2016; Teringova et al., 2026; Levine et al., 2022). Post-AMI patients often experience reduced

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functional capacity, left ventricular dysfunction, impaired quality of life, and psychosocial challenges, contributing to a less than optimal long-term prognosis (Zhou et al., 2025; Anderson & Taylor, 2014)

The post-AMI phase is a critical period that determines long-term clinical outcomes. During this phase, treatment approaches focused solely on pharmacological therapy have proven inadequate to address the complexity of patients' clinical, functional, and behavioral problems. Therefore, cardiac rehabilitation is widely recommended by various international guidelines as an integral part of secondary prevention after myocardial infarction (Visseren et al., 2021; Ades et al., 2017).

Cardiac rehabilitation is defined as a comprehensive, multidisciplinary care program that includes structured physical exercise, patient education, lifestyle modification, cardiovascular risk factor management, and psychosocial support (Brown et al., 2024; Ambrosetti et al., 2021; Balady et al., 2011; Piepoli et al., 2010). The primary goals of cardiac rehabilitation are to restore functional capacity, improve quality of life, reduce cardiovascular mortality and morbidity, and prevent recurrent cardiovascular events (Zhou et al., 202; Visseren et al., 2021).

Scientific evidence from large cohort studies, randomized controlled trials, and meta-analyses over the past decade consistently demonstrates that participation in post-AMI cardiac rehabilitation programs is associated with significant reductions in total mortality and cardiovascular mortality. Recent meta-analyses report that patients who participate in cardiac rehabilitation have a 20–30% lower risk of death compared to patients who do not participate in rehabilitation programs, even after adjustment to optimal pharmacological therapy (Aleksova et al., 2025; Ades et al., 2017).

In recent years, innovations in cardiac rehabilitation models have emerged to address low patient participation rates. Home-based cardiac rehabilitation approaches, hybrid programs, and digital technology-based tele-rehabilitation have demonstrated comparable effectiveness to center-based rehabilitation in improving functional capacity, quality of life, and therapy adherence (Lee et al., 2023; Taylor et al., 2022; Zampolini et al., 2024). These models have the potential to expand access to cardiac rehabilitation without compromising its clinical benefits, particularly in populations with geographic or mobility limitations (Ades et al., 2017; Rawstorn et al., 2016).

Thus, post-myocardial infarction cardiac rehabilitation is an evidence-based intervention that provides multidimensional clinical benefits, encompassing mortality, cardiac function, functional capacity, quality of life, and secondary prevention. However, despite its strong evidence of benefits, implementation and participation rates in cardiac rehabilitation remain suboptimal in many countries. Therefore, a comprehensive literature review on the benefits of post-myocardial infarction cardiac rehabilitation is essential to strengthen the scientific basis, raise clinician awareness, and encourage broader and more sustainable implementation of cardiac rehabilitation programs.

METHODS

Type of Research

This study was a literature review using a narrative review design. The aim was to identify and summarize previously published articles that were accredited/indexed in syntactic sources such as Google Scholar, PubMed/NCBI, and MDPI/Frontiers/Elsevier.

Reference Criteria

The data used in this study was secondary data, obtained from scientific publications in the form of research articles (original research), review articles, and textbooks discussing the benefits of cardiac rehabilitation after myocardial infarction. Priority was given to nationally and internationally indexed journals. In accordance with the Decree of the Dean of the Faculty of Medicine, UMI No. 613/H.23/FK-UMI/VI/2020, this study utilized a minimum of 20 references

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published within the last three years, calculated from the date of this scientific paper (KTI). If the number of relevant references within the specified timeframe is insufficient, literature published up to a maximum of 10 years is permitted, particularly for basic references in the form of textbooks or conceptual articles that are still scientifically relevant.

Inclusion Criteria

The inclusion criteria for this study included scientific articles or journals discussing cardiac rehabilitation in post-myocardial infarction patients, including aspects of physiological mechanisms, clinical benefits, functional capacity, quality of life, secondary prevention, and short- and long-term outcomes. Included literature included original research articles, randomized controlled clinical trials, cohort studies, meta-analyses, systematic reviews, and narrative review articles relevant to the topic of post-myocardial infarction cardiac rehabilitation. Included articles were scientific publications published within the last 10 years, starting from the year the study was conducted, to ensure the currency and relevance of the scientific evidence used. The literature used must be available in full text and obtained from reputable scientific databases, such as PubMed/NCBI, Google Scholar, the Cochrane Library, and trusted international open-access journal publishers, including MDPI, Frontiers, and open-access journals from Elsevier. The literature search was conducted using keywords relevant to the topic, including "cardiac rehabilitation after myocardial infarction," "exercise-based cardiac rehabilitation," "benefits of cardiac rehabilitation after myocardial infarction," "cardiac rehabilitation and mortality," "cardiac rehabilitation and quality of life," and "home-based or tele-cardiac rehabilitation after myocardial infarction." Furthermore, literature specifically addressing the benefits of cardiac rehabilitation on mortality, recurrent cardiovascular events, exercise capacity, left ventricular function, health-related quality of life, and cardiovascular risk factor control in post-myocardial infarction patients was also included in this review.

Exclusion Criteria

Exclusion criteria for this study included articles that were not fully accessible (non-full text) and publications irrelevant to the topic of cardiac rehabilitation in post-myocardial infarction patients. Articles that solely discussed myocardial infarction or coronary heart disease without linking them to cardiac rehabilitation interventions, or conversely, solely discussed cardiac rehabilitation without a post-myocardial infarction context, were excluded from this review. Furthermore, duplicate articles found in more than one database were excluded from the selection process. Publications in the form of non-scientific reports, opinion pieces, editorials, letters to the editor, conference abstracts without complete data, and publications that had not undergone peer-review were also excluded. Articles that did not match the search keywords or did not provide a clear conceptual or clinical contribution to the discussion of the benefits of cardiac rehabilitation after myocardial infarction, whether in terms of mechanisms, clinical outcomes, functional capacity, or quality of life, were excluded from this study.

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Research Flow

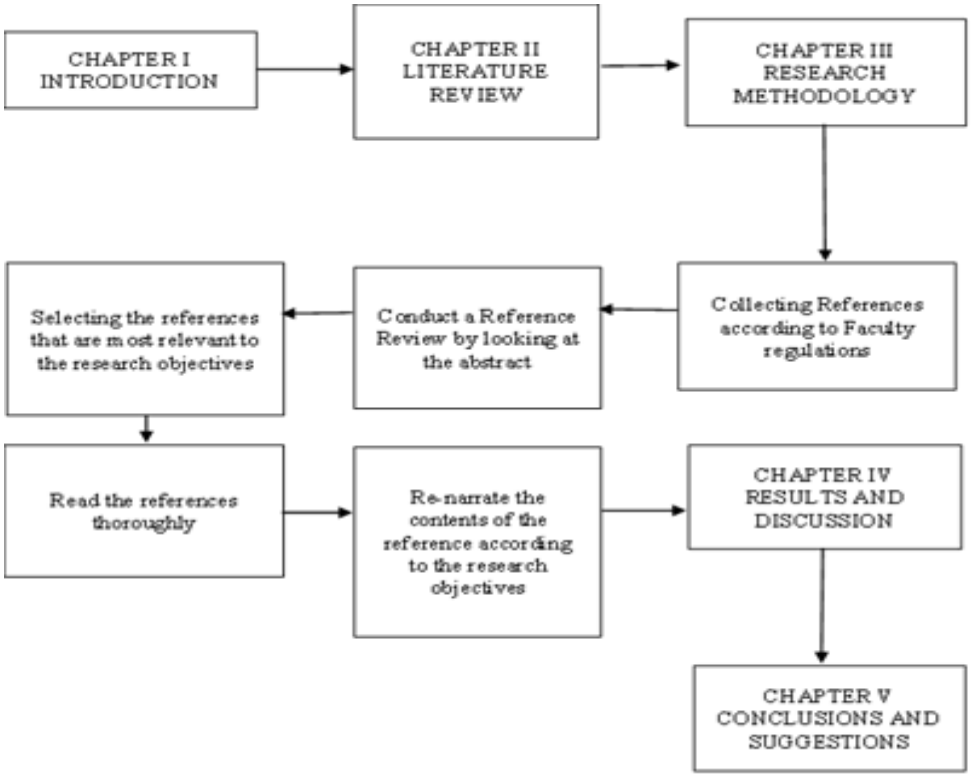

Figure 1. Research Flow

RESULT AND DISCUSSION

Based on a literature search conducted through several scientific databases, including PubMed, ScienceDirect, SpringerLink, ResearchGate, Elsevier, and Google Scholar, using the keywords "cardiac rehabilitation after myocardial infarction," "exercise-based cardiac rehabilitation," "benefits of cardiac rehabilitation after myocardial infarction," "cardiac rehabilitation and mortality," "cardiac rehabilitation and quality of life," and "home-based or tele-cardiac rehabilitation after myocardial infarction," a total of 7,453 relevant scientific articles were retrieved. The screening process was based on the title, abstract, and year of publication. The inclusion criteria were articles discussing cardiac rehabilitation in post-myocardial infarction patients, including aspects such as physiological mechanisms, clinical benefits, functional capacity, quality of life, secondary prevention, and short- and long-term outcomes. Articles that were irrelevant, lacked specific data on cardiac rehabilitation in post-myocardial infarction patients, or were not available in full-text format were excluded from the initial review. After the first screening phase, 243 articles were identified that were relevant to the topic and published within the last 10 years (2015–2025).

These articles were then re-screened based on full-text availability, publication quality (indexed by PubMed, Scopus, or Sinta), and their relevance to the focus of the literature review, namely cardiac rehabilitation in post-myocardial infarction patients. From the subsequent selection of articles obtained during the identification and screening phase, 15 scientific articles were identified that met all inclusion criteria and were deemed most relevant for use in this narrative review. These articles came from various reputable and indexed international journals, including Frontiers in Cardiovascular Medicine, Journal of Clinical Medicine, BMC Sports Science, Medicine and Rehabilitation, European Heart Journal, Cochrane Database of Systematic Reviews, and other international cardiovascular journals with high scientific credibility and full-text access. The fifteen selected articles provide a comprehensive overview of the benefits of cardiac rehabilitation after myocardial infarction, including its impact on reducing cardiovascular mortality and morbidity, reducing recurrent cardiovascular events, improving exercise capacity

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and left ventricular function, improving health-related quality of life, and controlling cardiovascular risk factors. Furthermore, several articles discuss home-based cardiac rehabilitation and tele-rehabilitation models, which have demonstrated comparable effectiveness to center-based rehabilitation.

Journal Filtering Scheme

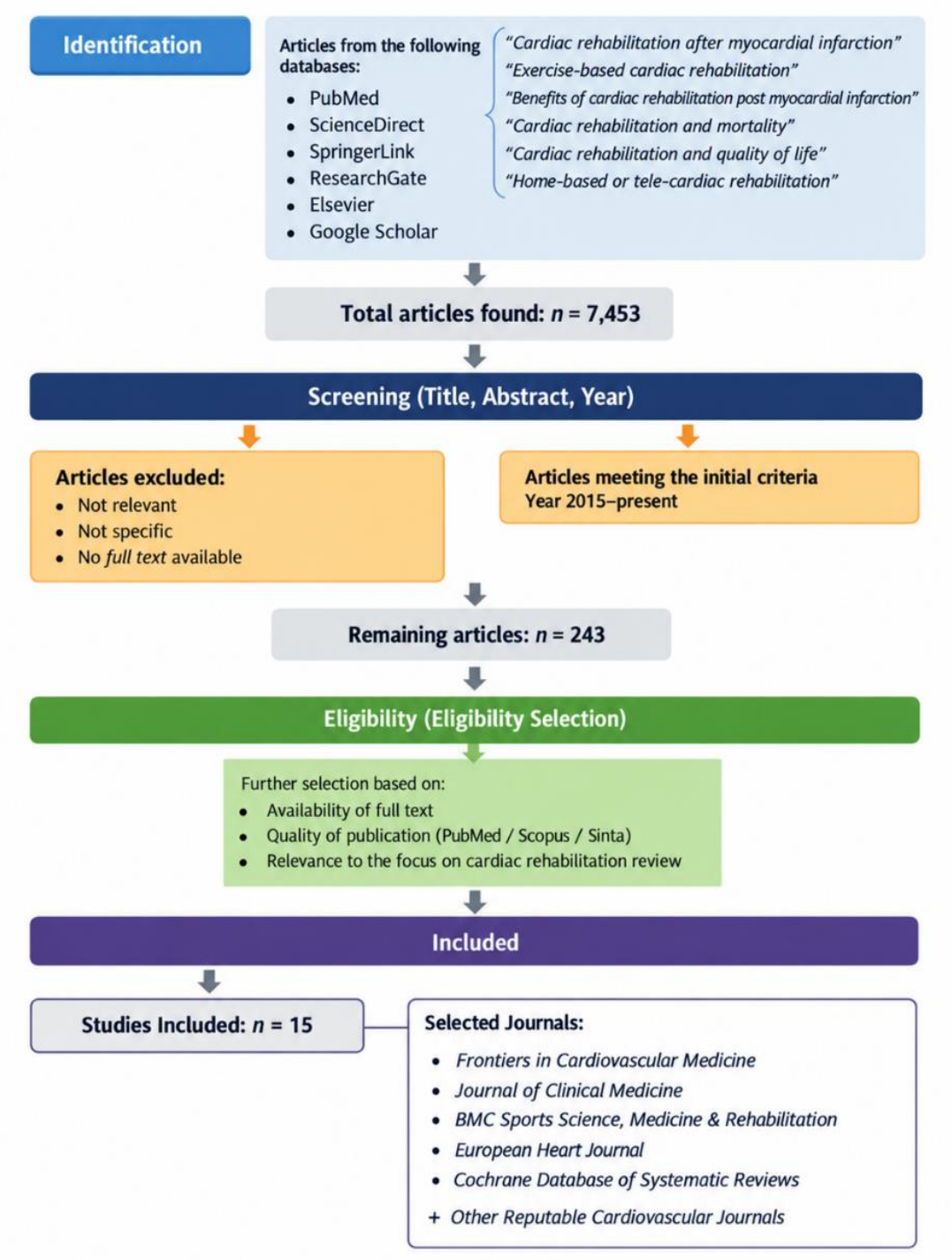

Figure 2. Journal Filtering Scheme

Thus, the collection of literature analyzed in this study is expected to provide a strong and up-to-date scientific basis in understanding the role of cardiac rehabilitation as an integral part of the management and secondary prevention of post-myocardial infarction patients, as well as support the optimal implementation of cardiac rehabilitation in clinical practice.

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Table 1. Scientific Articles

No	Author, Year, Journal	Title	Research methods	Research result
1	Zhou et al., 2025 – Frontiers in Cardiovascular Medicine	Effect of exercise rehabilitation training on cardiac function and quality of life after PCI for acute myocardial infarction	Randomized controlled trial (n=180), AMI patients post PCI, 3 months rehabilitation exercise intervention	Cardiac rehabilitation significantly improved LVEF, 6MWT distance, and quality of life (SF-36), and reduced cardiovascular events compared to standard care.
2	Aleksova et al., 2025 – Journal of Clinical Medicine (MDPI)	Cardiac Rehabilitation After an Acute Myocardial Infarction: Four Phases of the Programme	Narrative review	Multidisciplinary cardiac rehabilitation improves functional capacity, left ventricular function, and reduces morbidity and mortality after myocardial infarction.
3	Shokri et al., 2025 – BMC Sports Science, Medicine and Rehabilitation	Effect of exercise-based cardiac rehabilitation in patients with acute coronary syndrome	Systematic review & meta-analysis (10 RCT)	Exercise-based cardiac rehabilitation reduces the risk of MACE and improves exercise capacity (6MWT), in both center-based and home-based models.
4	Mansilla-Chacón et al., 2021 – Journal of Cardiovascular Development and Disease	Effects of Supervised Cardiac Rehabilitation Programmes on Quality of Life among MI Patients	Systematic review & meta-analysis	Supervised cardiac rehabilitation programs improve health-related quality of life, particularly the physical and emotional domains, in post-MI patients.
5	Rawstorn et al., 2016 – Heart (BMJ)	Telehealth exercise-based cardiac rehabilitation: a systematic review and meta-analysis	Systematic review & meta-analysis RCT	Cardiac tele-rehabilitation is equivalent to conventional rehabilitation in improving exercise capacity and cardiovascular risk factor control.
6	Jolliffe et al., 2001 – Cochrane Database of Systematic Reviews	Exercise-based cardiac rehabilitation for coronary heart disease	Systematic review & meta-analysis (85 RCT)	Cardiac rehabilitation reduces the risk of recurrent infarction, long-term cardiovascular mortality, hospitalizations, and improves quality of life.
7	McDonagh et al., 2008 – Cochrane Database of Systematic Reviews	Home-based versus centre-based cardiac rehabilitation	Systematic review & meta-analysis	Home-based cardiac rehabilitation has equivalent effectiveness to center-based in mortality, exercise capacity, and quality of life.
8	Hiruma et al., 2024 – Circulation Journal	Comprehensive Cardiac Rehabilitation Following Acute Myocardial Infarction Improves Clinical Outcomes	Cohort study (n=610), long-term follow-up	Comprehensive cardiac rehabilitation significantly reduced MACE, regardless of the patient's initial exercise capacity.

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9	Wittboldt et al., 2024 – Physiotherapy Theory and Practice	Exercise-based cardiac rehabilitation after acute myocardial infarction in Sweden	Observational national study	Post-MI cardiac rehabilitation according to European guidelines is cost-effective and efficient, with a high level of compliance with service standards.
10	Aleksova et al., 2025 – Journal of Clinical Medicine (MDPI)	Timing and Gender Differences in Adherence to Cardiac Rehabilitation	Narrative review	Earlier initiation of cardiac rehabilitation improves adherence and clinical outcomes; there are differences in adherence by gender.
11	Hurdus et al., 2020 – Heart (BMJ)	Association of cardiac rehabilitation and health-related quality of life following acute myocardial infarction	National prospective cohort study (EMMACE-3), n = 4,570 AMI patients	Cardiac rehabilitation participation is associated with significant improvements in HRQoL (EQ-5D and EQ-VAS) up to 12 months post-infarction, particularly in physically active patients.
12	Shi et al., 2025 – International Journal of Surgery	Exercise-based cardiac rehabilitation for patients undergoing coronary artery operation: a systematic review and meta-analysis	Systematic review & meta-analysis (25 RCT, n = 4.106)	Rehabilitasi jantung berbasis latihan menurunkan kejadian infark ulang dan rawat inap, serta meningkatkan kualitas hidup (SF-36), tanpa meningkatkan mortalitas
13	Hama et al., 2024 – JACC: Advances	Home-Based Cardiac Rehabilitation Among Attendees During the COVID-19 Pandemic	Retrospective cohort study (HBCR vs CBCR)	Home-based cardiac rehabilitation has equivalent effectiveness to center-based in improving QoL, risk factor control, and clinical outcomes.
14	Susca et al., 2020 – Medicine (Wolters Kluwer)	Impact of cardiac rehabilitation programs on left ventricular remodeling after acute myocardial infarction	Prospective clinical trial protocol study	Early mobilization as part of cardiac rehabilitation has the potential to reduce systemic inflammation and prevent left ventricular remodeling after myocardial infarction.
15	Li et al., 2025 – The Lancet Digital Health	Effectiveness of home-based cardiac rehabilitation interventions delivered via mHealth technologies	Systematic review & meta-analysis (13 RCT)	mHealth-based cardiac rehabilitation improves exercise capacity (6MWT, VO_2 peak) and QoL; effectiveness is equivalent to conventional rehabilitation

The following discussion is based on an analysis of 15 scientific journals that met all inclusion criteria. Based on a common focus, the fifteen journals were grouped into five main categories: (1) improving cardiac function, LVEF, exercise capacity, and preventing left ventricular remodeling; (2) reducing MACE, recurrent infarction, hospitalizations, and cardiovascular mortality; (3) improving health-related quality of life (HRQoL); (4) home-based rehabilitation, telehealth, and mHealth; and (5) program implementation, adherence, timing of initiation, gender differences, and cost-efficiency.

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Improving Cardiac Function, LVEF, Exercise Capacity, and Preventing Left Ventricular Remodeling

Zhou et al. (2025) conducted a randomized controlled trial (RCT) in 180 patients with acute myocardial infarction (AMI) after percutaneous coronary intervention (PCI), who were randomly assigned to cardiac rehabilitation and standard care. After 3 months of intervention, the cardiac rehabilitation group demonstrated a statistically significant increase in left ventricular ejection fraction (LVEF) compared to the control group. Furthermore, the distance covered on the 6-minute walk test (6MWT) increased significantly, quality of life scores based on the SF-36 improved in almost all domains, and major cardiovascular events (MACE) were lower in the rehabilitation group. This study confirms that cardiac rehabilitation programs initiated as early as possible after PCI have measurable structural and functional impacts on the heart (Zhou et al., 2025).

Aleksova et al. (2025a) in a comprehensive narrative review of the four phases of cardiac rehabilitation after AMI outlined that a multidisciplinary approach encompassing structured physical exercise, education, risk factor management, and psychosocial support provides synergistic benefits for improving functional capacity and left ventricular function. This review emphasized the importance of continuity of care from Phase I (inpatient) to Phase III (long-term maintenance) to ensure sustained improvement in cardiac function. Aleksova et al. (2025a) also highlighted that patients who completed the full rehabilitation program experienced greater reductions in morbidity and mortality than those who only partially participated in the program (Aleksova et al., 2025b).

Susca et al. (2020) designed a prospective clinical trial protocol specifically evaluating the impact of early mobilization as a Phase I component of cardiac rehabilitation on preventing left ventricular remodeling after MI. This study protocol measured inflammatory biomarkers (C-reactive protein/CRP, interleukin-6/IL-6) and echocardiographic parameters serially to test the hypothesis that early intervention can inhibit the progression of maladaptive remodeling. Although the protocol had not yet published its final results at the time of writing, its design provides a robust scientific framework for investigating the causal relationship between early rehabilitation and the prevention of left ventricular remodeling (Susca et al., 2020).

The findings of the three journals above can be explained through the theory of cardiovascular adaptation to exercise. Structured and progressive aerobic exercise induces increases in cardiac output, myocardial work efficiency, and skeletal muscle oxidative capacity. Physiologically, this adaptation increases residual myocardial contractility through the Frank-Starling mechanism, whereby a regular increase in preload due to exercise gradually strengthens the contraction of viable cardiomyocytes, thus contributing to an increase in LVEF (Zhou et al., 2025; Aleksova et al., 2025a; Aleksova et al., 2025b).

The link between cardiac rehabilitation and the prevention of left ventricular remodeling can be understood through the theory of neurohormonal modulation (Susca et al., 2020). After myocardial infarction, excessive activation of the renin-angiotensin-aldosterone system (RAAS) and the sympathetic nervous system are the primary triggers of maladaptive ventricular remodeling characterized by dilation, fibrosis, and decreased systolic function. Controlled physical exercise in cardiac rehabilitation has been shown to suppress sympathoadrenal hyperactivity and modulate the RAAS, thereby reducing ventricular wall stress and inhibiting remodeling progression. Heusch (2020) In addition, cardiac rehabilitation has a systemic anti-inflammatory effect by reducing proinflammatory cytokines such as IL-6 and TNF-α. Early mobilization can inhibit post-infarction inflammation and remodeling (Libby, 2021; Susca et al., 2020).

Overall, the three journals in this group provide consistent and complementary evidence that cardiac rehabilitation, whether initiated early in the inpatient phase or continued comprehensively into the maintenance phase, provides significant benefits on cardiac function, LVEF, exercise capacity, and prevention of left ventricular remodeling after myocardial infarction.

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Reduction in MACE, Recurrent Infarction, Hospitalizations, and Cardiovascular Mortality

Shokri et al. (2025) published a systematic review and meta-analysis that included 10 randomized controlled trials evaluating the effectiveness of exercise-based cardiac rehabilitation in patients with acute coronary syndrome (ACS). Pooled analysis results showed that exercise-based cardiac rehabilitation significantly reduced the risk of MACE and increased exercise capacity as measured by the 6MWT. Interestingly, these benefits did not differ significantly between center-based cardiac rehabilitation (CBCR) and home-based cardiac rehabilitation (HBCR) models, suggesting that the physical exercise component itself, rather than the location of implementation, is the primary determinant of cardiovascular risk reduction (Shokri et al., 2025).

Jolliffe et al. (2001) published the largest Cochrane meta-analysis in the field of cardiac rehabilitation, analyzing 85 randomized controlled trials with a total of over 23,000 participants with coronary heart disease. This meta-analysis reported that exercise-based cardiac rehabilitation significantly reduced the risk of recurrent myocardial infarction, cardiovascular mortality at long-term follow-up (over 12 months), and recurrent hospitalizations. No evidence of an increased risk of serious events was found during the cardiac rehabilitation program. This represents one of the strongest lines of evidence supporting the role of cardiac rehabilitation as a critical component of secondary prevention of coronary heart disease (Jolliffe et al., 2001).

Hiruma et al. (2024) conducted a long-term cohort study of 610 patients with AMI classified by initial exercise capacity using exercise testing. The study's key finding was that comprehensive cardiac rehabilitation significantly reduced MACE in all subgroups, including patients with low initial exercise capacity. This is highly clinically relevant, as there have been concerns that patients with severe deconditioning or low functional capacity may not derive the same benefits from cardiac rehabilitation. Hiruma et al.'s (2024) study decisively refutes these concerns.

Shi et al. (2025) conducted a systematic review and meta-analysis of 25 RCTs involving a total of 4,106 patients undergoing coronary artery surgery, including coronary artery bypass grafting (CABG) and PCI. The analysis showed that exercise-based cardiac rehabilitation significantly reduced the incidence of recurrent myocardial infarction and rehospitalization, and improved patients' quality of life. Unlike the three previous studies, Shi et al. (2025) did not find a statistically significant reduction in total mortality in the post-complete revascularization population. These findings are not contradictory, but rather reflect that in populations undergoing optimal revascularization, the baseline mortality risk is already very low, making the benefits of rehabilitation more pronounced in the endpoints of re-infarction, hospitalization, and quality of life.

The reductions in MACE and cardiovascular mortality reported by Shokri et al. (2025), Jolliffe et al. (2001), and Hiruma et al. (2024) can be understood through several integrated theoretical mechanisms. First, cardiac rehabilitation is an evidence-based secondary prevention intervention that works through increasing aerobic capacity, controlling risk factors (hypertension, dyslipidemia, diabetes, obesity), and behavioral modification. Any increase in aerobic capacity directly correlates with a reduced risk of cardiovascular mortality, as higher cardiorespiratory fitness reflects a more efficient and resilient cardiovascular system (Visseren et al., 2021).

Second, the anti-arrhythmic mechanism of physical exercise is an important theoretical explanation for the reduction in cardiovascular mortality. After myocardial infarction, a sympatho-vagal imbalance with a predominance of sympathetic activity increases the risk of fatal ventricular arrhythmias. Cardiac rehabilitation improves heart rate variability (HRV) as a reflection of increased vagal tone and decreased sympathetic hyperactivity, thereby reducing the predisposition to arrhythmias and sudden death (Heusch, 2020). This mechanism provides the theoretical foundation for explaining why even patients with low initial exercise capacity, as

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studied by Hiruma et al. (2024), still benefit significantly from rehabilitation, as improvements in autonomic balance can occur even at low exercise intensities.

Third, the finding of Shi et al. (2025) that did not show a significant reduction in mortality in the post-revascularization population can be theoretically explained through the concept of a "floor effect" in cardiovascular epidemiology. In patients who have undergone complete coronary revascularization with optimal pharmacological therapy, the initial risk of mortality is already very low, so individual studies with limited follow-up have insufficient statistical power to detect a significant reduction in mortality. In contrast, the benefits of rehabilitation in reducing re-infarction and hospitalization, which are more frequent events, remain clearly detectable.

Improved Health-Related Quality of Life

Mansilla-Chacón et al. (2021) conducted a systematic review and meta-analysis specifically focusing on the impact of supervised cardiac rehabilitation programs on HRQoL in patients after myocardial infarction. Across all the studies analyzed, the meta-analysis results showed significant improvements in the physical and emotional domains of quality of life after participating in professionally supervised cardiac rehabilitation programs. Supervised programs provide the additional benefit of psychological safety for patients during exercise, which contributes to increased motivation and self-confidence (Livsey & Lewis, 2018; Nielsen et al., 2022; Gauthier et al., 2020; Firth et al., 2016; Billany et al., 2022). This study confirms that supervision not only ensures exercise safety but is also a therapeutic component in itself that impacts HRQoL.

Hurdus et al. (2020) published the results of the EMMACE-3 national prospective cohort study involving 4,570 AMI patients in the UK. HRQoL was measured using the EQ-5D and EQ-VAS instruments at 1, 6, and 12 months post-infarction. Study results showed that participation in cardiac rehabilitation was independently associated with significant improvements in HRQoL up to 12 months post-infarction, even after adjustment for confounding variables such as age, sex, comorbidities, and infarction severity. Patients who maintained sustained physical activity after the rehabilitation program showed greater improvements in HRQoL, indicating the importance of internalizing physical activity habits as a long-term goal of rehabilitation (Sadiq et al., 2025; Borg et al., 2023; Walker et al., 2018).

The consistency of HRQoL improvements as an outcome of cardiac rehabilitation is confirmed by several other studies in this review. Zhou et al. (2025) reported improved SF-36 scores in the rehabilitation group compared to standard care after 3 months. Jolliffe et al. (2001) in a Cochrane meta-analysis reported improved HRQoL as one of the consistent outcomes of exercise-based cardiac rehabilitation in coronary heart disease. Shi et al. (2025) also reported improved HRQoL scores in post-coronary artery surgery patients undergoing cardiac rehabilitation. Li et al. (2025) in a meta-analysis of mHealth-based rehabilitation reported improvements in HRQoL equivalent to conventional rehabilitation in patients using digital technology platforms.

The consistent improvements in HRQoL reported across all journals in this group can be understood through the biopsychosocial theory of cardiovascular rehabilitation. Coronary heart disease, particularly AMI, not only causes biological impacts in the form of decreased heart function but also has severe psychological impacts such as depression, anxiety, and decreased self-efficacy, which collectively reduce HRQoL. Comprehensive cardiac rehabilitation, by integrating physical exercise, education, and psychosocial support, targets all these biopsychosocial dimensions simultaneously, resulting in multidimensional improvements in HRQoL.

The findings of Hurdus et al. (2020) that patients who maintain continuous physical activity experience greater improvements in HRQoL can be explained by the neurobiological mechanisms of physical exercise.25 According to Libby (2021), regular aerobic physical activity stimulates the secretion of endorphins, serotonin, and brain-derived neurotrophic factor (BDNF),

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which directly improve mood, reduce anxiety, and increase psychological resilience. This mechanism explains why the benefits of cardiac rehabilitation on HRQoL tend to be dose-response. The longer and more consistently a patient exercises, the greater the improvement in their quality of life.

The role of professional supervision identified by Mansilla-Chacón et al. (2021) as an additional factor in improving HRQoL can be linked to self-efficacy theory. 24 McDonagh et al. (2008) noted that the involvement of healthcare professionals in rehabilitation programs, both in-person and through technology, provides positive feedback that strengthens patients' confidence in their ability to safely perform activities, a process known as increased self-efficacy. Patients with higher self-efficacy have been shown to have better therapy adherence and report higher HRQoL.

Home-Based Cardiac Rehabilitation, Telehealth, and mHealth

Rawstorn et al. (2016) published a systematic review and meta-analysis that became one of the earliest references regarding the effectiveness of cardiac telerehabilitation. This study analyzed RCTs comparing telecommunications technology-based rehabilitation programs with conventional rehabilitation in patients with coronary heart disease. The results of a meta-analysis showed that telerehabilitation was equivalent in effectiveness (non-inferior) to conventional rehabilitation in improving exercise capacity and controlling cardiovascular risk factors, including blood pressure, lipid profile, and body weight. This study laid the scientific foundation for the development of various subsequent models of telerehabilitation.

McDonagh et al. (2008) updated the scientific evidence through a recent Cochrane meta-analysis directly comparing HBCR with CBCR in patients with coronary heart disease. This meta-analysis, which included studies up to 2022, found no significant differences between HBCR and CBCR in terms of total mortality, cardiovascular mortality, exercise capacity, quality of life, and major cardiovascular events at follow-up up to 24 months. These findings provide the strongest evidence yet that HBCR is a valid and widely recommended alternative, not merely a second-line option for patients unable to access CBCR.

Hama et al. (2024) provided a contextual perspective through a retrospective cohort study comparing outcomes of patients undergoing HBCR with CBCR during the COVID-19 pandemic. The pandemic, which restricted in-person services, made this study a unique "natural experiment" evaluating HBCR in a real-world setting. The study results showed that HBCR produced comparable outcomes to CBCR in improving quality of life, controlling cardiovascular risk factors, and achieving good clinical outcomes. Patient satisfaction with HBCR was also reported to be high, indicating good acceptance of the remote rehabilitation model.

Li et al. (2025) published a recent systematic review and meta-analysis evaluating the effectiveness of mHealth technologies-based cardiac rehabilitation, including smartphone apps, wearable devices, and integrated digital platforms, in patients with post-myocardial infarction and coronary heart disease. Of the 13 RCTs analyzed, the meta-analysis showed that mHealth-based rehabilitation significantly increased exercise capacity (6MWT and VO_2 peak) and improved HRQoL with comparable effectiveness compared to conventional rehabilitation. Additional advantages reported are implementation flexibility, ease of access, and the potential for increased patient compliance thanks to real-time monitoring and feedback features.

The equivalence of effectiveness between the HBCR/tele-rehabilitation/mHealth and CBCR models, consistently reported by the four journals mentioned above, can be understood through the active components theory of cardiac rehabilitation. The clinical benefits of cardiac rehabilitation stem from its essential components: structured and progressive physical exercise, medical monitoring, education, and feedback, not from the physical location of implementation. As long as these components can be delivered with adequate quality, both face-to-face and through technology, the clinical effectiveness achieved should be equivalent.

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The findings of Li et al. (2025) regarding the potential of mHealth to improve adherence can be explained through the theory of healthcare accessibility. Access barriers, whether geographical, financial, or temporal, are the main determinants of low cardiac rehabilitation utilization worldwide, with reported participation rates reaching only 20–30% of patients who meet the indications. mHealth platforms address these barriers by providing rehabilitation services that are accessible anytime and anywhere, theoretically increasing participation rates and long-term adherence, particularly in populations with limited mobility, geographic distance, or work schedule constraints.

The HBCR model provides patients with flexibility and autonomy in undergoing rehabilitation programs tailored to their individual circumstances and preferences, aligning with the principle that effective cardiac rehabilitation should be tailored to each patient's needs, values, and capacities. This flexibility also serves as the theoretical basis for why HBCR demonstrates comparable or even better adherence rates than CBCR in some patient subgroups.

Program Implementation, Adherence, Initiation Timing, Gender Differences, and Cost-Efficiency

Aleksova et al. (2025b) in their second narrative review (Part 2) specifically examined the timing of initiation and gender differences in adherence to cardiac rehabilitation after an MI. This study found that earlier initiation of cardiac rehabilitation, ideally within the first 1–2 weeks post-infarction, was consistently associated with higher adherence rates and better clinical outcomes. Patients who started rehabilitation earlier reported stronger motivation, developed physical activity habits more quickly, and dropped out of the program less frequently. Regarding gender differences, the study identified that women consistently had lower participation and adherence rates than men, even after adjusting for age and comorbidities. Factors contributing to women's lower participation include the burden of being a caregiver, limited transportation, more atypical symptoms resulting in less referral, and differing risk perceptions between women and men.13

Wittboldt et al. (2024) reported the results of the Swedish national observational study, The Perfect-CR Study, which evaluated the implementation of a post-AMI cardiac rehabilitation program from the perspective of compliance with ESC guidelines, cost-efficiency, and patient adherence. The study found that cardiac rehabilitation implemented according to ESC standards resulted in good clinical outcomes with satisfactory adherence among patients enrolled in the program. From a health economics perspective, the study demonstrated that cardiac rehabilitation is a cost-effective intervention, with direct costs of the rehabilitation program offset by cost savings resulting from reduced re-hospitalization, reduced use of emergency healthcare resources, and increased productivity of patients returning to work. However, Wittboldt et al. (2024) also noted significant variation in program implementation across healthcare facilities, suggesting that standardization of cardiac rehabilitation delivery still needs to be improved.

AMI is a critical juncture that increases patient receptiveness to behavior change, as the experience of a heart attack creates a strong intrinsic motivation to improve lifestyle. Early initiation of rehabilitation optimally capitalizes on this psychological momentum, making it easier for patients to develop physical activity habits and maintain long-term adherence to therapy. Conversely, delayed initiation allows this motivation to fade over time, which theoretically explains the lower adherence in patients who start rehabilitation late.

The gender differences in adherence identified by Aleksova et al. (2025) can be explained through the perspective of social determinants of health. The ESC Guidelines emphasize that structural and social barriers, including gender roles, socioeconomic status, and social support, are critical determinants influencing access to and utilization of cardiovascular rehabilitation services. Women have historically faced greater barriers to accessing cardiac rehabilitation, including being less likely to receive referrals from clinicians despite having the same indications as men. This finding has important practical implications: cardiac rehabilitation programs need

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to be designed with women's specific needs and barriers in mind, including providing flexible schedules, home-based programs, and gender-sensitive communication approaches.

The results of Wittboldt et al. (2024) demonstrating the cost-effectiveness of cardiac rehabilitation according to the ESC Guidelines can be linked to the value theory of health investment. Cardiac rehabilitation as a secondary-prevention intervention results in substantial long-term cost savings through reduced recurrent hospitalizations, reduced need for repeat revascularization procedures, and increased quality-adjusted life years gained (QALYs). The findings of interfacility variation noted by Wittboldt et al. (2024) are also relevant from the perspective of implementation theory, which states that fidelity the degree of adherence to a standard protocol is a critical mediator between an intervention's effectiveness under ideal conditions (efficacy) and its effectiveness under actual conditions (effectiveness). Low implementation variation reflects high fidelity, which in turn results in more consistent clinical outcomes and better cost-effectiveness.

Based on an analysis of 15 journals grouped into five focus areas, a strong and consistent common thread emerged: post-myocardial infarction cardiac rehabilitation is an evidence-based intervention that provides multidimensional benefits. No single journal entirely denied the benefits of cardiac rehabilitation. The differences found, particularly regarding mortality outcomes in Shi et al. (2025), are contextual and can be explained theoretically based on differences in populations, study designs, and endpoints measured.

The integration of findings from the five journal groups forms a cohesive scientific narrative: cardiac rehabilitation works through biological (cardiovascular adaptation, neurohormonal and autonomic modulation, anti-inflammatory effects, prevention of ventricular remodeling), psychological (increased self-efficacy, reduced depression and anxiety), and behavioral (lifestyle changes, long-term therapy adherence) mechanisms that interact synergistically to produce comprehensive clinical benefits, including improved LVEF, increased exercise capacity, reduced MACE and hospitalizations, and improved HRQoL.

The findings that HBCR, tele-rehabilitation, and mHealth models are equivalent in effectiveness to CBCR confirmed by Rawstorn et al. (2016), McDonagh et al. (2008), Hama et al. (2024), and Li et al. (2025) open up significant opportunities for expanding access to cardiac rehabilitation globally. For Indonesia and other developing countries facing limited CBCR infrastructure, these findings provide a strong scientific basis for adopting technology-based rehabilitation models as a national strategy to increase cardiac rehabilitation coverage.

The implementation aspects highlighted by Aleksova et al. (2025) and Wittboldt et al. (2024) emphasize that the benefits of cardiac rehabilitation will not be optimally achieved without special attention to timely initiation, a gender-sensitive approach, program standardization according to guidelines, and adequate financing. Thus, post-myocardial infarction cardiac rehabilitation deserves to be recognized as an essential and integral component of comprehensive post-myocardial infarction patient management, the implementation of which needs to be systematically improved at all levels of healthcare facilities.

CONCLUSION

Based on a narrative review of 15 scientific journals, cardiac rehabilitation after myocardial infarction provides consistent clinical, functional, psychological, and preventive benefits. It improves left ventricular function, LVEF, exercise capacity, and quality of life while potentially limiting adverse ventricular remodeling. Cardiac rehabilitation also reduces major adverse cardiovascular events, recurrent myocardial infarction, rehospitalization, and cardiovascular mortality, although evidence regarding total mortality varies across specific patient populations. Home-based rehabilitation, telerehabilitation, and mHealth programs demonstrate effectiveness and safety comparable to center-based rehabilitation while increasing accessibility and flexibility. However, successful implementation depends on early initiation, patient adherence, gender-sensitive strategies, standardized services, and adequate health-

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system support. Therefore, cardiac rehabilitation should be considered an essential and cost-effective component of comprehensive post-myocardial infarction management alongside pharmacological therapy and revascularization.

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