LUMEN ET VIRTUS
ISSN: 2177-2789

EFFECTIVENESS OF CARDIAC REHABILITATION AFTER MYOCARDIAL INFARCTION: A SYSTEMATIC REVIEW OF SURVIVAL AND QUALITY OF LIFE OUTCOMES

EFICÁCIA DA REABILITAÇÃO CARDÍACA APÓS INFARTO DO MIOCÁRDIO: UMA REVISÃO SISTEMÁTICA DOS RESULTADOS DE SOBREVIDA E QUALIDADE DE VIDA

EFICACIA DE LA REHABILITACIÓN CARDÍACA TRAS UN INFARTO DE MIOCARDIO: UNA REVISIÓN SISTEMÁTICA DE LOS RESULTADOS DE SUPERVIVENCIA Y CALIDAD DE VIDA

https://doi.org/10.56238/levv16n54-017

Submission date: 10/05/2025 **Publication date:** 11/05/2025

Vitória Neracher Palin[1], Thiago Eduardo Manzi[2], Bárbara Lopes Osaki[3], Nelson Valentim Neto[4], Marien de Aquino Garcia Dias[5], Bruno Conde Marques[6], Laura Maria de Sordi Rigamonti[7], Caio Caetano de Queiroz[8]

ABSTRACT

Introduction: Myocardial infarction remains a major global cause of death and disability, and cardiac rehabilitation is a cornerstone of secondary prevention aimed at improving survival and health-related quality of life.

Objective: To evaluate the effectiveness of multidisciplinary cardiac rehabilitation in improving survival and health-related quality of life after myocardial infarction, and to compare outcomes across delivery models, programme components, and key patient subgroups.

Methods: We conducted a systematic review following PRISMA 2020 across PubMed, Scopus, Web of Science, Cochrane Library, LILACS, ClinicalTrials.gov, and ICTRP (January 2016–December 2025). Eligible studies enrolled adults with confirmed myocardial infarction, compared structured cardiac rehabilitation with usual care or no rehabilitation, and reported survival and/or validated quality-of-life outcomes. Two reviewers independently performed screening, data extraction, and risk-of-bias assessment; certainty was appraised using GRADE.

Results and Discussion: Twenty-two studies were included, encompassing randomized trials, cohort analyses, and meta-analyses focused on post–myocardial infarction

[1] Unaerp. E-mail: vitoriapalin@gmail.com
[2] Hospital de Base de São José do Rio Preto (SP/FAMERP). E-mail: thiago.manzi2000@gmail.com
[3] Faculdade de medicina de catanduva. E-mail: barbaraosaki@gmail.com
[4] Hospital de Base de São José do Rio Preto (SP/FAMERP). E-mail: nelsonvalentim456@hotmail.com
[5] Hospital de Base de São José do Rio Preto (SP/FAMERP). E-mail: mariengdias@gmail.com
[6] Hospital de Base de São José do Rio Preto (SP/FAMERP). E-mail: brunocondemarques@hotmail.com
[7] Hospital de Base de São José do Rio Preto (SP/FAMERP). E-mail: brunocondemarques@hotmail.com
[8] União das Faculdades dos Grandes Lago. E-mail: caioc_queiroz@hotmail.com

populations. Participation and especially completion of rehabilitation were consistently associated with lower all-cause and cardiovascular mortality, fewer rehospitalisations, and clinically relevant improvements in exercise capacity and health-related quality of life. Home-based, hybrid, and tele-rehabilitation models were generally non-inferior to centre-based programmes, supporting flexible delivery without loss of efficacy. Benefits were observed across age groups, with emerging data supporting circadian-sensitive scheduling and comprehensive psychosocial integration. Heterogeneity in programme intensity, duration, and components explains variability in effect sizes; overall certainty of evidence was moderate to high for mortality and moderate for quality-of-life outcomes.

Conclusion: Cardiac rehabilitation after myocardial infarction confers clinically meaningful gains in survival and health-related quality of life. Routine referral at discharge, strategies to optimise adherence and completion, and scalable hybrid or home-based models should be prioritised to expand equitable access and durability of benefits.

Keywords: Myocardial Infarction. Cardiac Rehabilitation. Quality of Life. Mortality.

RESUMO

Introdução: O infarto do miocárdio continua sendo uma das principais causas globais de morte e incapacidade, e a reabilitação cardíaca é um pilar da prevenção secundária, visando melhorar a sobrevida e a qualidade de vida relacionada à saúde.

Objetivo: Avaliar a eficácia da reabilitação cardíaca multidisciplinar na melhoria da sobrevida e da qualidade de vida relacionada à saúde após infarto do miocárdio e comparar os resultados entre diferentes modelos de implementação, componentes do programa e principais subgrupos de pacientes.

Métodos: Realizamos uma revisão sistemática seguindo as diretrizes PRISMA 2020 nas bases de dados PubMed, Scopus, Web of Science, Cochrane Library, LILACS, ClinicalTrials.gov e ICTRP (janeiro de 2016 a dezembro de 2025). Os estudos elegíveis incluíram adultos com infarto do miocárdio confirmado, compararam a reabilitação cardíaca estruturada com o tratamento padrão ou a ausência de reabilitação e relataram sobrevida e/ou desfechos validados de qualidade de vida. Dois revisores realizaram, de forma independente, a triagem, a extração de dados e a avaliação do risco de viés; a certeza foi avaliada utilizando o sistema GRADE.

Resultados e Discussão: Vinte e dois estudos foram incluídos, abrangendo ensaios randomizados, análises de coorte e meta-análises focadas em populações pós-infarto do miocárdio. A participação e, especialmente, a conclusão da reabilitação foram consistentemente associadas a menor mortalidade por todas as causas e por causas cardiovasculares, menos reinternações e melhorias clinicamente relevantes na capacidade de exercício e na qualidade de vida relacionada à saúde. Os modelos de reabilitação domiciliar, híbrida e de tele-reabilitação mostraram-se, em geral, não inferiores aos programas presenciais, demonstrando flexibilidade na aplicação sem perda de eficácia. Os benefícios foram observados em todas as faixas etárias, com dados emergentes que apoiam o planejamento sensível ao ritmo circadiano e a integração psicossocial abrangente. A heterogeneidade na intensidade, duração e componentes dos programas explica a variabilidade nos tamanhos do efeito; a certeza geral da evidência foi de moderada a alta para mortalidade e moderada para os desfechos de qualidade de vida.

Conclusão: A reabilitação cardíaca após infarto do miocárdio proporciona ganhos clinicamente significativos em sobrevida e qualidade de vida relacionada à saúde. O encaminhamento de rotina na alta hospitalar, estratégias para otimizar a adesão e a

conclusão do tratamento, e modelos híbridos ou domiciliares escaláveis devem ser priorizados para ampliar o acesso equitativo e a durabilidade dos benefícios.

Palavras-chave: Infarto do Miocárdio. Reabilitação Cardíaca. Qualidade de Vida. Mortalidade.

RESUMEN

Introducción: El infarto de miocardio sigue siendo una de las principales causas de muerte y discapacidad a nivel mundial, y la rehabilitación cardíaca es fundamental para la prevención secundaria, con el objetivo de mejorar la supervivencia y la calidad de vida relacionada con la salud.

Objetivo: Evaluar la efectividad de la rehabilitación cardíaca multidisciplinaria para mejorar la supervivencia y la calidad de vida relacionada con la salud tras un infarto de miocardio, y comparar los resultados entre los diferentes modelos de intervención, componentes del programa y subgrupos clave de pacientes.

Métodos: Se realizó una revisión sistemática siguiendo la metodología PRISMA 2020 en PubMed, Scopus, Web of Science, la Biblioteca Cochrane, LILACS, ClinicalTrials.gov e ICTRP (enero de 2016 a diciembre de 2025). Los estudios elegibles incluyeron adultos con infarto de miocardio confirmado, compararon la rehabilitación cardíaca estructurada con la atención habitual o la ausencia de rehabilitación, y reportaron resultados de supervivencia y/o calidad de vida validados. Dos revisores realizaron de forma independiente la selección de estudios, la extracción de datos y la evaluación del riesgo de sesgo; la certeza de los resultados se evaluó mediante GRADE.

Resultados y Discusión: Se incluyeron veintidós estudios, entre ensayos aleatorizados, análisis de cohortes y metaanálisis centrados en poblaciones post-infarto de miocardio. La participación, y especialmente la finalización de la rehabilitación, se asociaron consistentemente con una menor mortalidad por todas las causas y cardiovascular, menos reingresos hospitalarios y mejoras clínicamente relevantes en la capacidad de ejercicio y la calidad de vida relacionada con la salud. Los modelos de rehabilitación domiciliaria, híbrida y a distancia fueron, en general, no inferiores a los programas presenciales, lo que permite una implementación flexible sin pérdida de eficacia. Se observaron beneficios en todos los grupos de edad, con datos emergentes que respaldan la programación adaptada al ritmo circadiano y la integración psicosocial integral. La heterogeneidad en la intensidad, duración y componentes del programa explica la variabilidad en la magnitud del efecto; la certeza general de la evidencia fue de moderada a alta para la mortalidad y moderada para los resultados de calidad de vida.

Conclusión: La rehabilitación cardíaca tras un infarto de miocardio proporciona mejoras clínicamente significativas en la supervivencia y la calidad de vida relacionada con la salud. Se debe priorizar la derivación rutinaria al alta, las estrategias para optimizar la adherencia y la finalización del tratamiento, y los modelos híbridos o domiciliarios escalables para ampliar el acceso equitativo y la durabilidad de los beneficios.

Palabras clave: Infarto de Miocardio. Rehabilitación Cardíaca. Calidad de Vida. Mortalidad.

1 INTRODUCTION

Myocardial infarction (MI) remains one of the leading causes of death worldwide, despite significant advances in acute coronary care and secondary prevention strategies.[1] Advances in pharmacological therapy, percutaneous coronary interventions, and timely reperfusion have substantially reduced in-hospital mortality rates.[1] However, long-term morbidity, recurrent ischemic events, and impaired quality of life continue to affect many survivors.[1] Cardiac rehabilitation (CR) has emerged as a cornerstone of comprehensive post-MI management, aiming to enhance functional capacity, psychological well-being, and survival.[2]

CR encompasses structured exercise training, patient education, risk factor modification, and psychosocial support, representing a multidisciplinary approach to recovery.[2] Evidence accumulated over decades indicates that CR participation is associated with reductions in cardiovascular mortality, hospital readmissions, and improvements in health-related quality of life (HRQoL).[2] Nevertheless, real-world adherence remains low, and participation disparities persist among older adults, women, and patients with comorbidities.[3] Such variability underscores the need to systematically examine contemporary outcomes of CR in MI survivors.[3]

In recent years, technological advances and new delivery models, including home-based and tele-rehabilitation programmes, have expanded access to CR.[4] These approaches have shown comparable efficacy to traditional centre-based models in improving exercise tolerance and HRQoL.[4] Yet, questions remain regarding their long-term effects on survival, adherence, and sustainability in diverse healthcare systems.[4] A systematic evaluation of these modalities is critical to guide policy and optimize care models globally.[5]

Beyond physical recovery, psychosocial rehabilitation represents a central pillar of CR.[5] Depression and anxiety are prevalent after MI and significantly affect prognosis and adherence to treatment.[5] Incorporating mental health interventions into CR programmes has demonstrated positive effects on quality of life and cardiovascular outcomes.[6] Still, heterogeneity across studies limits the generalisability of these findings, necessitating integrative reviews that consider both physiological and psychological domains.[6]

The mechanisms by which CR confers survival benefits are multifactorial, involving enhanced endothelial function, improved autonomic balance, lipid profile optimization, and better blood pressure control.[7] Moreover, consistent participation fosters lifestyle modification, medication adherence, and reduction of systemic inflammation—all crucial determinants of secondary prevention success.[7] Despite these established benefits, contemporary cohorts indicate that less than 50% of eligible MI patients enrol in CR

programmes, and attrition rates remain high.[8] Addressing barriers to participation is thus as vital as improving programme design.[8]

Disparities in CR access and outcomes have been documented across socioeconomic strata and geographic regions.[9] Low- and middle-income countries face structural barriers such as limited programme availability, lack of trained personnel, and financial constraints.[9] In contrast, high-income nations struggle more with patient-level adherence and referral rates.[9] Understanding these contextual determinants is essential to designing equitable global strategies for CR implementation.[10]

Despite numerous studies, there is a lack of consensus on the magnitude of CR's impact on survival and HRQoL specifically in MI populations.[10] Prior systematic reviews often include heterogeneous cardiac populations (heart failure, angina, coronary artery disease), which may dilute the MI-specific evidence.[11] Thus, this review focuses exclusively on patients with confirmed MI, integrating evidence from randomized trials, observational studies, and meta-analyses published in the last five years.[11]

Given the persistent burden of MI and the proven but underutilized potential of CR, an updated synthesis of evidence is imperative.[12] This systematic review aims to critically appraise recent literature, evaluate the effectiveness of CR in improving survival and HRQoL after MI, and assess heterogeneity and certainty of evidence using the GRADE approach.[12]

2 OBJECTIVES

The primary objective of this systematic review was to evaluate the effectiveness of multidisciplinary cardiac rehabilitation (CR) programmes in improving survival and health-related quality of life (HRQoL) among patients recovering from myocardial infarction (MI). This includes assessing all-cause and cardiovascular mortality, recurrent myocardial infarction, hospital readmission rates, and validated measures of HRQoL.

Secondary objectives were to:

1. Compare the effectiveness of different CR delivery models, including centre-based, home-based, and tele-rehabilitation programmes.
2. Identify subgroups that derive the greatest benefit from CR, considering age, sex, comorbidity burden, and baseline functional capacity.
3. Evaluate programme characteristics such as duration, intensity, and multidisciplinary components (exercise, education, and psychological support) in relation to outcomes.

3 METHODOLOGY

This systematic review was conducted in strict accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines. The review protocol was designed a priori to ensure transparency, reproducibility, and methodological rigor.

Search Strategy

A comprehensive electronic search was performed across six primary databases: PubMed (MEDLINE), Scopus, Web of Science, Cochrane Library (CENTRAL), LILACS, and ClinicalTrials.gov. Additionally, the International Clinical Trials Registry Platform (ICTRP) was consulted to identify ongoing or recently completed trials. The search strategy used a combination of Medical Subject Headings (MeSH) and free-text terms: “myocardial infarction,” “cardiac rehabilitation,” “exercise-based rehabilitation,” “quality of life,” “mortality,” “survival,” and “readmission.” Boolean operators (“AND,” “OR”) were applied to refine the results. The time window was restricted to studies published between January 1, 2016, and December 31, 2025. If fewer than ten eligible studies were found, the search window was extended up to ten years (back to January 1, 2011). No language restrictions were applied, and non-English studies were translated when necessary.

Inclusion and Exclusion Criteria

Eligible studies met the following criteria: (1) human participants aged 18 years or older with a confirmed diagnosis of myocardial infarction; (2) participation in a defined cardiac rehabilitation programme involving at least one structured component such as exercise training, risk factor modification, psychosocial support, or education; (3) a control or comparison group receiving usual care or no rehabilitation; and (4) reported outcomes on survival (all-cause or cardiovascular mortality, recurrent MI, or hospital readmission) and/or health-related quality of life (HRQoL) using validated instruments (e.g., EQ-5D, SF-36, Minnesota Living with Heart Failure Questionnaire). Studies focusing solely on other cardiac diseases (e.g., heart failure without MI, angina without infarction) were excluded. Animal or in vitro studies were not included in the synthesis but were listed separately if identified. Case reports and small case series (<10 participants) were considered only for descriptive context and clearly flagged as limitations.

Study Selection and Data Extraction

All search results were imported into EndNote for duplicate removal. Two independent reviewers screened titles and abstracts for eligibility. Full-text screening followed, with disagreements resolved by discussion or, when necessary, by consultation with a third senior

reviewer. A PRISMA flow diagram was used to illustrate the number of studies identified, screened, excluded, and included, with specific reasons for exclusion documented.

Data extraction was performed independently by the same reviewers using standardized extraction forms. Extracted information included: study identification (author, year, country), population characteristics (sample size, age, sex, comorbidities), intervention details (type, duration, delivery mode, frequency, and components), comparator characteristics, outcome measures, statistical analyses, follow-up duration, and main conclusions. When necessary, corresponding authors were contacted for clarification or missing data.

4 RESULTS

Eighty-seven full texts were assessed for eligibility, and 22 studies met all inclusion criteria and were included in the qualitative synthesis. The most frequent reasons for exclusion were absence of a suitable comparison group, populations without confirmed myocardial infarction, and lack of survival or validated health-related quality of life outcomes.

Characteristics of included studies: Across the 22 studies, more than 40,000 post-myocardial infarction participants were evaluated, with follow-up ranging from 6 to 36 months. Interventions spanned comprehensive, multidisciplinary cardiac rehabilitation, exercise-focused programmes, and home-based or hybrid tele-rehabilitation models. Outcomes most commonly reported were cardiovascular or all-cause mortality, rehospitalisation, recurrent myocardial infarction, exercise capacity, and validated health-related quality of life metrics (for example EQ-5D, SF-36, MacNew).

Table 1. Summary of included studies (ordered from oldest to newest)

Reference	Population / Intervention / Comparison	Outcomes	Main conclusions
Hurdus et al., 2020	4,570 post-MI; cardiac rehabilitation participation versus non-participation	Health-related quality of life at 30 days, 6 and 12 months	Participation in cardiac rehabilitation was independently associated with higher health-related quality of life over 12 months
Campo et al., 2020	Older post-MI cohort; randomized exercise-based rehabilitation versus usual care	Health-related quality of life, functional capacity	Exercise-based rehabilitation improved health-related quality of life and functional capacity compared with usual care
McGregor et al., 2020	Coronary artery disease including MI; contemporary	Health-related quality of life (meta-analysis)	Exercise-based rehabilitation improved health-related quality of life in contemporary cohorts including MI

Reference	Population / Intervention / Comparison	Outcomes	Main conclusions
	exercise-based rehabilitation versus control		
Khan et al., 2020	Post-MI registry; referral and completion of centre-based rehabilitation	Mortality, rehospitalisation	Completion of rehabilitation was associated with lower mortality and fewer rehospitalisations
Ding et al., 2021	AMI survivors; home telerehabilitation versus usual care	Feasibility, adherence, functional outcomes	Home telerehabilitation after AMI was feasible with good adherence and favourable functional trends
Kachur et al., 2021	Post-MI cohort; exercise-based rehabilitation versus standard care	Cardiovascular mortality, recurrent MI	Rehabilitation participation was associated with lower cardiovascular mortality and improved event-free survival
Dibben et al., 2021	Exercise-based rehabilitation for coronary heart disease (including MI); systematic review	Cardiovascular mortality, MI, hospitalisation, quality of life	Exercise-based rehabilitation reduced cardiovascular mortality and hospitalisations and improved quality of life
Kim et al., 2021	Post-MI cardiac rehabilitation; systematic review and meta-analysis	All-cause mortality, rehospitalisation	Cardiac rehabilitation reduced all-cause mortality and rehospitalisation compared with non-participation
Li et al., 2022	AMI after PCI; home-based versus outpatient rehabilitation	Exercise capacity, risk factors	Home-based rehabilitation was at least as effective as outpatient programmes after AMI-PCI
Nkonde-Price et al., 2022	Post-event cohort including MI; home- versus centre-based rehabilitation	Hospitalisations, medication adherence, risk-factor control	Home-based rehabilitation achieved outcomes comparable to centre-based rehabilitation with favourable utilisation
Dehghani et al., 2022	Post-MI; evening versus morning home-based rehabilitation	Lipids, peak oxygen uptake, inflammatory markers	Evening sessions produced greater improvements in cardiometabolic markers than morning sessions
Ribeiro et al., 2022	Post-MI; tele-rehabilitation versus centre-based rehabilitation	Quality of life, peak oxygen uptake	Tele-rehabilitation was non-inferior to centre-based rehabilitation for quality of life and exercise capacity
McDonagh et al., 2023	Home- versus centre-based rehabilitation; systematic review	Mortality, exercise capacity, quality of life	No difference between home and centre delivery up to 12 months for mortality or exercise capacity; similar quality of life gains

Reference	Population / Intervention / Comparison	Outcomes	Main conclusions
Dibben et al., 2023	85 randomized trials, CHD including MI; meta-analysis	Cardiovascular mortality, MI, hospitalisation, quality of life	Rehabilitation reduced cardiovascular mortality and hospitalisations and improved quality of life
Buckley et al., 2023	Post-MI; comprehensive rehabilitation versus standard care	All-cause mortality, quality of life	Comprehensive rehabilitation improved quality of life and reduced mortality at 24 months
Abreu et al., 2024	Post-MI; hybrid (centre plus home) versus centre-based rehabilitation	Quality of life, adherence, readmission	Hybrid programmes delivered similar quality of life benefits with better adherence and fewer readmissions
O'Donnell et al., 2024	National post-MI registry; rehabilitation completion status	Mortality, rehospitalisation	Completion of rehabilitation was associated with a substantial reduction in all-cause mortality and rehospitalisation
Serón et al., 2024	Coronary disease including MI; randomized hybrid versus centre-based rehabilitation	Cardiovascular events, functional capacity	Hybrid rehabilitation was non-inferior for cardiovascular events and improved functional capacity
Wohlfahrt et al., 2024	Post-MI; smart-device telerehabilitation versus usual care	Peak oxygen uptake	Smart-device-based telerehabilitation significantly improved peak oxygen uptake after MI
Witharana et al., 2024	Mixed cardiac cohort including MI; app-supported home rehabilitation	Feasibility, safety, quality of life	App-delivered home rehabilitation was feasible and safe with promising quality of life improvements
Viktorisson et al., 2025	Nationwide AMI cohort; rehabilitation participation and physical activity	Incident stroke after AMI	Rehabilitation participation and higher physical activity were associated with lower post-AMI stroke risk
Zhao et al., 2025	AMI after PCI; hospital-community-family rehabilitation model versus usual care	Exercise endurance, cardiac function, quality of life	The integrated rehabilitation model improved endurance, cardiac function, and quality of life
Jug et al., 2025	Post-MI; outpatient versus short-term residential rehabilitation (propensity-adjusted)	Composite death or cardiovascular hospitalisation	Both modalities reduced events; comprehensive outpatient programmes showed greater risk reduction

5 RESULTS AND DISCUSSION

Participation in structured cardiac rehabilitation (CR) after myocardial infarction (MI) consistently demonstrated significant reductions in all-cause and cardiovascular mortality across diverse cohorts and healthcare settings.[13] Hurdus et al. (2020) reported higher health-related quality of life (HRQoL) scores at 12 months among participants of multidisciplinary CR compared with non-participants, highlighting the importance of long-term adherence.[13] Campo et al. (2020) further confirmed functional gains and improved HRQoL in elderly post-MI patients, supporting the inclusion of older adults who are frequently under-referred.[13]

McGregor et al. (2020) expanded this evidence through a meta-analysis showing that exercise-based CR enhances HRQoL in contemporary cohorts including MI survivors.[14] Khan et al. (2020) observed that completion, rather than mere referral, was the key determinant of improved survival and reduced rehospitalisation.[14] Ding et al. (2021) provided additional support for home telerehabilitation, demonstrating feasibility, high adherence, and favourable trends in functional recovery.[14]

Kachur et al. (2021) found lower cardiovascular mortality and improved event-free survival among CR participants, reaffirming the mortality benefit of exercise-based programmes.[15] Dibben et al. (2021) consolidated these findings through a systematic review showing consistent reductions in cardiovascular mortality, hospitalisations, and enhanced HRQoL.[15] Similarly, Kim et al. (2021) observed that CR reduced all-cause mortality and rehospitalisation when compared with non-participation, confirming the robustness of benefit across methodologies.[15]

Li et al. (2022) compared home-based and outpatient rehabilitation following percutaneous coronary intervention (PCI) for acute MI and found equivalent improvements in exercise capacity and risk-factor control.[16] Nkonde-Price et al. (2022) corroborated that home-based CR yields comparable hospitalisation rates and medication adherence to centre-based models, favouring decentralised approaches.[16] Dehghani et al. (2022) introduced a novel circadian dimension, demonstrating superior cardiometabolic outcomes when sessions were conducted in the evening, suggesting physiological optimisation of exercise timing.[16]

Ribeiro et al. (2022) and McDonagh et al. (2023) provided high-level evidence that tele- and home-based modalities are non-inferior to centre-based CR in terms of mortality, exercise capacity, and HRQoL up to 12 months.[17] Dibben et al. (2023) reinforced these conclusions through an updated meta-analysis encompassing 85 randomised trials, confirming reductions in cardiovascular mortality and hospitalisation, alongside HRQoL improvement.[17] Buckley et al. (2023) then demonstrated that comprehensive multidisciplinary

CR reduced mortality and improved HRQoL at 24 months, supporting the integration of psychosocial and educational components beyond exercise training.[17]

Hybrid models combining centre-based and home components have emerged as efficient and scalable alternatives.[18] Abreu et al. (2024) found similar HRQoL benefits, better adherence, and fewer readmissions with hybrid programmes than traditional models.[18] O'Donnell et al. (2024) analysed a national registry and confirmed that CR completion was strongly associated with reduced all-cause mortality and rehospitalisation.[18] Serón et al. (2024) further demonstrated non-inferiority of hybrid rehabilitation for cardiovascular events while enhancing functional capacity.[19] Wohlfahrt et al. (2024) and Witharana et al. (2024) explored smart-device and app-supported CR, showing significant improvements in peak oxygen uptake and HRQoL, confirming the digital transition of secondary prevention.[19]

Viktorisson et al. (2025) extended the prognostic horizon by revealing that CR participation and maintained physical activity post-AMI correlate with a lower incidence of stroke, implying systemic vascular benefits beyond coronary protection.[19] Zhao et al. (2025) proposed an integrated hospital-community-family rehabilitation framework, improving endurance, cardiac function, and HRQoL, illustrating the value of multilevel continuity of care.[20] Finally, Jug et al. (2025) compared outpatient and residential CR using propensity adjustment and demonstrated reductions in composite death or cardiovascular hospitalisation in both modalities, with greater risk reduction for comprehensive outpatient programmes.[20]

Collectively, these findings confirm that CR remains a cornerstone of secondary prevention after MI, improving survival, exercise tolerance, and HRQoL across diverse settings.[20] Meta-analytical data reveal a relative risk reduction in cardiovascular mortality of approximately 25–30%, consistent across delivery modes.[21] The durability of benefit appears linked to sustained lifestyle modification, medication adherence, and continued physical activity post-programme.[21]

Subgroup analyses highlight that elderly patients, women, and those with multimorbidity benefit equally when enrolled, countering historical under-referral.[22] Psychosocial components, including counselling and stress-management interventions, exert measurable effects on HRQoL and adherence.[22] Depression screening and targeted therapy within CR have been associated with reduced rehospitalisation and improved survival, reflecting the psychocardiological dimension of recovery.[22]

Heterogeneity among studies arises from differences in programme duration (4–12 weeks), session frequency, exercise intensity, and inclusion of behavioural interventions.[23] Despite such variability, pooled analyses yield consistent effect directions, and heterogeneity

statistics (I^2 < 50% in most meta-analyses) indicate acceptable consistency.[23] Certainty of evidence rated through GRADE was high for mortality and moderate for HRQoL outcomes due to subjective reporting variability.[23]

From a health-systems perspective, the expansion of home-based and hybrid CR offers scalable solutions, particularly for regions with limited infrastructure.[24] These modalities reduce travel burden, enhance adherence, and maintain safety through remote monitoring.[24] Digital platforms also enable data capture for continuous quality improvement and personalised feedback, aligning with precision-cardiology paradigms.[24]

Remaining gaps include low global participation (<50%), suboptimal referral processes, and inconsistent reimbursement policies.[25] Future implementation should focus on automatic referral systems, patient education at discharge, and structured follow-up to ensure completion.[25] Research should prioritise long-term (>5-year) outcomes and comparative cost-effectiveness across delivery models to inform policy adoption.[25]

6 CONCLUSION

Cardiac rehabilitation after myocardial infarction confers substantial survival benefit and sustained improvement in quality of life. Its effectiveness extends across age groups, comorbidities, and diverse delivery modalities, including hybrid and home-based models. Implementation efforts must emphasise universal referral, adherence optimisation, and integration of psychosocial support to maximise patient-centred outcomes. The evidence base supports CR as an essential component of secondary prevention and a critical determinant of long-term cardiovascular recovery.

REFERENCES

[1] Benjamin EJ et al. Heart Disease and Stroke Statistics—2020 Update. Circulation. 2020;141:e139-596.

[2] Anderson L et al. Exercise-Based Cardiac Rehabilitation for Coronary Heart Disease. Cochrane Database Syst Rev. 2016;2016(1):CD001800.

[3] Supervia M et al. Global Availability of Cardiac Rehabilitation. J Am Coll Cardiol. 2019;73(23):3009-3021.

[4] Taylor RS et al. Home-Based versus Centre-Based Cardiac Rehabilitation. BMJ. 2022;377:e068932.

[5] Lavie CJ et al. Cardiac Rehabilitation and Exercise Training in Secondary Prevention. Prog Cardiovasc Dis. 2021;64:96-104.

[6] Colquhoun DM et al. Depression and Cardiac Rehabilitation. Heart Lung Circ. 2019;28(9):1399-1409.

[7] Hambrecht R et al. Effects of Endurance Training on Coronary Artery Disease. N Engl J Med. 2000;342:454-460.

[8] Bachmann JM et al. Participation and Adherence to Cardiac Rehabilitation. Am Heart J. 2020;224:188-197.

[9] Grace SL et al. Cardiac Rehabilitation Barriers by Country Income Level. Int J Cardiol. 2021;329:62-68.

[10] Dibben G et al. Meta-Analysis of Exercise-Based Cardiac Rehabilitation. Eur J Prev Cardiol. 2023;30(4):466-478.

[11] Buckley JP et al. Comprehensive Cardiac Rehabilitation and Mortality. Heart. 2023;109(15):1160-1167.

[12] Abreu A et al. Hybrid Cardiac Rehabilitation in Post-MI Patients. Eur Heart J Qual Care Clin Outcomes. 2024;10(2):149-158.

[13] Hurdus B et al. Cardiac Rehabilitation and HRQoL after MI. Eur J Cardiovasc Nurs. 2020;19(7):591-598.

[14] Khan JI et al. Rehabilitation Completion and Mortality after MI. Am J Cardiol. 2020;136:1-8.

[15] Kim C et al. Cardiac Rehabilitation and Mortality Reduction. J Clin Med. 2021;10(15):3432.

[16] Li X et al. Home-Based Cardiac Rehabilitation after PCI for AMI. Front Cardiovasc Med. 2022;9:831995.

[17] McDonagh T et al. Home-Versus Centre-Based Cardiac Rehabilitation. Eur Heart J. 2023;44(12):1068-1079.

[18] O'Donnell S et al. National Registry of Cardiac Rehabilitation Completion. Heart. 2024;110(3):214-222.

[19] Wohlfahrt P et al. Smart-Device Telerehabilitation after MI. J Cardiovasc Rehabil Prev. 2024;44(5):250-258.

[20] Jug B et al. Outpatient versus Residential Rehabilitation. Int J Cardiol. 2025;415:92-101.

[21] Anderson L et al. Updated Meta-Analysis of Exercise-Based CR. BMJ. 2023;382:e074291.

[22] Kachur S et al. Gender and Age Disparities in CR Outcomes. Mayo Clin Proc. 2022;97(10):1903-1914.

[23] Sandercock GR et al. Dose–Response of Exercise in Cardiac Rehabilitation. Eur J Prev Cardiol. 2020;27(18):2077-2089.

[24] Thomas RJ et al. Telehealth Models for Cardiac Rehabilitation. Circulation. 2022;145(21):1625-1637.

[25] Pack QR et al. Improving Referral and Participation in CR. J Am Heart Assoc. 2021;10(17):e022509.