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[Intervention Review]

Exercise-based cardiac rehabilitation for coronary heart disease

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ABSTRACT

Background

Coronary heart disease (CHD) is the most common cause of death globally. However, with falling CHD mortality rates, an increasing number of people living with CHD may need support to manage their symptoms and prognosis. Exercise-based cardiac rehabilitation (CR) aims to improve the health and outcomes of people with CHD. This is an update of a Cochrane Review previously published in 2016.

Objectives

To assess the clinical effectiveness and cost-effectiveness of exercise-based CR (exercise training alone or in combination with psychosocial or educational interventions) compared with 'no exercise' control, on mortality, morbidity and health-related quality of life (HRQoL) in people with CHD.

Search methods

We updated searches from the previous Cochrane Review, by searching CENTRAL, MEDLINE, Embase, and two other databases in September 2020. We also searched two clinical trials registers in June 2021.

Selection criteria

We included randomised controlled trials (RCTs) of exercise-based interventions with at least six months' follow-up, compared with 'no exercise' control. The study population comprised adult men and women who have had a myocardial infarction (MI), coronary artery bypass graft (CABG) or percutaneous coronary intervention (PCI), or have angina pectoris, or coronary artery disease.

Data collection and analysis

We screened all identified references, extracted data and assessed risk of bias according to Cochrane methods. We stratified meta-analysis by duration of follow-up: short-term (6 to 12 months); medium-term (> 12 to 36 months); and long-term (> 3 years), and used meta-regression to explore potential treatment effect modifiers. We used GRADE for primary outcomes at 6 to 12 months (the most common follow-up time point).



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Main results

This review included 85 trials which randomised 23,430 people with CHD. This latest update identified 22 new trials (7795 participants). The population included predominantly post-MI and post-revascularisation patients, with a mean age ranging from 47 to 77 years.

In the last decade, the median percentage of women with CHD has increased from 11% to 17%, but females still account for a similarly small percentage of participants recruited overall (< 15%). Twenty-one of the included trials were performed in low- and middle-income countries (LMICs). Overall trial reporting was poor, although there was evidence of an improvement in quality over the last decade. The median longest follow-up time was 12 months (range 6 months to 19 years).

At short-term follow-up (6 to 12 months), exercise-based CR likely results in a slight reduction in all-cause mortality (risk ratio (RR) 0.87, 95% confidence interval (CI) 0.73 to 1.04; 25 trials; moderate certainty evidence), a large reduction in MI (RR 0.72, 95% CI 0.55 to 0.93; 22 trials; number needed to treat for an additional beneficial outcome (NNTB) 75, 95% CI 47 to 298; high certainty evidence), and a large reduction in all-cause hospitalisation (RR 0.58, 95% CI 0.43 to 0.77; 14 trials; NNTB 12, 95% CI 9 to 21; moderate certainty evidence). Exercise-based CR likely results in little to no difference in risk of cardiovascular mortality (RR 0.88, 95% CI 0.68 to 1.14; 15 trials; moderate certainty evidence), CABG (RR 0.99, 95% CI 0.78 to 1.27; 20 trials; high certainty evidence), and PCI (RR 0.86, 95% CI 0.63 to 1.19; 13 trials; moderate certainty evidence) up to 12 months' follow-up. We are uncertain about the effects of exercise-based CR on cardiovascular hospitalisation, with a wide confidence interval including considerable benefit as well as harm (RR 0.80, 95% CI 0.41 to 1.59; low certainty evidence). There was evidence of substantial heterogeneity across trials for cardiovascular hospitalisations (I² = 53%), and of small study bias for all-cause hospitalisation, but not for all other outcomes.

At medium-term follow-up, although there may be little to no difference in all-cause mortality (RR 0.90, 95% CI 0.80 to 1.02; 15 trials), MI (RR 1.07, 95% CI 0.91 to 1.27; 12 trials), PCI (RR 0.96, 95% CI 0.69 to 1.35; 6 trials), CABG (RR 0.97, 95% CI 0.77 to 1.23; 9 trials), and all-cause hospitalisation (RR 0.92, 95% CI 0.82 to 1.03; 9 trials), a large reduction in cardiovascular mortality was found (RR 0.77, 95% CI 0.63 to 0.93; 5 trials). Evidence is uncertain for difference in risk of cardiovascular hospitalisation (RR 0.92, 95% CI 0.76 to 1.12; 3 trials).

At long-term follow-up, although there may be little to no difference in all-cause mortality (RR 0.91, 95% CI 0.75 to 1.10), exercise-based CR may result in a large reduction in cardiovascular mortality (RR 0.58, 95% CI 0.43 to 0.78; 8 trials) and MI (RR 0.67, 95% CI 0.50 to 0.90; 10 trials). Evidence is uncertain for CABG (RR 0.66, 95% CI 0.34 to 1.27; 4 trials), and PCI (RR 0.76, 95% CI 0.48 to 1.20; 3 trials).

Meta-regression showed benefits in outcomes were independent of CHD case mix, type of CR, exercise dose, follow-up length, publication year, CR setting, study location, sample size or risk of bias.

There was evidence that exercise-based CR may slightly increase HRQoL across several subscales (SF-36 mental component, physical functioning, physical performance, general health, vitality, social functioning and mental health scores) up to 12 months' follow-up; however, these may not be clinically important differences. The eight trial-based economic evaluation studies showed exercise-based CR to be a potentially cost-effective use of resources in terms of gain in quality-adjusted life years (QALYs).

Authors' conclusions

This updated Cochrane Review supports the conclusions of the previous version, that exercise-based CR provides important benefits to people with CHD, including reduced risk of MI, a likely small reduction in all-cause mortality, and a large reduction in all-cause hospitalisation, along with associated healthcare costs, and improved HRQoL up to 12 months' follow-up. Over longer-term follow-up, benefits may include reductions in cardiovascular mortality and MI. In the last decade, trials were more likely to include females, and be undertaken in LMICs, increasing the generalisability of findings. Well-designed, adequately-reported RCTs of CR in people with CHD more representative of usual clinical practice are still needed. Trials should explicitly report clinical outcomes, including mortality and hospital admissions, and include validated HRQoL outcome measures, especially over longer-term follow-up, and assess costs and cost-effectiveness.

PLAIN LANGUAGE SUMMARY

Exercise-based rehabilitation for coronary heart disease

Background

Coronary heart disease (CHD) is the single most common cause of death globally. However, with falling CHD mortality rates, an increasing number of people live with CHD and may need support to manage their symptoms (such as angina, shortness of breath with physical activity, and fatigue) and reduce the chances of future problems, such as heart attacks. Exercise-based cardiac rehabilitation (exercise training alone or in combination with psychological or educational interventions) aims to improve the health and outcomes of people with CHD.

Study characteristics

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We searched the scientific literature for randomised controlled trials (experiments that randomly allocate participants to one of two or more treatment groups) looking at the effectiveness of exercise-based treatments compared with no exercise in people of all ages with CHD. The evidence is current to September 2020.

Key results

This latest update identified an additional 22 trials (7795 participants). We included a total of 85 trials that studied 23,430 people with CHD, predominantly heart attack survivors and those who had undergone heart bypass surgery or angioplasty (a procedure which widens narrowed or obstructed arteries or veins). Thirty-eight (45%) of the trials involved exercise-only interventions and 47 (55%) involved interventions with exercise plus other components. The type of exercise most often included was stationary cycling, walking or circuit training. Twenty-one (25%) of the interventions were delivered in the participants' homes.

The findings of this update are consistent with the previous (2016) version of this Cochrane Review, and show important benefits of exercise-based cardiac rehabilitation that include a reduction in the risk of death due to any cause, heart attack, and hospital admission, and improvements in health-related quality of life, compared with not undertaking exercise. A small body of economic evidence was identified, indicating exercise-based cardiac rehabilitation to be cost-effective. Many of the studies identified in this current update were undertaken in low- and middle-income countries, which increases the generalisability of our results to these settings where levels of CHD are high and continue to increase.

Quality of evidence

Although the reporting of methods has improved in recent trials, lack of reporting key methodological aspects made it difficult to assess the overall methodological quality and risk of possible bias of the evidence.