Promoting patient uptake and adherence in cardiac rehabilitation (Review)

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[Intervention Review]

Promoting patient uptake and adherence in cardiac rehabilitation

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ABSTRACT

Background

Cardiac rehabilitation is an important component of recovery from coronary events but uptake and adherence to such programs are below recommended levels. In 2010, our Cochrane review identified some evidence that interventions to increase uptake of cardiac rehabilitation can be effective but there was insufficient evidence to provide recommendations on intervention to increase adherence. In this review, we update the previously published Cochrane review.

Objectives

To determine the effects, both harms and benefits, of interventions to increase patient uptake of, or adherence to, cardiac rehabilitation.

Search methods

We performed an updated search in January 2013 to identify studies published after publication of the previous systematic review. We searched the Cochrane Central Register of Controlled Trials (CENTRAL) (Issue 12, 2012), MEDLINE (Ovid), EMBASE (Ovid), CINAHL EBSCO, Conference Proceedings Citation Index - Science (CPCI-S) on Web of Science (Thomson Reuters), and National Health Service (NHS) Centre for Reviews and Dissemination (CRD) databases (Health Technology Assessment (HTA) and Database of Abstracts of Reviews of Effects (DARE)) on *The Cochrane Library* (Issue 4, 2012). We also checked reference lists of identified systematic reviews and randomised controlled trials (RCTs) for additional studies. We applied no language restrictions.

Selection criteria

Adults with myocardial infarction, coronary artery bypass graft, percutaneous transluminal coronary angioplasty, heart failure, angina, or coronary heart disease eligible for cardiac rehabilitation and RCTs or quasi-randomized trials of interventions to increase uptake or adherence to cardiac rehabilitation or any of its component parts. We only included studies reporting a primary outcome.

Data collection and analysis

At least three authors independently screened titles and abstracts of all identified references for eligibility and obtained full papers of potentially relevant trials. At least two authors checked the selection. Three authors assessed included studies for risk of bias.

Main results

The updated search identified seven new studies (880 participants) of interventions to improve uptake of cardiac rehabilitation and one new study (260 participants) of interventions to increase adherence. When added to the previous version of this review, we included 18 studies (2505 participants), 10 studies (1338 participants) of interventions to improve uptake of cardiac rehabilitation and eight studies (1167 participants) of interventions to increase adherence. We assessed the majority of studies as having high or unclear risk of bias. Meta-analysis was not possible due to multiple sources of heterogeneity. Eight of 10 studies demonstrated increased uptake of cardiac rehabilitation. Successful interventions to improve uptake of cardiac rehabilitation included: structured nurse- or therapist-led contacts, early appointments after discharge, motivational letters, gender-specific programs, and intermediate phase programs for older patients. Three of eight studies demonstrated improvement in adherence to cardiac rehabilitation. Successful interventions included: self monitoring of activity, action planning, and tailored counselling by cardiac rehabilitation staff. Data were limited on mortality and morbidity but did not demonstrate a difference in cardiovascular events or mortality except for one study that noted an increased rate of revascularization in the intervention group. None of the studies found a difference in health-related quality of life and there was no evidence of adverse events. No studies reported on costs or healthcare utilization.

Authors' conclusions

We found only weak evidence to suggest that interventions to increase the uptake of cardiac rehabilitation are effective. Practice recommendations for increasing adherence to cardiac rehabilitation cannot be made. Interventions targeting patient-identified barriers may increase the likelihood of success. Further high-quality research is still needed.

PLAIN LANGUAGE SUMMARY

Promoting patient uptake and adherence in cardiac rehabilitation

Background

Cardiac rehabilitation programs aid recovery from cardiac events such as heart attacks, coronary stent placement, and bypass surgery and reduce the likelihood of further illness. Cardiac rehabilitation programs vary, but usually include one or more of the following: exercise, education, and psychological counselling/support. Despite the benefits of cardiac rehabilitation, not everyone agrees to participate and, of those who do, many people do not adhere to the program recommended. This review updates a previously published Cochrane review that evaluated trials of strategies to promote the uptake of or adherence to cardiac rehabilitation.

Study characteristics

We searched a wide variety of scientific databases for randomised controlled trials (studies that allocate participants to one of two or more treatment groups in a random manner) in adults (over 18 years of age) who had a heart attack, coronary artery bypass graft (a surgical procedure that diverts blood around narrowed or clogged sections of the major arteries to improve blood flow and oxygen supply to the heart), percutaneous transluminal coronary angioplasty (a procedure that opens up blocked coronary arteries), heart failure, angina, or coronary heart disease who were eligible for cardiac rehabilitation. The search was current to January 2013.

Key results

We found 18 trials that were suitable for inclusion (10 trials of interventions to improve uptake and eight trials of interventions to improve adherence). The studies evaluated a variety of techniques to improve uptake or adherence and, in many studies, a combination of strategies was employed.

Strategies to increase uptake were generally effective and included regular nurse- or therapist-led visits, early appointments after discharge, motivational letters, gender-specific programs, and intermediate phase programs for older patients. We assessed few studies as having low risk of bias (low risk of arriving at wrong conclusions because of favoritism by the researchers). Only a small number of studies demonstrated an improvement in adherence with effective interventions including: daily self monitoring of activity, action planning, and adherence facilitation by cardiac rehabilitation staff. However, the risk of bias in these studies was high. We found no evidence that these interventions improved health-related quality of life or reduce cardiovascular events or total mortality. We found no evidence to suggest that interventions to promote uptake or adherence to cardiac rehabilitation cause harm. We found no studies providing information about costs or resource implications.

Quality of the evidence

There was only weak evidence to suggest that interventions to increase uptake of cardiac rehabilitation were effective. Practice recommendations for increasing adherence to cardiac rehabilitation cannot be made. Further high-quality research is needed, particularly in under-represented groups of people such as women, ethnic minorities, older patients, patients with heart failure, and people with co-morbidities (presence of one or more diseases or conditions other than those of primary interest).

BACKGROUND

Description of the condition

The burden of cardiovascular disease (CVD) remains substantial, and the World Health Organization (WHO) lists CVD as the number one cause of death worldwide (WHO 2011). Progress in therapeutic procedures and pharmacologic therapies has led to dramatic reductions in CVD mortality, and, as a result, a greater number of men and women survive acute CVD events. In this context, there is increasing recognition of the need to build comprehensive, multidimensional prevention strategies to prevent recurrent CVD events.

Description of the intervention

Cardiac rehabilitation is a medically sponsored program offered to individuals after cardiac events to aid recovery and prevent further cardiac illness. It includes specific core components that aim to optimize cardiovascular risk reduction, foster healthy behaviours, promote an active lifestyle, and reduce disability among patients with CVD (Balady 2007). This review evaluates interventions that promote uptake or adherence to a cardiac rehabilitation program.

How the intervention might work

Cardiac rehabilitation has been shown to promote a healthy lifestyle, improve physical health, and decrease subsequent morbidity and mortality among patients with coronary heart disease (CHD) (Heran 2011; Taylor 2004). As a result, cardiac rehabilitation is an integral part of many national guidelines for secondary prevention in cardiac patients (Balady 2007; NICE 2007; Perk 2012; Stone 2005). By promoting uptake or adherence to cardiac rehabilitation, these interventions promote the effectiveness of cardiac rehabilitation.

Why it is important to do this review

Although the beneficial effects of cardiac rehabilitation have been shown, participation and adherence remain suboptimal. Surveys across several countries have shown that only 30% of eligible patients participate in such programs (Bethell 2001; Kotseva 2009; Suaya 2007). Such underutilization can be attributed in part to low referral rates among healthcare providers (Brown 2009). However, even among individuals referred to cardiac rehabilitation, few complete a program and less than 50% maintain an exercise regimen for as long as six months after completion (Daly 2002; Moore 2003). Factors reported as predicting attendance and adherence to cardiac rehabilitation include: illness perception, distance, financial and work constraints, gender, age, social support, and depression (Yohannes 2007).

This review was originally published in 2005 (Beswick 2005) and updated using Cochrane methodology in 2010 (Davies 2010a). The review identified some evidence that interventions to increase uptake of cardiac rehabilitation can be effective but insufficient evidence to provide recommendations on interventions to increase adherence. Since publication of the review, there have been several new studies completed. In this review, we aimed to update the 2010 review and incorporate the most recent additions to the literature.

OBJECTIVES

To determine the effects, both harms and benefits, of interventions to increase patient uptake of, or adherence to, cardiac rehabilitation.

METHODS

Criteria for considering studies for this review

Types of studies

Randomized controlled trials (RCTs) either at individual or cluster level or either parallel group, cross-over, or quasi-randomized

design. We identified systematic reviews and meta-analyses as a source of additional studies.

Types of participants

Adults (ages 18 years or over) with myocardial infarction (MI), coronary artery bypass graft (CABG), percutaneous transluminal coronary angioplasty (PTCA), heart failure (HF), angina, or CHD who were eligible for cardiac rehabilitation, or any of its constituent components. For studies of uptake, the study population comprised patients who were eligible for cardiac rehabilitation. For studies of increasing adherence, participants were those who had already registered to take part in a cardiac rehabilitation program at the start of the study.

We excluded studies of participants with heart transplants and people implanted with either cardiac-resynchronization therapy or implantable defibrillators.

Types of interventions

Any intervention with the specific aim of increasing patient uptake of, or adherence to, cardiac rehabilitation or any of its component parts. Interventions could be targeted to: individuals, groups, partners, caregivers or other family members, or health professionals.

We excluded studies evaluating the effects of interventions to improve uptake or adherence to pharmacologic treatments alone (i.e. not in conjunction with any other cardiac rehabilitation activities).

We only included studies comparing two or more interventions to increase uptake or adherence if the study included a usual care control arm.

Types of outcome measures

Primary outcomes

Primary outcome measures for this review were 1. measures of the uptake of, or 2. adherence to, cardiac rehabilitation and its exercise, education, and lifestyle components. We defined adherence as the extent to which the participant's behavior concurred with the advice given by healthcare professionals (e.g. to attend cardiac rehabilitation meetings or to undertake independent exercise). Adherence could be expressed as a dichotomous outcome (i.e. the participant did or did not concord with the advice given) or as a rate (e.g. percentage of weeks during the follow-up period in which the participant did the recommended amount of exercise). We did not consider measures such as frequency of exercise, amount of exercise taken, and measures of exercise capacity (strength, peak oxygen uptake) to be suitable measures of adherence as they do not given an indication of the extent to which participants concurred with the advice given.

Secondary outcomes

Secondary outcomes included:

- all-cause mortality;
- morbidity, modifiable coronary risk factors (smoking behavior, blood lipid levels, blood pressure);
- health-related quality of life;
- harms;
- health service utilization, costs, and any other beneficial or adverse events relevant to the review.

We included only studies that reported at least one primary outcome.

Search methods for identification of studies

A generic search strategy was initially carried out as this review forms part of a broader review that includes four other Cochrane systematic review addressing cardiac rehabilitation (Davies 2010b; Heran 2011; Taylor 2010; Whalley 2011). We then updated this generic search for the purposes of this specific review with detailed search strategies for each electronic database searched.

Electronic searches

In the previous version of the review, RCTs and quasi-randomized controlled trials were identified from a non-Cochrane review (Beswick 2005). The review searched the following databases: Cochrane Central Register of Controlled Trials (CENTRAL) (Issue 4, 2007), MEDLINE DIALOG (2001 to January 2008), EMBASE DIALOG (2001 to January 2008), CINAHL DIALOG (2001 to January 2008), and PsycINFO DIALOG (2001 to January 2008). The review had searched conference proceedings on Web of Science: ISI Proceedings (2001 to April 2008). The authors had located additional studies on National Health Service (NHS) Centre for Reviews and Dissemination (CRD) databases (Health Technology Assessment (HTA) and Database of Abstracts of Reviews of Effects (DARE)), which were both searched from 2001 to January 2008. See Appendix 1 for full details.

We repeated the search in January 2013 as part of the update process by searching the following databases: CENTRAL (Issue 12, 2012), MEDLINE (Ovid, 1946 to January week 2 2013), EMBASE (Ovid, 1980 to 2013 week 03), and CINAHL (EBSCO, 2000 to January 2013). We also searched Conference Proceedings Citation Index - Science (CPCI-S) on Web of Science (Thomson Reuters) (1990 to January 2013). We located additional studies on NHS CRD databases (HTA and DARE), which were both searched from January 2008 to January 2013 on *The Cochrane Library* (Issue 4, 2012).

We limited searches to RCTs (including quasi-randomized), except the searches on *The Cochrane Library* (Lefebvre 2011). We imposed no language or other limitations. Consideration was given

to variations in terms used and spellings of terms in different countries so that studies were not missed by the search strategy. We searched reference lists of all eligible trials and systematic reviews for additional studies. We designed search strategies with reference to those of the previous version of this review (Davies 2010a), and in accordance with Cochrane Heart Group methods and guidance. See Appendix 2 for the search strategy employed in the update.

Data collection and analysis

Selection of studies

In the previous version of this review, two authors (Philippa Davies (PD), Rod Taylor (RT)) independently screened the references identified by the search strategy by title and abstract. In order to be selected, abstracts had to identify the study design, an appropriate population, and relevant components of the intervention clearly as described above. We excluded clearly irrelevant references. We obtained the full-text reports of all remaining trials and two authors (PD, RT) independently assessed them for eligibility based on the defined inclusion criteria. Two authors (PD, Fiona Taylor (FT)) assessed studies included in the non-Cochrane review for inclusion (Beswick 2005). We resolved any disagreements by discussion or, where agreement could not be reached, by consultation with an independent third person (Shah Ebrahim (SE), RT).

For the update, three authors (Kunal N Karmali (KK), FT, Andrew Beswick (AB)) independently screened the references identified by the search strategy by title and abstract. In order to be selected, abstracts had to identify the study design clearly, an appropriate population, and relevant components of the intervention as described above. We excluded clearly irrelevant references. We obtained the full-text reports of all remaining trials and two authors (PD, KK) independently assessed them for eligibility, based on the defined inclusion criteria. We resolved any disagreements by discussion or, where agreement could not be reached, by consultation with an independent third author (FT).

Data extraction and management

For the previous version of this review, a data extraction form was re-designed based on that used in the non-Cochrane review (Beswick 2005). Items relating to risk of bias recommended by the *Cochrane Handbook for Systematic Reviews of Interventions* were added (Higgins 2011). Due to time constraints, a single author (FT) undertook data extraction and a second author (PD) checked entries. We have detailed the excluded studies and reasons for exclusion in the Characteristics of excluded studies table.

For the update, we used the previously designed data extraction form. Two authors (KK and PD or FT) independently extracted relevant data regarding inclusion criteria (study design: participants, type of intervention, comparisons, and outcomes), risk of bias, and results. We have detailed the excluded studies and reasons for exclusion in the Characteristics of excluded studies table.

Assessment of risk of bias in included studies

In the previous version of this review, the risk of bias in eligible trials was assessed by a single author (FT) and verified by a second (PD) using The Cochrane Collaboration's recommended tool, which is a domain-based critical evaluation of the following domains: sequence generation, allocation concealment, blinding of outcome assessment, incomplete outcome data, and selective outcome reporting (Higgins 2011). For the update, two authors (KK and PD or FT) independently assessed the risk of bias in included studies.

Because of the nature of the interventions studied, we did not consider it possible to assess the blinding of treatment assignment. Thus, in our risk of bias table we instead reported on the blinding of outcome assessors. One of the authors (KK) re-extracted the domains of incomplete outcome data and selective outcome reporting that were not explicitly delineated in the original review.

Data synthesis

Based on prior versions of this review (Beswick 2005; Davies 2010a), it was anticipated that a quantitative synthesis would not be possible. The multiple sources of heterogeneity observed across studies (in terms of participants, interventions, and outcomes), together with the small number of studies identified, meant that undertaking a formal meta-analysis was not appropriate. We explored heterogeneity among included studies qualitatively (by comparing the characteristics of included studies). We grouped studies according to whether the interventions were intended to increase uptake of, or adherence to, cardiac rehabilitation (or any of it components).

RESULTS

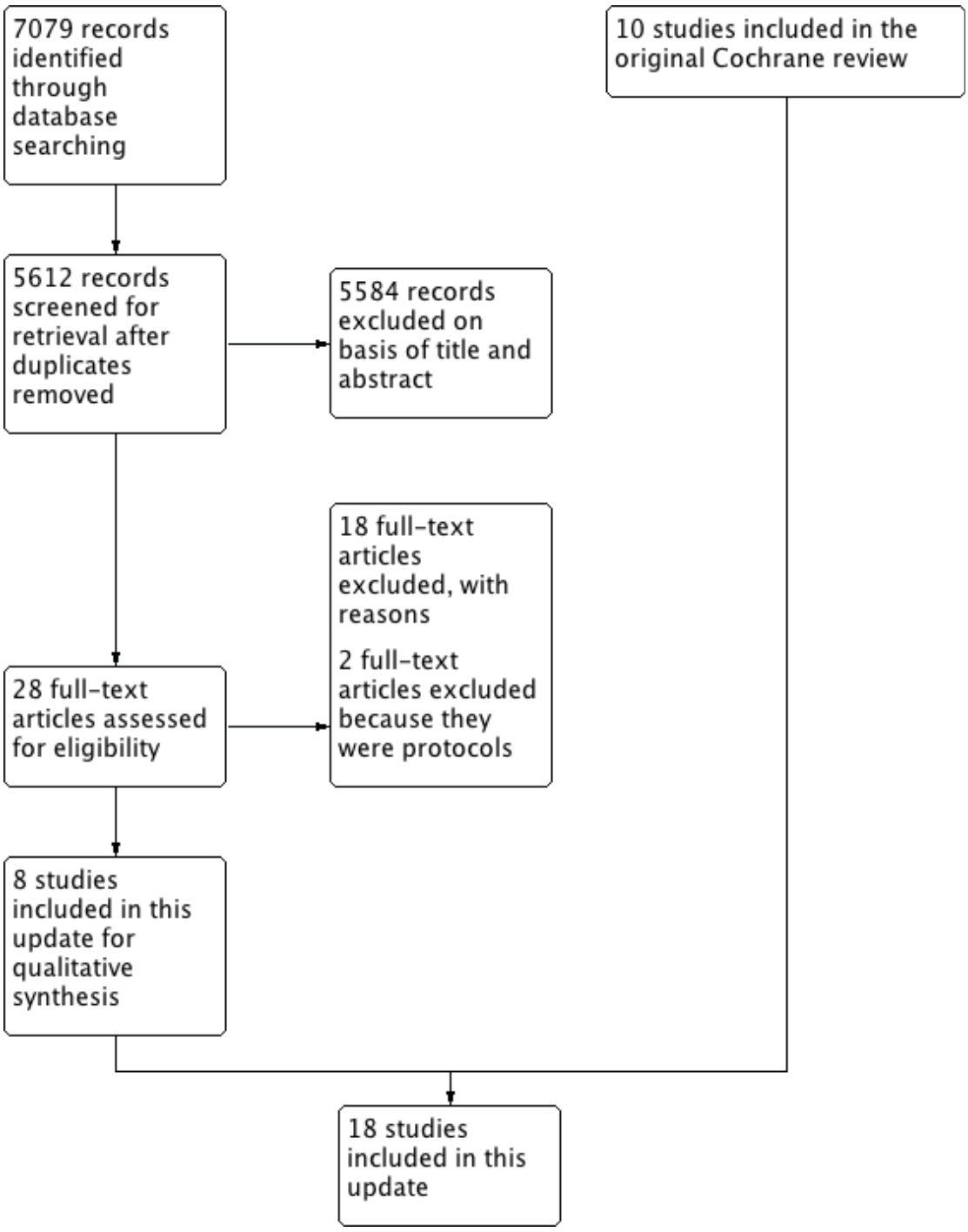
Description of studies

Results of the search

The updated electronic search performed in January 2013 yielded 5612 titles after removal of duplicates. After reviewing the titles and abstracts, we retrieved 28 full-text articles for possible inclusion. We excluded 20 studies, two because they were active protocols. Eight studies met the inclusion criteria and had extractable data to assess interventions that promoted the uptake and adherence to cardiac rehabilitation. The study selection process is illustrated in the flow diagram in Figure 1.

The previous version of this Cochrane review (Davies 2010a) included 10 studies (Ashe 1993; Daltroy 1985; Duncan 2002; Hillebrand 1995; Izawa 2005; Jolly 1999; Moore 2006; Oldridge 1983; Sniehotta 2006; Wyer 2001). We identified an additional eight studies in the updated search that met our inclusion criteria (Arrigo 2008; Beckie 2010; Cossette 2012; Dolansky 2011; McPaul 2007; Pack 2013; Parry 2009; Price 2012). Thus, we have included 18 studies in this update. Details of the studies included in the review are listed in the Characteristics of included studies table.

Figure 1. Flow diagram of the study selection for this update.



Included studies

Studies examining uptake of cardiac rehabilitation

In the previous version of this review, we identified three RCTs that evaluated interventions to increase uptake of cardiac rehabilitation with 458 participants (Hillebrand 1995; Jolly 1999; Wyer 2001). The updated search identified seven new studies with 880 participants (Beckie 2010; Cossette 2012; Dolansky 2011; McPaul 2007; Pack 2013; Parry 2009; Price 2012). Thus, we found 10 studies of 1338 participants evaluating interventions to increase uptake of cardiac rehabilitation.

Study design

One study was cluster randomised by general practice (Jolly 1999). Nine studies were parallel-group RCTs (Beckie 2010; Cossette 2012; Dolansky 2011; Hillebrand 1995; McPaul 2007; Pack 2013; Parry 2009; Price 2012). Four studies were conducted in Canada (Beckie 2010; Cossette 2012; Parry 2009; Price 2012), three studies were conducted in the UK (Jolly 1999; McPaul 2007; Wyer 2001), two studies were conducted in the US (Dolansky 2011; Pack 2013), and one study was conducted in Germany (Hillebrand 1995).

Participants were all people who had had an MI in three studies (Hillebrand 1995; McPaul 2007; Wyer 2001). In three studies, participants were hospitalised for acute coronary syndrome (ACS) or angina (Cossette 2012; Jolly 1999; Pack 2013). Four studies examined a mixed CHD population (Beckie 2010; Dolansky 2011; Parry 2009; Price 2012).

Participants

The majority of participants in six studies were male with participation rates ranging between 71% and 89% (Cossette 2012; Hillebrand 1995; Jolly 1999; McPaul 2007; Parry 2009). Two studies exhibited more parity with 34% to 55% male participation rates (Dolansky 2011; Pack 2013). Two studies, both identified in the updated search, exclusively focused on interventions to increase uptake of cardiac rehabilitation among women (Beckie 2010; Price 2012). Mean age of participants ranged from 52 to 68 years for nine studies (Beckie 2010; Cossette 2012; Hillebrand 1995; Jolly 1999; McPaul 2007; Pack 2013; Parry 2009; Price 2012; Wyer 2001). One study identified in the updated search exclusively focused on older people with a mean age of 77 years (Dolansky 2011).

Interventions

The studies tested a variety of strategies to increase uptake of cardiac rehabilitation. Five studies utilized a structured telephone call or visit by a nurse or therapist after hospital discharge (Cossette 2012; Hillebrand 1995; Jolly 1999; McPaul 2007; Price 2012). Cossette 2012 studied the effect of a nursing intervention focused on illness perception with a combination of telephone and face-to-face meetings during the 10 days after hospital discharge. In the study by Hillebrand 1995, participants in the intervention group received an in-hospital visit from a social worker and a telephone call at four weeks after discharge (the authors described the content of these contacts as "motivational"). Jolly 1999 evaluated a multifaceted intervention involving liaison nurses who coordinated the transfer of care between hospital and general practice, together with patient-held record cards to prompt and guide follow-up. Price 2012 studied the effects of a nurse-delivered telephone coaching program. McPaul 2007 studied the effects of home visits versus telephone follow-up by an occupational therapist on cardiac rehabilitation attendance. One study examined the use of a peer support group to increase cardiac rehabilitation attendance in patients after surgery (Parry 2009). Pack 2013 studied the effect of an early appointment (within 10 days) rather than standard care (within 35 days) on uptake of cardiac rehabilitation. Wyer 2001 evaluated the effects of motivational letters based on the theory of planned behavior (Ajzen 1986).

Two studies employed novel strategies to increase uptake of cardiac rehabilitation in previously under-represented patient subsets, women and older people (Beckie 2010; Dolansky 2011). Beckie 2010 compared the effect of a gender-tailored cardiac rehabilitation program versus traditional cardiac rehabilitation on attendance in exercise and education sessions. Dolansky 2011 studied the effect of an intermediate phase program consisting of cardiac self management instruction and exercise monitoring for older patients discharged to a skilled nursing or home healthcare facility.

Outcomes

Uptake was variously defined in these studies as enrolment in cardiac rehabilitation (Cossette 2012); attendance at a variety of time points: intake appointment (McPaul 2007; Pack 2013; Price 2012), at least one cardiac rehabilitation session (Jolly 1999; Parry 2009), the first week of cardiac rehabilitation (Wyer 2001), six weeks after discharge (Dolansky 2011), 12 months (Hillebrand 1995), or by number of sessions over a 12-week period (Beckie 2010). Two studies reported on the secondary outcomes of serum cholesterol, blood pressure, and smoking status (Cossette 2012; Jolly 1999). Health-related quality of life was also reported by Parry 2009. Three studies included data on the secondary outcomes

of death, mortality, CHD events, or hospitalizations (Dolansky 2011; McPaul 2007; Pack 2013).

Studies examining adherence to cardiac rehabilitation

In the original review, seven studies evaluated eight interventions to increase adherence to cardiac rehabilitation or its component parts, with 906 participants (Ashe 1993; Daltroy 1985; Duncan 2002; Izawa 2005; Moore 2006; Oldridge 1983; Sniehotta 2006). The updated search identified one study of 261 patients (Arrigo 2008). Thus, we found eight studies involving 1167 patients.

Study design

Six studies were randomised (Arrigo 2008; Daltroy 1985; Duncan 2002; Izawa 2005; Moore 2006; Oldridge 1983), and two were quasi-randomized (Ashe 1993; Sniehotta 2006). All eight studies utilized a parallel group design and the unit of allocation was the individual patient. Length of follow-up ranged from two to 12 months. Four studies were conducted in the US (Ashe 1993; Daltroy 1985; Duncan 2002; Moore 2006), and one each in Japan (Izawa 2005), Canada (Oldridge 1983), Germany (Sniehotta 2006), and Switzerland (Arrigo 2008).

Participants

Participants were all patients who had had an MI in one study (Izawa 2005), and all patients with HF in another study (Duncan 2002). Six studies included a mix of patients with CHD including MI, CABG, PTCA, angina, and valve problems (Arrigo 2008; Ashe 1993; Daltroy 1985; Moore 2006; Oldridge 1983; Sniehotta 2006). In six studies, over 80% of participants were male (Arrigo 2008; Daltroy 1985; Duncan 2002; Izawa 2005; Oldridge 1983; Sniehotta 2006), 62% were male in one study (Moore 2006), and gender was not reported in one study (Ashe 1993). The mean age of participants in studies ranged from 51 to 66 years.

Interventions

In seven of the eight studies, the intervention was designed to increase adherence to exercise (Arrigo 2008; Ashe 1993; Daltroy 1985; Duncan 2002; Izawa 2005; Moore 2006; Sniehotta 2006). In three of these studies, exercise occurred in a supervised setting (Arrigo 2008; Ashe 1993; Daltroy 1985), whereas in four studies participants were given a recommended level of exercise that was carried out unsupervised (Duncan 2002; Izawa 2005; Moore 2006; Sniehotta 2006). In one study, the intervention targeted adherence to supervised cardiac rehabilitation sessions (Oldridge 1983). The intervention involved self monitoring of daily physical activities, body weight and cigarettes smoked, and a written commitment to participate.

The interventions evaluated to increase adherence were varied and multifaceted. These interventions included: goal setting (Ashe 1993; Duncan 2002; Moore 2006), action planning (Sniehotta 2006), self monitoring of exercise (Duncan 2002; Izawa 2005; Moore 2006), self monitoring of daily activities (Arrigo 2008; Ashe 1993), body weight (Izawa 2005), heart rate (Izawa 2005), feedback (Duncan 2002; Izawa 2005), problem-solving and coping strategies (Ashe 1993; Daltroy 1985; Duncan 2001; Moore 2006; Sniehotta 2006), written and oral commitments (Daltroy 1985), stress management (Ashe 1993), persuasive written and telephone communication (Daltroy 1985), and small group interaction and peer modeling (Moore 2006). One study targeted the intervention at participants' spouses in addition to the participants themselves (Daltroy 1985).

Outcomes

Adherence was variously defined across studies in terms of number of sessions attended, frequency of exercise, or duration of exercise. In one study, the exact method used to calculate adherence was not clear (Duncan 2002).

In addition to adherence, two studies evaluated health-related quality of life (Arrigo 2008; Duncan 2002), and one reported on CHD event rates (Arrigo 2008).

Excluded studies

In the original review, we excluded 18 studies with the most common reason being an inadequate measure of adherence (Aish 1996; Brodie 2005; Carroll 2007; Duncan 2001; Froelicher 2003; Hopper 1995; Hughes 2002; Hughes 2007; Kummel 2007; Luszczynska 2006; Mahler 1999; Moore 2002; Palomäki 2002; Rejeski 2002; Sniehotta 2005; Southard 2003; Stromberg 2006; Vestfold 2003).

In the update, we excluded 18 studies after full-text review (Butler 2009; Carlson 2000; Dankner 2011; Furber 2010; Higgins 2001; Jolly 2009; Leemrijse 2012; Meillier 2012; Peterson 2012; Powell 2010; Redfern 2009; Reid 2012; Reusch 2011; Richardson 2010; Willmott 2011; Wolkanin-Bartnik 2011; Wu 2012; Zarani 2010). The most common reason for exclusion was an inadequate measure of adherence.

A list of excluded studies, together with reasons for exclusion, can be found in the Characteristics of excluded studies table.

Ongoing studies

We identified two RCT protocols in the updated search examining interventions to increase adherence to cardiac rehabilitation. One RCT examined the effect of a telephone-delivered lifestyle intervention on weight management and physical activity among individuals referred to cardiac rehabilitation in Australia (Sangster 2010). Another RCT examined the effect mobile health technologies to deliver personalized and automated messages to improve exercise capacity and self reported physical activity over a 24-week

period (Maddison 2011). Additional details of the studies are provided in the Characteristics of ongoing studies table.

Risk of bias in included studies

Limited reporting of the methodology and outcome data in the published papers precluded us, in most cases, from adequately performing a critical evaluation of the following domains: sequence generation, allocation concealment, blinding, incomplete outcome data, selective outcome reporting, and other sources of bias. Nevertheless, we attempted to assess the risk of bias for each of the 18 included studies given the available information in the published trial reports (see Figure 2; Figure 3).

Figure 2. Methodological quality graph: review authors' judgments about each methodological quality item presented as percentages across all included studies.

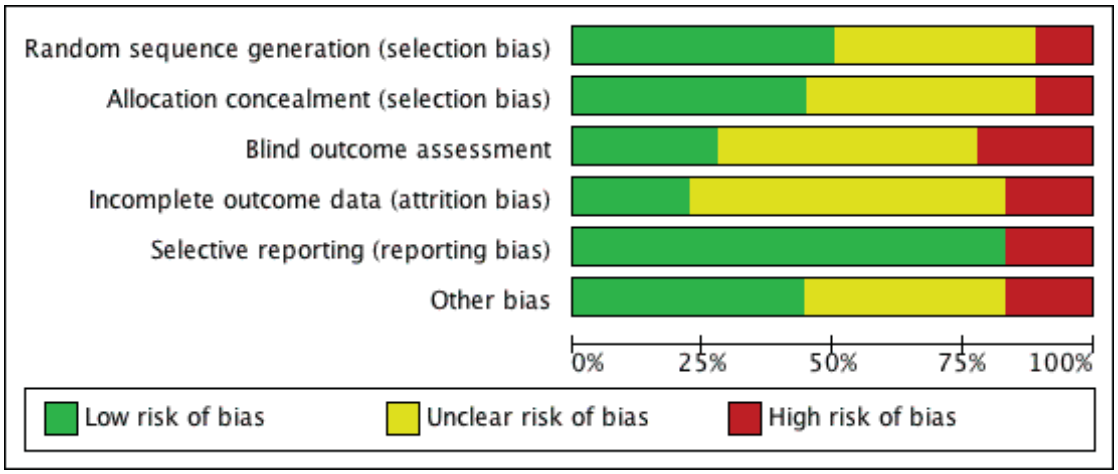
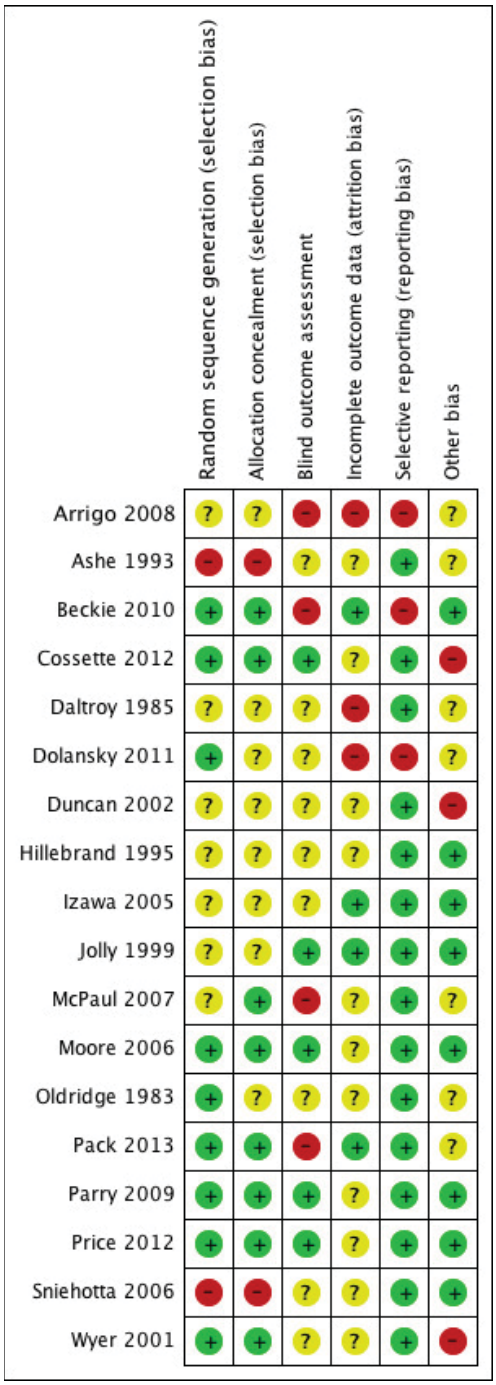


Figure 3. Methodological quality summary: review authors' judgments about each methodological quality item for each included study.



Notably, our inclusion of only studies reporting the outcomes of interest (uptake or adherence to cardiac rehabilitation) may have resulted in a biased sample.

Allocation

All studies were described as randomised but seven did not report the method of randomization (Arrigo 2008; Daltroy 1985; Duncan 2002; Hillebrand 1995; Izawa 2005; Jolly 1999; McPaul 2007). Two studies employed a weak method of randomization (Ashe 1993; Sniehotta 2006). The remaining nine studies reported an adequate method of randomization (Beckie 2010; Cossette 2012; Dolansky 2011; Moore 2006; Oldridge 1983; Pack 2013; Parry 2009; Price 2012; Wyer 2001). Concealment of allocation prior to entry to the study was not done in two studies (Ashe 1993; Sniehotta 2006), and was unclear in eight studies (Arrigo 2008; Daltroy 1985; Dolansky 2011; Duncan 2002; Hillebrand 1995; Izawa 2005; Jolly 1999; Oldridge 1983). Eight studies adequately described methods used to conceal allocation (Beckie 2010; Cossette 2012; McPaul 2007; Moore 2006; Pack 2013; Parry 2009; Price 2012; Wyer 2001).

Blinding

Due to the nature of the intervention, blinding of participants and personnel to treatment allocation was not deemed possible, so blinding of outcome assessors was evaluated instead. Blinding of outcome assessors was only adequately performed in five studies (Cossette 2012; Jolly 1999; Moore 2006; Parry 2009; Price 2012). It could not be determined in nine studies (Ashe 1993; Daltroy 1985; Dolansky 2011; Duncan 2002; Hillebrand 1995; Izawa 2005; Oldridge 1983; Sniehotta 2006; Wyer 2001), and was not satisfactory in four studies (Arrigo 2008; Beckie 2010; McPaul 2007; Pack 2013).

Incomplete outcome data

Dropout rates varied from 0% to 50%, but only one study had a dropout rate greater than 24% (Daltroy 1985). Reasons for loss to follow-up and drop-out were rarely reported and intention-to-treat analyses were rarely performed. Only four studies adequately addressed incomplete data (Beckie 2010; Izawa 2005; Jolly 1999; Pack 2013).

Selective reporting

The majority of studies reported all outcomes described in the methods section. Only three studies had high-risk of bias in selective reporting of outcomes (Arrigo 2008; Beckie 2010; Dolansky 2011).

Due to time constraints, we did not contact authors for clarification of data, thus our review may be at risk of outcome reporting bias. If protocols had been published for the studies included in our review, these would have been identified by our search. Our search identified two protocols of ongoing studies (Maddison 2011; Sangster 2010). Outcome reporting bias most commonly occurs when outcomes are not reported due to no significant effect being found. Given that the interventions evaluated in our study were varied with little overlap between interventions and that most of the adherence studies were negative, we feel that publication bias is unlikely to have changed the conclusions of our review.

Effects of interventions

Interventions to increase uptake of cardiac rehabilitation

Uptake

Of the 10 RCTs (1338 participants) evaluating the effectiveness of interventions to increase uptake of cardiac rehabilitation, eight studies (1206 participants) reported higher rates of cardiac rehabilitation uptake in the intervention group (Beckie 2010; Cossette 2012; Dolansky 2011; Hillebrand 1995; Jolly 1999; Pack 2013; Price 2012; Wyer 2001). Two studies (120 participants) found no difference (McPaul 2007; Parry 2009). Twelve participants who were randomised to an intervention were not analysed. Attendance in the intervention groups ranged from 24% to 90%. Percentage difference in attendance between intervention and comparison groups ranged from 11% to 46%. Successful interventions were varied and included gender-tailored cardiac rehabilitation sessions (Beckie 2010), structured follow-up via either telephone call or visit by a healthcare professional, or both (Cossette 2012; Hillebrand 1995; Jolly 1999; Price 2012); intermediate phase program (Dolansky 2011), protocolized early appointments to cardiac rehabilitation (Pack 2013), and motivational letters (Wyer 2001). Most studies were assessed as unclear or high risk of bias. Only two studies that demonstrated an improvement in uptake of cardiac rehabilitation were assessed as low risk of bias (Cossette 2012; Price 2012). Results for the individual studies can be found in Table 1.

Secondary outcomes

Six studies (827 participants) reported data for secondary outcomes (Cossette 2012; Dolansky 2011; Jolly 1999; McPaul 2007; Pack 2013; Parry 2009). Cardiovascular risk factors such as smoking rates and body mass index (BMI) did not differ between treatment arms in two studies involving 519 participants (Cossette

2012; Jolly 1999). Three studies (213 participants) reported on re-hospitalization, CHD event, and mortality rates and found no difference between treatment arms (Dolansky 2011; McPaul 2007; Pack 2013). Results are summarized in Table 2, Table 3, and Table 4. One study reported on health-related quality of life and found no difference although there was a trend toward greater improvement in the role-physical domain (t[93] = -1.9; P value = 0.06) and physical component score (t[89] = -1.6; P value = -0.12) in the peer support intervention group (Parry 2009). Additional information on adverse effects were not reported. No studies examined cost-effectiveness.

Interventions to increase adherence to cardiac rehabilitation

Adherence

Eight studies (1167 participants) examined interventions to increase adherence to cardiac rehabilitation or any of its components. Three studies (486 participants) demonstrated significant improvements in adherence to cardiac rehabilitation or any of its components (Arrigo 2008; Duncan 2002; Sniehotta 2006). Five studies (630 participants) showed no difference in adherence to cardiac rehabilitation (Ashe 1993; Daltroy 1985; Izawa 2005; Moore 2006; Oldridge 1983). Fifty-one participants of the 1167 participants who were initially randomised in the eight trials were not analysed. Results for the individual studies can be found in Table 5.

Of the studies that found improvements in adherence to cardiac rehabilitation, one study evaluated adherence in the setting of a supervised exercise session (Arrigo 2008). Two studies examined interventions to increase adherence to unsupervised exercise (Duncan 2002; Sniehotta 2006). Arrigo 2008 utilized a diary monitoring physical activity on a daily basis as well as quarterly physician-supervised exercise sessions to demonstrate an improvement in regular physical activity at one year (227 participants, 70% with diary monitoring versus 37% with usual care, P value < 0.0001). Duncan 2002 evaluated a multifaceted intervention incorporating goal setting, feedback, and problem solving in patients with HF. No significant difference was observed at 12 weeks in adherence to the recommended duration of exercise, but adherence to the recommended frequency of exercise was significantly higher in the intervention group (16 participants, 104% in the intervention group versus 64% in the control group, P value < 0.01). Sniehotta 2006 evaluated two interventions to increase adherence. Participants in the action-planning group were asked to develop three action plans each about when, where, and how they intended to exercise and implement extra everyday activities after discharge. Participants in the combined group were asked to develop three coping plans to overcome anticipated barriers (identified by participants themselves), in addition to the action plans. Although there was no difference in adherence between the 'Action-planning' and control participants (149 participants, 44% adherence in the action-planning group versus 42% adherence in the control group, not statistically significant), those in the 'Combined-planning' group were significantly more adherent than both the 'Action-planning' (130 participants, 71% adherence in the combined-planning group versus 44% adherence in the action-planning group, P value < 0.01) and control groups (143 participants, 71% adherence in the combined-planning group versus 42% adherence in the control group, P value < 0.001). However, all three studies had high risk of bias with differential drop-out in the intervention group for one study (Arrigo 2008), and inadequate randomization and concealment of allocation for two studies (Duncan 2002; Sniehotta 2006). Notably, the findings of Duncan 2002 can be contrasted with those of Moore 2006, a study with lower risk of bias that evaluated a similar intervention but found no strong evidence of effect on adherence (measured at 12 months).

Secondary outcomes

Two studies reported data for secondary outcomes considered by this review (Arrigo 2008; Duncan 2002). Both studies reported on measures of health-related quality of life. In Duncan 2002, health-related quality of life was improved in the intervention group but the evidence was weak. The sample size was small (16 participants) and the study may, therefore, not have been adequately powered. In Arrigo 2008, health-related quality of life scores improved in both groups but there was no significance different between intervention and control. Arrigo 2008 also demonstrated an improvement at one year in the intervention arm for low-density lipoprotein-cholesterol (0.25 mmol/L reduction versus 0.03 mmol/L reduction, P value < 0.05) and BMI (0.1 kg/m^2 increase versus 0.3 kg/m^2 increase, p < 0.05). In addition, Arrigo 2008 demonstrated an increase in CHD event rates in the intervention arm but this was attributed to an increase in revascularization (see Table 3). Additional information on adverse effects was not reported. None of the studies identified reported mortality, health service utilization, or costs.

DISCUSSION

Cardiac rehabilitation is an important component of improving from coronary events and reduces the risk of future cardiac events. Despite this, both uptake of cardiac rehabilitation and adherence to such programs are below the recommended levels, especially in certain groups. The aim of this systematic review was to update a previously published Cochrane review (Davies 2010a), and to determine the effects of interventions to increase patient uptake of, or adherence to, cardiac rehabilitation.

Summary of main results

Uptake of cardiac rehabilitation

We identified 10 RCTs (1338 participants) of interventions to improve uptake of cardiac rehabilitation, of which eight demonstrated improvement in the uptake of cardiac rehabilitation (Beckie 2010; Cossette 2012; Dolansky 2011; Hillebrand 1995; Jolly 1999; Pack 2013; Price 2012; Wyer 2001). Successful interventions included structured telephone or home visits by a nurse or therapist after hospital discharge (Cossette 2012; Hillebrand 1995; Jolly 1999; Price 2012), early appointments to cardiac rehabilitation (Pack 2013), and motivational letters (Wyer 2001). Two studies examined novel interventions to improve uptake of cardiac rehabilitation in women and older people, two previously under-represented patient groups (Beckie 2010; Dolansky 2011). Studies did not find a difference in cardiovascular risk factor levels (Cossette 2012; Jolly 1999); event rates such as rehospitalization, CHD events, or mortality (Dolansky 2011; McPaul 2007; Pack 2013); or health-related quality of life (Parry 2009).

Adherence of cardiac rehabilitation

We identified eight RCTs (1167 participants). One RCT examined adherence to a comprehensive cardiac rehabilitation program (Oldridge 1983), and seven RCTs examined exercise only, either supervised (Arrigo 2008; Ashe 1993; Daltroy 1985), or unsupervised (Duncan 2002; Izawa 2005; Moore 2006; Sniehotta 2006). A wide variety of techniques, and combinations of techniques, were evaluated including goal setting, action planning, self monitoring (of exercise, daily activities, body weight, heart rate, smoking, and contact with healthcare professionals), feedback, problem-solving and coping strategies, written and oral commitment, stress management, persuasive written and telephone communication, and small group interaction and peer modeling. Three studies reported improvement on adherence using activity monitoring with daily diary entries, goal setting, and action planning (Arrigo 2008; Duncan 2002; Sniehotta 2006), but adherence to exercise was self reported and follow-up length was limited. We assessed none of the studies as having low risk of bias.

Overall completeness and applicability of evidence

Six of the 10 studies promoting uptake of cardiac rehabilitation recruited people with MI or ACS (Cossette 2012; Hillebrand 1995; Jolly 1999; McPaul 2007; Pack 2013; Wyer 2001). Four studies recruited a mixed CHD population (Beckie 2010; Dolansky 2011; Parry 2009; Price 2012).

Six of the eight studies of adherence to cardiac rehabilitation recruited mixed CHD populations including MI, CABG, PTCA, angina, and valve problems (Arrigo 2008; Ashe 1993; Daltroy 1985; Moore 2006; Oldridge 1983; Sniehotta 2006). Only one study identified by the review included people with HF and the sample size was small (13 participants; Duncan 2002). Exercise training is an emerging therapy for people with HF and has been shown to be beneficial in people with mild-to-moderate HF (Davies 2010b), yet such patients may avoid exercise through fear of placing excessive strain on the heart. The identification of effective techniques to increase adherence to exercise recommendations in people with HF may, therefore, be particularly valuable.

The majority of participants in the studies included in this review were male. However, two studies identified in the updated search had interventions specifically targeted to women (Beckie 2010; Price 2012). Other groups frequently under-represented in cardiac rehabilitation include older participants, ethnic minorities, and people with co-morbidities (Beswick 2004). Although the majority of participants in the review were middle-aged (age 40 to 60 years), Dolansky 2011 examined the effect of an intermediary stage in cardiac rehabilitation in an older population (ages 65 years or older). Ethnicity was rarely reported within the included studies.

In the majority of the included studies, the intervention was targeted at recruited participants while one study also targeted the intervention at participants' spouses (Daltroy 1985). Despite the fact that physician endorsement has been found to be a strong predictor of uptake (Jackson 2005), only one study was identified that targeted health professionals as well as patients (Jolly 1999).

A range of different techniques to increase uptake or adherence has been evaluated in the studies identified. Interventions were usually multifaceted and many different combinations of techniques were studied. Very few studies evaluated a single intervention strategy. The literature review by Beswick identified a broad range of suggested interventions for increasing uptake and adherence in cardiac rehabilitation, most of which have not been formally evaluated (Beswick 2004).

Interventions rarely targeted barriers to uptake and adherence frequently cited by patients, such as transport difficulties, family commitments, and inconvenient timing (Beswick 2004). Only one study identified in the update targeted participants' illness perceptions (Cossette 2012).

We used strict definitions of uptake and adherence for the purpose of this review, and only included studies that reported these primary outcomes. Few studies reported secondary outcomes considered in this review. Three studies reported the effects of the intervention on cardiovascular risk factors (serum cholesterol, blood pressure, smoking status) (Arrigo 2008; Cossette 2012; Jolly 1999). Three studies reported on cardiovascular event rates (Arrigo 2008; Dolansky 2011; Pack 2013), with one reporting an increase in cardiovascular events among people randomised to intervention due to an increased rate of revascularization (Arrigo 2008). Three studies included mortality information and found no difference (Dolansky 2011; McPaul 2007; Pack 2013). Three studies

reported on measures of health-related quality of life and found no difference (Arrigo 2008; Duncan 2002; Parry 2009). No studies provided information on the costs of the intervention or other resource implications. Lastly, despite the wide definition of cardiac rehabilitation, the studies overwhelmingly studied exercise programs. Therefore, we have little evidence to support these interventions in increasing uptake or adherence in more diverse cardiac rehabilitation programs.

Quality of the evidence

As with the previously published version of this Cochrane review (Davies 2010a), this update reveals limitations in the available RCT evidence examining interventions to promote uptake to, and adherence of, cardiac rehabilitation. Several studies did not provide enough detail to assess their potential risk of bias (Figure 2; Figure 3). Details of allocation concealment and blinding of outcomes assessment were rarely described. Incomplete outcome data (primarily due to losses to follow-up or drop-outs) were insufficiently addressed in most trials and intention-to-treat analyses were rarely reported or performed. Nine studies provided adequate description of the randomization process (Beckie 2010; Cossette 2012; Dolansky 2011; Moore 2006; Oldridge 1983; Pack 2013; Parry 2009; Price 2012; Wyer 2001). Eight studies provided adequate description of allocation concealment (Beckie 2010; Cossette 2012; McPaul 2007; Moore 2006; Pack 2013; Parry 2009; Price 2012; Wyer 2001). The interventions evaluated were varied and often multifaceted limiting the ability to determine consistency of findings. Both uptake and adherence were defined differently from study to study and time-horizons also varied. All eight studies examining interventions to increase adherence to physical activity relied upon self reported exercise levels and these measures may have been affected by social desirability or poor recall (Arrigo 2008; Ashe 1993; Daltroy 1985; Duncan 2002; Izawa 2005; Moore 2006; Oldridge 1983; Sniehotta 2006). Use of pedometers and heart monitors to validate self reported exercise behavior in such trials would have been desirable. The small body of evidence and the multifaceted nature of many of the interventions evaluated means that the consistency of findings could not be determined. Although the quality of reporting tends to be poorer for older studies and improved among studies included from the updated search, it does not appear to have appreciably improved.

Potential biases in the review process

This Cochrane review focused on the uptake or adherence of cardiac rehabilitation. We applied strict inclusion and exclusion criteria for study selection so our review may be biased toward studies that found positive effects. Other outcome measures, such as frequency of exercise, amount of exercise taken, measures of exercise capacity (strength, peak oxygen uptake), cardiac functional status, and potential mediating variables of adherence (e.g. self efficacy, health beliefs) were not considered. It may be the case that some of the interventions evaluated were effective in targeting these outcomes even if the effects on adherence were not significant.

Due to the nature of the interventions, blinding of participants and personnel to treatment allocation was not felt to be possible. Instead, we evaluated blinding of outcome assessors. Nevertheless, the potential for lack of blinding of participants and personnel may introduce a potential source of bias in all these studies.

Due to time constraints, we did not contact authors of studies for further information. The primary reason for exclusion of full papers assessed was the lack of a suitable measure of adherence. It may be that adherence rates (or sufficient data to calculate adherence) could have been obtained from study authors had they been contacted, resulting in a greater number of trials of interventions to increase uptake and adherence being included.

AUTHORS' CONCLUSIONS

Implications for practice

This update reveals multiple interventions that can increase uptake of cardiac rehabilitation, such as motivational communications by nurse liaisons, therapists, or peers; early appointments after discharge; gender-tailored cardiac rehabilitation; or intermediary rehabilitation programs for older people. There is some evidence that increasing self monitoring of physical activity and action planning can lead to greater adherence to cardiac rehabilitation but these studies were assessed as having high or unclear risk of bias, so there continues to be few practice recommendations that can be made. Coping strategies targeting barriers to adherence may be helpful in improving adherence. Barriers to uptake and adherence in cardiac rehabilitation are many and varied and reasons for non-participation may vary between individuals. Individually tailored approaches may increase the likelihood of success.

Implications for research

As there is a good rationale for increasing uptake and adherence to cardiac rehabilitation, further high-quality research is needed, particularly in under-represented groups such as women, ethnic minorities, older people, people with HF, and people with co-morbidities. Interventions should be developed with barriers to uptake and adherence in mind. The evaluation of single strategies will make it easier to identify the 'active ingredients' of interventions. The effects of interventions on clinical outcomes such as cardiovascular risk factors (smoking, blood lipid levels, blood pressure), health behaviours, and health-related quality of life should be assessed. Moreover, the beneficial and adverse effects of these interventions should be studied within the context of the costs and resources that they require.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Arrigo 2008

Methods	Parallel group RCT.
Participants	261 patients recruited from an inpatient or outpatient cardiac rehabilitation program (129 intervention, 132 control). 227 (105 intervention, 133 control) analysed. 91% with CAD, 42% with previous cardiac surgery, 58% with prior angioplasty. Mean age 61 ± 10 years, 85% male
Interventions	INTERVENTION: participants were instructed on how to use a diary sheet where physical activities were described and quantitated in minutes. They were also invited to take part in quarterly physician-supervised group exercise sessions where diary sheets were collected and questions discussed. COMPARISON: participants were asked to return after 1 year for re-evaluation without further instructions
Outcomes	Primary outcome: regular physical activity defined as "being active to noticeably increase pulse rate and breathing ≥ 30 minutes." Secondary outcomes: nonfatal cardiac events, exercise capacity, BMI, cholesterol, medication use, quality of life
Notes	Authors did not report on use of diary or attendance at quarterly group meetings. There was differential drop-out with 23 participants from the intervention arm withdrawing consent and not available for 1-year follow-up compared with 8 participants from the control arm. Participants in the intervention arm had increased rate of nonfatal cardiac events but this was driven by increased rate of revascularization procedures

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Randomized allocation reported but the means by which randomization was performed was not
Allocation concealment (selection bias)	Unclear risk	Not reported.
Blind outcome assessment All outcomes	High risk	Not blinded.
Incomplete outcome data (attrition bias) All outcomes	High risk	31 randomised patients (23 intervention, 8 control) withdrew and were not available for re-evaluation after 1 year. Outcomes only reported on 216 patients. Dropout rate 17%. ITT not performed

Arrigo 2008 (*Continued*)

Selective reporting (reporting bias)	High risk	Did not report on outcomes of diary use or attendance at quarterly meetings
Other bias	Unclear risk	Groups comparable at baseline including all major prognostic factors. However, primary outcome of physical activity was measured by self report. The intervention arm had additional physician-supervised meetings every 3 months

Ashe 1993

Methods	Parallel group RCT (see notes).
Participants	41 participants recruited from a phase 2 cardiac rehabilitation program. Mixed sample including cardiac patients with MI, CABG, angina, and valve problems. Mean age 62 (range 33-77) years, gender not reported, 95% white
Interventions	INTERVENTION: motivational relapse prevention intervention received during the course of the cardiac rehabilitation program, which consisted of 3 exercise sessions per week of 30-40 minutes' duration for 2-3 months. The intervention was started after 4 or 5 exercise sessions. The intervention was based on Marlatt and Gordon's model (Marlatt 1980). Patients received individual sessions, 1 a week for 3 weeks Session 1: using pretest information, factors found to interfere with adherence were introduced. Patients discussed their perceptions on the value of exercise, listed their goals for the program and anticipated outcomes Session 2: patients were introduced to decision-making concepts and cognitive interference factors. Discussion with regard to coping with 'slips' and introduction to appropriate ways to reframe perspectives. Patients filled in daily activity sheets Session 3: focused on the importance of lifestyle balance. Patients were asked to refer to daily activity sheets to introduce concepts of shoulds and wants. Stressors were identified that may affect lifestyle balance and discussed, as was the importance of positive thinking and use of medication. Patients also took part in a stress management exercise and relaxation procedure COMPARISON: during the course of the exercise program patients received a 'benign' education intervention, which covered basic exercise concepts, guidelines for proper exercise participation, exercise tips and handouts, and the benefits of exercise
Outcomes	Primary outcome: total adherence to the maximum number of exercise sessions
Notes	Weak randomization - allocation to groups by presenting patients with a packet containing a form coded A or B

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	Allocation to groups by presenting patients with a packet containing a form coded A or B

Ashe 1993 (*Continued*)

Allocation concealment (selection bias)	High risk	Allocation to groups by presenting patients with a packet containing a form coded A or B
Blind outcome assessment All outcomes	Unclear risk	Not reported.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	9 (22%) drop-outs matched between treatment allocation but reason not provided
Selective reporting (reporting bias)	Low risk	All relevant outcomes described in methods were reported.
Other bias	Unclear risk	Similarity of groups at baseline unclear.

Beckie 2010

Methods	Parallel group RCT
Participants	252 women aged > 21 years old referred to an outpatient cardiac rehabilitation program in the US (141 randomised to a gender-tailored cardiac rehabilitation program, 111 to a traditional program). Mixed CHD population but exact case-mix not defined. Prior publication referred to: 52.7% PCI, 30.8% CABG, 12.1% stable angina, 4.4% MI (Beckie 2008). Mean age 63 (range 31-87) years. 0% male. 82% Caucasian.
Interventions	INTERVENTION: participants were randomised to a gender-tailored cardiac rehabilitation program where participants exercised exclusively with women. The intervention was guided by the TTM of behavioral change and delivered with motivational interviewing counselling style by research nurses and exercise physiologists. The TTM expert prepared an individualized report tailored on TTM constructs to facilitate feedback. Psychologists and nurse specialists provided 1-hr individualized motivational interviewing sessions at weeks 1 and 6 to participants. Psychoeducational classes were held weekly prior to exercise sessions. COMPARISON: traditional cardiac rehabilitation program following the case management model that was delivered by female nurses and exercise physiologists. The exercise protocol consisted of aerobic and resistance training 3 days/week for 12 weeks. Cardiac rehabilitation personnel provided education classes focusing on CHD risk factor modification at 5 different times weekly
Outcomes	Primary outcomes: exercise attendance and education attendance Secondary outcomes: psychosocial predictors of cardiac rehabilitation attendance (perceived health status, quality of life, depression, social support, hope, and optimism), BMI, smoking status, metabolic equivalents on modified Bruce protocol
Notes	The gender-tailored rehabilitation session was a single class time when the traditional rehabilitation facility was closed. The study also studied baseline sociodemographic and clinical predictors of attendance of the exercise and education components of cardiac rehabilitation

Beckie 2010 (*Continued*)

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Biased coin randomization.
Allocation concealment (selection bias)	Low risk	Statistician provided treatment assignment sheets that were placed in opaque envelopes, sealed, and delivered to the project director
Blind outcome assessment All outcomes	High risk	Cardiac rehabilitation staff not blinded and project director aware of randomization. Only 1 class available for gender-tailored cardiac rehabilitation
Incomplete outcome data (attrition bias) All outcomes	Low risk	No drop-outs.
Selective reporting (reporting bias)	High risk	Primary outcome (attendance) reported but secondary outcomes were not
Other bias	Low risk	Groups were comparable at baseline including all major prognostic factors. Validated tools used for measurement of psychosocial variables in secondary outcomes

Cossette 2012

Methods	Parallel group RCT.
Participants	242 adults hospitalised for suspected acute coronary syndrome at the coronary care unit or medical ward of a specialized cardiac hospital in Montreal (121 randomised to nursing intervention, 121 randomised to control). 59% hospitalised for MI and 41% with unstable angina. Mean age 59 years. 86% male
Interventions	INTERVENTION: 3 encounters over the 10 days after discharge. The first encounter was face-to-face and occurred before discharge, addressing the patient's symptoms and physical activity after discharge, their understanding of the illness, and their concerns and worries. The second encounter occurred 3 days post-discharge via telephone call and focused on the patient's clinical condition, including ability to manage the disease. The third encounter occurred 10 days post-discharge via telephone call or hospital meeting with the focus of addressing risk factors and lifestyle modification including rehabilitation enrolment. COMPARISON: patients were referred to the rehabilitation centre affiliated with academic hospital and encouraged to call the rehabilitation centre themselves to schedule an appointment All study participants received telephone calls from staff to enrol in cardiac rehabilitation and those who accepted were scheduled for a first appointment within 6 weeks of discharge

Cossette 2012 (*Continued*)

Outcomes	Primary outcome: enrolment in cardiac rehabilitation program Secondary outcomes: illness perception, family support, anxiety level, medication adherence, and cardiac risk factor levels
Notes	Study only included patients hospitalised for acute coronary syndrome. Rehabilitation centre was free of charge. Enrollment at surrounding rehabilitation facilities was not ascertained

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Randomization carried out in advance by a statistician at the coordinating centre
Allocation concealment (selection bias)	Low risk	Study nurses provided with sealed opaque envelopes that they opened after each patient had completed the baseline questionnaire
Blind outcome assessment All outcomes	Low risk	Enrollment in cardiac rehabilitation assessed by database as well as independent data entry performed by the coordinating centre
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	5 lost to follow-up in intervention arm, 17 in control arm. ITT calculations not provided
Selective reporting (reporting bias)	Low risk	All relevant outcomes described in methods were reported.
Other bias	High risk	Control group had higher rates of men, obesity, and physical inactivity. The intervention arm had more people with hypertension

Daltroy 1985

Methods	Parallel group RCT
Participants	174 patients randomised. Mixed CHD patients, 81% MI, 63% with a history of angina, 17% post-CABG. Mean age 53.8 years, 88% men, 95% white
Interventions	INTERVENTION: oral persuasive communication and education intervention to improve patient adherence to exercise regimens. Intervention developed from interviews with previous patients and their spouses to elicit the most common beliefs of benefits and drawbacks to the exercise program. Patients received an oral persuasive communication on the telephone in scripted counselling format to: convince them of the benefits of regular exercise, warn them of likely drawbacks so that expectations would be realistic, acquaint them with methods used by other patients to cope with drawbacks, and elicit an oral commitment to attend at least 2 classes per week for the first 6 weeks. In addition, patients received a mailed written persuasive communication to reinforce these

Daltroy 1985 (*Continued*)

	points. Spouses also received telephone counselling to encourage the patient to attend and discuss methods that other patients' spouses found useful. A written communication to reinforce these points was also sent to the spouse to increase the spouses' support. Patients also received a pamphlet with information on benefits and drawbacks of exercise. All communication was tailored to individual patients based on data collected by questionnaire at baseline COMPARISON: patients and spouses received the same pamphlet with information on the benefits and drawbacks of exercise as the intervention group. This was done so all patients would have the same inducement to enter the program. It was thought unlikely that this single intervention would produce lasting behavioral change
Outcomes	Attendance at exercise sessions over 3 months.
Notes	Subgroup analysis revealed that among the intervention group, attendance was greater among better-educated patients. Spouse participation, age, gender, and occupation were not associated with attendance, although the numbers in these subgroups were likely to be too small to draw firm conclusions

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not reported.
Allocation concealment (selection bias)	Unclear risk	Not reported.
Blind outcome assessment All outcomes	Unclear risk	Not reported.
Incomplete outcome data (attrition bias) All outcomes	High risk	Half of patients stopped at 12 weeks.
Selective reporting (reporting bias)	Low risk	All relevant outcomes described in methods were reported.
Other bias	Unclear risk	Cardiac rehabilitation nurse not aware of group assigned to; however, no procedure in place to stop patients telling nurse which letter they had received

Dolansky 2011

Methods	Parallel group RCT
Participants	40 adults ages 65 years or older admitted to a skilled nursing or home healthcare facility following hospitalization for a cardiac event. 38 participants analysed. 55.3% patients with CABG, 23.7% with MI. Mean age 77.1 (SD 6.8) years. 34.2% men. 68.4% Caucasian, 26.3% African American

Dolansky 2011 (*Continued*)

Interventions	INTERVENTION: the Cardiac TRUST program, which consisted of cardiac self management instruction and exercise monitoring during the postacute care period. The education component consisted of 2 x 30-minute family sessions with a registered nurse to identify values/goals, problem-solving skills, decision-making, and healthcare partnerships. The action component consisted of monitoring the cardiac response to physical therapy. The distance walked was individually tailored and progressively increased each day. Participants were taught to rate their exertion and keep an exercise log. Family members were encouraged to participate in walking sessions. COMPARISON: all participants received usual postacute care services that included daily sessions of physical and occupational therapy as well as discharge instructions on physical activity level, medications, and follow-up
Outcomes	Primary outcome: outpatient cardiac rehabilitation attendance at 6 weeks' post-discharge Other outcomes: exercise self efficacy, number of steps by pedometer, number of cardiac events
Notes	Each participants was given USD20 for participation in the study. 9 patients with missing data were excluded from analysis. 68% of participants randomised to intervention did not complete their exercise log

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Random numbers table.
Allocation concealment (selection bias)	Unclear risk	Not reported.
Blind outcome assessment All outcomes	Unclear risk	Not reported.
Incomplete outcome data (attrition bias) All outcomes	High risk	5% dropout rate but 24% with missing data and excluded from analysis. ITT analysis not performed
Selective reporting (reporting bias)	High risk	Satisfaction reported for intervention arm but not control arm
Other bias	Unclear risk	Groups were comparable across major prognostic factors but more participants in the usual care arm were caregivers, lived with others, and were African Americans

Duncan 2002

Methods	Parallel group RCT.
Participants	Patients with heart failure who had completed a supervised exercise program. 16 randomised, results available for 13 (adherence) and 14 (quality of life). Mean age 66 years. 84% male. Duncan 2003 reports 16 patients
Interventions	INTERVENTION: advice from cardiac rehabilitation staff on home exercise specific to patient's requirements for 12 weeks. Adherence facilitation (adapted from social learning theory) consisting of goal setting and review of goal setting regarding exercise, graphic feedback, and problem-solving guidance delivered by a research nurse at 3-week intervals. Positive reinforcement provided if goals were not met with follow-up telephone calls. Diaries collecting data on adherence were collected with mailed feedback on progress every 3 weeks COMPARISON: advice from cardiac rehabilitation staff on home exercise specific to patient's requirements for 12 weeks. Diaries collecting data on adherence was collected at 12 weeks
Outcomes	Adherence to exercise regimen at 12 weeks. Quality of life (Minnesota Living with Heart Failure questionnaire)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not reported but participants needed permission from an attending cardiologist to participate
Allocation concealment (selection bias)	Unclear risk	Not reported.
Blind outcome assessment All outcomes	Unclear risk	Not reported.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Duncan 2003 reports that 16 patients were randomised, whereas Duncan 2002 reports 13 were randomised. 2 patients died and 2 patients dropped out of the control group. Adherence results reported for 11 participants therefore 1 being unaccounted for
Selective reporting (reporting bias)	Low risk	All relevant outcomes described in methods were reported.
Other bias	High risk	Intervention group were older than the control group and had been diagnosed with heart failure for longer (mean of 2.3 years with intervention versus 3.1 years with comparison). Not very clear how the outcome was calculated

Hillebrand 1995

Methods	Parallel group RCT, Germany.
Participants	94 patients randomised. Post-MI patients attending inpatient cardiac rehabilitation program. Mean age 52 (range 33-60) years, 89% men
Interventions	INTERVENTION: special outpatient care program to support blue-collar workers (people who have a job with manual labor) after MI to join coronary groups. The program consisted of 4 different conversations between patients and a social worker: at end of rehabilitation program, telephone contact after 4 weeks, home visit after 3 months, and telephone contact after 6 months COMPARISON: no outpatient care program.
Outcomes	Attendance at cardiac group after 12 months.
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not reported.
Allocation concealment (selection bias)	Unclear risk	Not reported.
Blind outcome assessment All outcomes	Unclear risk	Not reported.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	4 patients died, 3 refused follow-up. ITT analysis not performed
Selective reporting (reporting bias)	Low risk	All relevant outcomes described in methods were reported.
Other bias	Low risk	

Izawa 2005

Methods	Parallel group RCT.
Participants	Patients with MI who had completed a cardiac rehabilitation program. 50 patients randomised. Results available for 45 people. Mean age in intervention group 63.9 (SD 9.7) years and in comparison group 64.5 (SD 10.1) years. 84% male. Percentage white - intervention: 88%, comparison: 67%
Interventions	All patients received a program of cardiac rehabilitation delivered by a multidisciplinary team customized for each patient. Patients participated in supervised combined aerobic and resistance exercise twice a week for 1 hr. At discharge, all patients were advised of

	diet and exercise and CVD risk factors INTERVENTION: self monitoring approach based on Banduras self efficacy theory. Patients were taught to record body weight, exercise as measured by pedometer, and heart rate. Performance was addressed by written feedback COMPARISON: cardiac rehabilitation program alone.
Outcomes	Exercise maintenance at 6 months.
Notes	Exercise maintenance determined from a readiness to exercise evaluation based on the TTM of exercise behavior change. Self efficacy for physical activity and mean number of steps taken per day (measured by pedometer) were significantly higher in the intervention group compared with control at 12 months post-MI

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not reported.
Allocation concealment (selection bias)	Unclear risk	Not reported.
Blind outcome assessment All outcomes	Unclear risk	Not reported.
Incomplete outcome data (attrition bias) All outcomes	Low risk	1 drop-out. 4 with missing or incomplete data.
Selective reporting (reporting bias)	Low risk	All relevant outcomes described in methods were reported.
Other bias	Low risk	

Jolly 1999

Methods	Cluster-RCT, UK.
Participants	67 general practices in a specified geographical area randomised. 277 patients from randomised intervention practices and 320 from control practices. Patients admitted to hospital with MI (71%) or with angina of recent onset (< 3 months) seen in hospital (29%). Patients were judged well enough to participate by medical and nursing staff on the ward or in clinic. 71% male
Interventions	INTERVENTION: specialist cardiac liaison nurses coordinated the transfer of care between hospital and general practice. The liaison nurse saw patients in hospital and encouraged them to see the practice nurse after discharge. Support was provided to practice nurses by regular contact, including a telephone call shortly before patient discharge to discuss care and book a first follow-up visit to the practice. Practice nurses were encouraged to telephone the liaison nurse to discuss problems or to seek advice on

Jolly 1999 (*Continued*)

	clinical or organizational issues. Each patient was given a patient-held record card that prompted and guided follow-up at standard intervals COMPARISON: usual care without care coordination by a specialist cardiac liason nurse
Outcomes	Attendance at least 1 outpatient cardiac rehabilitation session, serum cholesterol, blood pressure, smoking
Notes	The difference in attendance was most marked in people with angina (42% with intervention vs. 10% with comparison). Serum cholesterol, blood pressure, distance walked in 6 minutes, and smoking cessation did not differ between groups. BMI was slightly lower in the intervention group

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not reported.
Allocation concealment (selection bias)	Unclear risk	Not reported.
Blind outcome assessment All outcomes	Low risk	Follow-up of patients carried out by a nurse not responsible for delivering the intervention to the patient's practice
Incomplete outcome data (attrition bias) All outcomes	Low risk	10% of patients lost to follow-up. Similar rates for intervention arm and control
Selective reporting (reporting bias)	Low risk	All relevant outcomes described in methods were reported.
Other bias	Low risk	

McPaul 2007

Methods	Parallel group RCT.
Participants	25 patients admitted with a diagnosis of MI. 15 randomised to intervention arm, 10 randomised to control. Age range 33-87 years. 84% male
Interventions	INTERVENTION: a home visit by the researcher (an occupational therapist) to the patient (and relative if required) and a semi-structured discussion format was used during the visit. The visit started with a general discussion about the patient's physical and mental health since hospital discharge. Counseling was provided about appropriate level of physical activity, medications, diet, and smoking cessation. The researcher invited the participant to attend and encouraged participation in phase 2 cardiac rehabilitation. COMPARISON: a telephone call using the same semi-structured interview format. Patients were invited to attend phase 2 exercise and education classes and were invited to attend a pre-rehabilitation clinic

Outcomes	Outcomes: attendance at phase 2 cardiac rehabilitation. Anxiety and depression measured using the Hospital Anxiety and Depression Scale. Number of days of rehospitalization with cardiac symptoms. Number of visits to the emergency room with cardiac symptoms
Notes	During the study, all patients with ST-elevation MIs were taken to another nearby hospital rather than being admitted to the study hospital. Thus, only patients with non-ST-elevation MI were studied. The control group was invited to a pre-rehabilitation clinic whereas people in the intervention arm were not invited. The control patients who attended the clinic all attended phase 2 cardiac rehabilitation later

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Envelopes allocating to intervention or treatment were randomly arranged by the researcher
Allocation concealment (selection bias)	Low risk	Sealed envelopes.
Blind outcome assessment All outcomes	High risk	Not blinded.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	4 patients lost to follow-up and excluded from the analysis. Analyses based on the 21 patients who completed the study. ITT analyses not performed
Selective reporting (reporting bias)	Low risk	1 death reported in the study but cause not reported.
Other bias	Unclear risk	No significant differences in baseline measurements of anxiety and depression but information on major cardiovascular risk factors not collected

Moore 2006

Methods	Parallel group RCT.
Participants	259 patients randomised. Results available for 250 patients. Mixed CHD patients, MI 52%, CABG 55%, PTCA 59%. Mean age 62 (range 38-86) years, 62% male. Recruited from 3 outpatient clinics
Interventions	All participants received usual cardiac rehabilitation program of structured exercise and individual and group classes (4) on diet modification and stress reduction. At the end, participants were given an exercise prescription that included target heart rate zone and advice to exercise at least 5 times per week for 30 minutes INTERVENTION: CHANGE program ("Change Habits by Applying New Goals and Experiences"), based on several cognitive behavioral frameworks (social problem-solving model, self efficacy theory, expectancy value theory, relapse prevention theory).

	CHANGE program given in 3 x 1.5-hr sessions, once per week in the last 3 weeks of the cardiac rehabilitation program. 2 further sessions held at 1 and 2 months post cardiac rehabilitation program. Sessions were provided by cardiac nurse in small groups and centered on: small group social interaction, peer modeling, self assessment, goal setting, and problem-solving activities reinforced at later stages COMPARISON: usual cardiac rehabilitation program only.
Outcomes	Adherence to exercise amount (10 hr of moderate intensity exercise a month - 150 minutes/week), adherence to exercise frequency (at least 5 times/week or 20 times/month). Both measured at 12 months
Notes	Mean duration of an exercise session among those who exercised was longer than 30 minutes recommended (mean session length 52 minutes). Men were less likely to discontinue exercise than women. Participants with higher comorbidity scores or more muscle and joint pain were more likely to discontinue exercise

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computerized minimization stratification randomization program used managed by program director in which participants were stratified on gender and site of recruitment
Allocation concealment (selection bias)	Low risk	The randomization sequence was concealed until intervention was assigned
Blind outcome assessment All outcomes	Low risk	Exercise measured using portable wristwatch heart rate monitors, backed up by diaries mailed to investigators. Data collectors were blind to study group
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	53 (19.4%) lost to follow-up, of which only 30 were included in the final analysis. Those lost to follow-up were older, less fit, and had lower self efficacy scores
Selective reporting (reporting bias)	Low risk	All relevant outcomes described in methods were reported.
Other bias	Low risk	

Oldridge 1983

Methods	Parallel group RCT.
Participants	120 patients randomised. Mixed CHD patients, MI 73%, CABG 16%, angina 12%. Mean age 50.5 years. All male

Interventions	INTERVENTION: usual comprehensive cardiac rehabilitation program, plus self management techniques including an agreement to participate in the program for 6 months to be signed by the patient and coordinator, and self report diaries to complete and be discussed with the coordinator at regular intervals. Diaries included 6 graphs for plotting self monitored submaximal heart rates each month, at 33%, 50%, and 75% of the maximum power output achieved in the previous exercise test, and 6 x 24-hr recall questionnaires of daily activities on a randomly chosen day to be completed each month. In addition, a weight loss diary to fill in each week was given to those patients who initially agreed to lose weight, and similar diaries to record number of cigarettes smoked each day. Follow-up at the end of the intervention period of 6 months COMPARISON: usual comprehensive cardiac rehabilitation program
Outcomes	Compliance (defined as attendance at 60% or more of the scheduled 48 supervised cardiac rehabilitation sessions)
Notes	Patients stratified by smoking status, occupation, leisure habits, and number of prior infarctions before randomization. These variables were shown to be predictors of drop-out based on previous experience of this group

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Random number list.
Allocation concealment (selection bias)	Unclear risk	Not reported.
Blind outcome assessment All outcomes	Unclear risk	Not reported.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attendance of drop-outs was similar in the intervention and control groups (21% with intervention vs. 16% with control) and was also similar for compliers (74% with intervention vs. 76% with control). Not all patients in the intervention group signed the agreement to participate. Compliance was significantly higher in the 48 people who signed (65%), than in the 15 who refused (20%)
Selective reporting (reporting bias)	Low risk	All relevant outcomes described in methods were reported.
Other bias	Unclear risk	Unclear whether comparison groups were similar at baseline.

Pack 2013

Methods	Parallel group RCT.
Participants	150 patients admitted to academic medical centre for a diagnosis of MI, PCI, or angina with documented ischemia on a stress test (76 randomised to early appointment and 74 randomised to control). 17% ST-elevation MI, 47% non-ST-elevation MI, 30% PCI without MI, 6% angina with ischemic stress test. Mean age 61 ± 12 years (early appointment), mean age 59 ± 12 (control). 55% male. 43% white
Interventions	INTERVENTION: patients were randomised to receive an early appointment for the orientation class for cardiac rehabilitation (within 10 days). COMPARISON: patients randomised to standard care were scheduled for an orientation appointment within 35 days from the index event
Outcomes	Primary outcome: attendance at orientation class for cardiac rehabilitation Secondary outcomes: attendance at ≥ 1 exercise and education session of cardiac rehabilitation, total number of exercise sessions attended, completion of cardiac rehabilitation, exercise-related safety events, clinical events
Notes	Study was terminated early due to relocation of the trial principal investigator. An unplanned interim analysis revealed a statistically significant difference in attendance rate for cardiac rehabilitation so recruitment was terminated early

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Sequence generation was created using a computerized random number generator
Allocation concealment (selection bias)	Low risk	Allocation cards kept in opaque sequential sealed envelopes until time of patient randomization
Blind outcome assessment All outcomes	High risk	Cardiac rehabilitation staff recorded primary outcomes and were not blinded to treatment allocation
Incomplete outcome data (attrition bias) All outcomes	Low risk	2 patients in intervention group withdrew consent and were excluded. Treated as nonattenders in the analyses. ITT analysis performed
Selective reporting (reporting bias)	Low risk	All relevant outcomes described in methods were reported.
Other bias	Unclear risk	Trial terminated early due to unplanned interim analysis.

Parry 2009

Methods	Parallel group RCT.
Participants	101 participants with a first time, nonemergency coronary bypass surgery (49 randomised to intervention and 52 to control). 95 participants analysed (45 intervention, 50 control) . 72% with angina and 54% with MI. Intervention arm: mean age 62 (range 40-84) years; control arm: mean age 64 (range 41-85) years. 83% male
Interventions	INTERVENTION: patients received peer-generated telephone calls for 8 weeks following hospital discharge. Peer volunteers included men and women who had undergone bypass surgery within the previous 5 years, and had attended a cardiac rehabilitation program. The telephone calls focused on pain management, exercise, and encouragement in enrolling in a cardiac rehabilitation program. Peer volunteers attended a 4-hr training session to develop skills required for effective telephone support. Dose and frequency of calls were determined by peer-patient dyad and most telephone calls were peer-initiated. COMPARISON: usual care consisted of standard pre- and postoperative education and visits from in-hospital peer volunteers
Outcomes	Uptake of cardiac rehabilitation (attendance of at least 1 session), health-related quality of life, pain, pain-related interference with activities
Notes	There was a wide range in the number of contacts as well as time per contact. Only 17 (18%) patients attended a cardiac rehabilitation program at 9 weeks' postsurgery

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Random assignment centrally controlled using an Internet-based randomization service
Allocation concealment (selection bias)	Low risk	
Blind outcome assessment All outcomes	Low risk	Outcome data collected via telephone interview by research assistant blinded to group allocation
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	6 drop-outs, balanced between intervention and control arms. Unclear if ITT analysis performed. Text refers to "intention to treat analyses" but figure suggests that excluded patients were not included in the analyses
Selective reporting (reporting bias)	Low risk	All relevant outcomes described in methods were reported.
Other bias	Low risk	

Price 2012

Methods	Parallel group RCT.
Participants	70 women (34 intervention, 36 usual care) hospitalised for a cardiovascular event in a tertiary care hospital in Toronto. 66 women analysed (33 intervention, 33 usual care) . CABG: 44% intervention, 44% control; MI: 29% intervention, 44% control; PCI: 35% intervention, 33% control. Mean age 67 (38-89) years. 100% women
Interventions	INTERVENTION: usual care plus an individualized, personal coaching program based on social cognitive theory constructs of self efficacy delivered by a registered nurse (the study author). The coaching program consisted of scheduled, coach-generated telephone calls between hospital discharge and cardiac rehabilitation intake appointment to explain the benefits of cardiac rehabilitation, clarify concerns, motivate women to enrol, and overcome any individual barriers to entering a program. Coaching emphasized problem solving, decision making, and confidence building. Interventions were initiated within 1-2 weeks of hospital discharge, calls were scheduled every 2 weeks, and at least 3 telephone calls until an intake appointment. All calls were scheduled and initiated by the investigator. COMPARISON: usual care consisted of a referral to cardiac rehabilitation followed by a letter from the cardiac rehabilitation program informing the patient of their intake appointment
Outcomes	Primary outcome: attendance at the initial cardiac rehabilitation appointment, assessed 10-12 weeks after discharge Secondary outcomes: self efficacy for exercise and self efficacy to attend cardiac rehabilitation intake
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Randomization centrally controlled using a web-based randomization service
Allocation concealment (selection bias)	Low risk	The primary investigator and participants were unaware of the next assignment in the randomization sequence
Blind outcome assessment All outcomes	Low risk	Research assistant, blinded to group allocation, collected all outcome data
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	4 patients lost to follow-up and 4 patients discontinued/refused to complete. Analyses described as ITT but patients lost to follow-up were excluded from analyses
Selective reporting (reporting bias)	Low risk	All relevant outcomes described in methods were reported.
Other bias	Low risk	Groups comparable at baseline including major prognostic factors

Sniehotta 2006

Methods	Parallel group RCT.
Participants	246 randomised. Mixed CHD patients: MI 58%, CABG 9%, PTCA 33%. Mean age 59.3 (SD 10, range 31-82) years. 88% male
Interventions	After discharge from residential cardiac rehabilitation program all patients were recommended to engage in regular vigorous exercise (at least 3 times per week for minimum of 30 minutes per unit), and increase their everyday physical activities. Motivation was addressed in psychoeducational classes INTERVENTION 1: 'Action-planning group' additionally developed 3 action plans each about when, where, and how they intended to exercise and implement extra every day activities after discharge. Treatments were conducted by trained consultants in a 1-to-1 setting and lasted up to 30 minutes INTERVENTON 2: 'Combined-planning group' additionally developed 3 action plans each about when, where, and how they intended to exercise and implement extra every day activities after discharge and 3 coping plans to overcome anticipated barriers. Treatments were conducted by trained consultants in a 1-to-1 setting and lasted up to 30 minutes
Outcomes	Adherence to exercise (self reported exercise at least 3 times per week for at least 30 minutes. Individuals who adhered were classified as 'achievers'). Follow-up 10 weeks
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	Each consultant assigned participants to experimental conditions according to an assignment sheet that followed the order control group, action-planning group, and combined-planning group
Allocation concealment (selection bias)	High risk	Each consultant assigned participants to experimental conditions according to an assignment sheet that followed the order control group, action-planning group, and combined-planning group
Blind outcome assessment All outcomes	Unclear risk	Not reported.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	35 patients excluded. 29 excluded for not returning questionnaire. 6 excluded for unclear reasons
Selective reporting (reporting bias)	Low risk	All relevant outcomes described in methods were reported.
Other bias	Low risk	

Wyer 2001

Methods	Parallel group RCT, UK.
Participants	87 patients randomised. All patients post-MI. Mean age 63 years. 87% male
Interventions	INTERVENTION: letters based on the theory of planned behavior (Ajzen 1986) designed to increase attendance at outpatient cardiac rehabilitation clinic were given to patients 3 days post-MI and sent 3 weeks post-MI. The first letter was designed to influence acceptance and the second was designed to influence attendance. Patients also received a nominal letter of thanks at 3 days and the standard letter detailing course dates as sent to control patients. After allocation to groups, the cardiac rehabilitation nurse saw all patients for routine assessment and personal invitation to the program. For patients who declined the offer of a place, a brief second letter was sent wishing them well and informing them that they were still welcome to contact the team COMPARISON: nominal letter of thanks given to patients at 3 days' post-MI and the standard letter detailing course dates
Outcomes	Uptake (defined as attendance at the outpatient cardiac rehabilitation program)
Notes	Women were less likely to attend the program, but neither age nor distance lived from the program predicted attendance. Authors noted that the intervention may have worked by acting as a fear message, rather than through implementation of theory of planned behavior

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Allocation by random number assignment.
Allocation concealment (selection bias)	Low risk	Patients were handed a sealed numbered envelope with a nominal letter. Half of the envelopes also contained an intervention letter. Envelope contents known to a research assistant only
Blind outcome assessment All outcomes	Unclear risk	Uptake defined as saying yes to cardiac nurse. Participants may have mentioned the letter received
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	13 participants excluded but not told treatment allocation.
Selective reporting (reporting bias)	Low risk	All relevant outcomes described in methods were reported.
Other bias	High risk	Cardiac rehabilitation nurse not aware of group assigned to; however, no procedure in place to stop patients telling nurse which letter received

BMI: body mass index; CABG: coronary artery bypass graft; CAD: coronary artery disease; CHD: coronary heart disease; CVD: cardiovascular disease; hr: hour; ITT: intention to treat; MI: myocardial infarction; PCI: percutaneous coronary intervention; RCT: randomised controlled trial; SD: standard deviation; TTM: transtheoretical model.

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Aish 1996	Adherence to dietary advice not cardiac rehabilitation.
Brodie 2005	No measure of adherence.
Butler 2009	No measure of adherence.
Carlson 2000	Compared different types of cardiac rehabilitation.
Carroll 2007	No measure of adherence.
Dankner 2011	Nonrandom allocation to study group.
Duncan 2001	Adherence to dietary advice not cardiac rehabilitation.
Froelicher 2003	No intervention to increase adherence.
Furber 2010	Targeted patients who did not participate in cardiac rehabilitation
Higgins 2001	No measure of adherence.
Hopper 1995	No measure of adherence.
Hughes 2002	No measure of adherence.
Hughes 2007	No measure of adherence.
Jolly 2009	No measure of adherence.
Kolt 2009	Not focused on patients in cardiac rehabilitation.
Kummel 2007	No measure of adherence.
Leemrijse 2012	No measure of adherence.
Luszczynska 2006	No measure of adherence.
Mahler 1999	No measure of adherence.
Meillier 2012	Non-random allocation to study group.

(*Continued*)

Moore 2002	Non-random allocation to study group.
Palomäki 2002	Non-random allocation to study group.
Peterson 2012	Inadequate control arm.
Powell 2010	No measure of adherence.
Redfern 2009	Study targeted adherence to medication and medical appointments not cardiac rehabilitation or any of its components
Reid 2012	Targeted patients who did not participate in cardiac rehabilitation
Rejeski 2002	Not all participants had coronary heart disease.
Reusch 2011	No measure of adherence.
Richardson 2010	No measure of adherence.
Sniehotta 2005	No measure of adherence.
Southard 2003	No measure of adherence.
Stromberg 2006	Study targeted adherence to medication and medical appointments not cardiac rehabilitation or any of its components
Vestfold 2003	No measure of adherence.
Willmott 2011	No measure of adherence.
Wolkanin-Bartnik 2011	No measure of adherence.
Wu 2012	No measure of adherence.
Zarani 2010	No measure of adherence.

Characteristics of ongoing studies *[ordered by study ID]*

Maddison 2011

Trial name or title	HEART (Heart Exercise And Remote Technologies) trial.
Methods	Parallel group RCT.
Participants	Outpatient cardiac rehabilitation patients.

Maddison 2011 (*Continued*)

Interventions	Personalized, automated package of text and video message components via mobile device and Internet over 24 weeks
Outcomes	Change in maximum oxygen uptake, self reported physical activity, cardiovascular risk factors, health-related quality of life, cost-effectiveness
Starting date	1 April 2011.
Contact information	Ralph Maddison, Clinical Trials Research Unit University of Auckland Private Bag 92019, Auckland Mailing Centre Auckland, New Zealand. Email: r.maddison@ctru.auckland.ac.nz
Notes	

Sangster 2010

Trial name or title	PANACHE (Physical Activity, Nutrition, And Cardiac HEalth) trial
Methods	RCT.
Participants	Patients referred for cardiac rehabilitation.
Interventions	Behavioral coaching and goal-setting sessions delivered by telephone over 8 weeks. Coaching sessions focused on weight, nutrition, and physical activity
Outcomes	Weight change, physical activity, sedentary time, nutrition habits, health-related quality of life
Starting date	1 March 2010.
Contact information	Janice Sangster, Wagga Wagga Community Health Centre Docker St, Wagga Wagga, NSW 2650, Australia. Email: janice.sangster@gsahs.health.nsw.gov.au
Notes	

RCT: randomised controlled trial.

DATA AND ANALYSES

This review has no analyses.

ADDITIONAL TABLES

Table 1. Studies of interventions to increase uptake of cardiac rehabilitation

Study	No. patients	Intervention	Comparison	Significance
Beckie 2010	252	90% - exercise 87% - education	77% - exercise 56% - education	P value < 0.001 P value < 0.001
Cossette 2012	242	45%	24%	P value = 0.001
Dolansky 2011	40	33%	12%	P value = 0.03
Hillebrand 1995	94	57%	27%	P value < 0.005
Jolly 1999	277	42%	24%	P value < 0.001
McPaul 2007	25	67%	78%	n.s.
Pack 2013	150	77%	59%	P value = 0.022
Parry 2009	101	25%	12%	P value = 0.11
Price 2012	70	58%	33%	P value = 0.048
Wyer 2001	87	86%	57%	P value < 0.0025

n.s.: not significant.

Table 2. Summary of rehospitalization rates between groups

Study	Intervention	Comparison	Significance
Dolansky 2011	21.67%*	18.4%*	n.s.
McPaul 2007	0 / 15	0 / 10	n.s.
Pack 2013	1 / 74	3 / 74	n.s.

* numbers not provided.
n.s.: not significant.

Table 3. Coronary heart disease event rates between groups

Study	Intervention	Comparison	Significance
Arrigo 2008*	17 / 105	12 / 123	P value < 0.01
Dolansky 2011	1 / 17	2 / 21	n.s.
Pack 2013	7 / 74	12 / 74	P value = 0.32

*Authors note the increased rate of revascularization in the intervention group versus control (4 versus 1).
n.s.: not significant.

Table 4. Mortality between groups

Study	Intervention	Comparison	Significance
Dolansky 2011	0 / 17	0 / 21	n.s.
McPaul 2007	2 / 15	0 / 10	n.s.
Pack 2013	1 / 74	1 / 74	n.s.

n.s.: not significant.

Table 5. Studies of interventions to increase adherence to cardiac rehabilitation

Study	No. of patients/clusters	Intervention	Comparison	Significance
Arrigo 2008	261	70%	37%	P value < 0.0001
Ashe 1993	41	90%	89%	n.s.
Daltroy 1985	174	64%	62%	n.s.
Duncan 2002	13	Exercise duration: 109% Exercise frequency: 104%	Exercise duration: 85% Exercise frequency: 64%	n.s. P value < 0.001
Izawa 2005	45	100%	81%	n.s.
Moore 2006	250	Exercise amount: 29% Exercise frequency: 8%	Exercise amount: 27% Exercise frequency: 8%	n.s. n.s.
Oldridge 1983	120	54%	42%	n.s.

Table 5. Studies of interventions to increase adherence to cardiac rehabilitation (*Continued*)

Sniehotta 2006	246	Action planning: 44% Combined planning: 2: 71%	42%	Int 1: n.s. Int 2: P value < 0.001

n.s.: not significant.

APPENDICES

Appendix 1. Search strategies 2010

CENTRAL on The Cochrane Library

#1 MeSH descriptor Myocardial Ischemia explode all trees
#2(myocard* NEAR isch*mi*)
#3 isch*mi* NEAR heart
#4 MeSH descriptor Coronary Artery Bypass explode all trees
#5 coronary
#6 MeSH descriptor Coronary Disease explode all trees
#7 MeSH descriptor Myocardial Revascularization explode all trees
#8 MeSH descriptor Myocardial Infarction explode all trees
#9 myocard* NEAR infarct*
#10 heart NEAR infarct*
#11 MeSH descriptor Angina Pectoris explode all trees
#12 angina
#13 MeSH descriptor Heart Failure, Congestive explode all trees
#14 heart and (failure or attack)
#15 MeSH descriptor Heart Diseases explode all trees
#16 heart and disease*
#17 myocard*
#18 cardiac*
#19 CABG
#20 PTCA
#21 stent* AND (heart or cardiac*)
#22 MeSH descriptor Heart Bypass, Left explode all trees
#23 MeSH descriptor Heart Bypass, Right explode all trees
#24 (#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23)
#25 MeSH descriptor Rehabilitation Centers, this term only
#26 MeSH descriptor Exercise Therapy explode all trees
#27 MeSH descriptor Sports, this term only
#28 MeSH descriptor Exertion explode all trees
#29 rehabilitat*
#30 (physical* NEAR (fit* or train* or therap* or activit*))
#31 MeSH descriptor Exercise explode all trees

#32 (train*) near (strength* or aerobic or exercise*)
#33 ((exercise* or fitness) NEAR/3 (treatment or intervent* or program*))
#34 MeSH descriptor Rehabilitation explode all trees
#35 MeSH descriptor Patient Education explode all trees
#36 (patient* NEAR/3 educat*)
#37 ((lifestyle or life-style) NEAR/3 (intervent* or program* or treatment*))
#38 MeSH descriptor Self Care explode all trees
#39 MeSH descriptor Ambulatory Care explode all trees
#40 MeSH descriptor Psychotherapy explode all trees
#41 psychotherap*
#42 psycholog* NEAR intervent*
#43 relax*
#44 MeSH descriptor Mind-Body and Relaxation Techniques explode all trees
#45 MeSH descriptor Counseling explode all trees
#46 counsel*ing
#47 MeSH descriptor Cognitive Therapy explode all trees
#48 MeSH descriptor Behavior Therapy explode all trees
#49 (behavio*r*) NEAR/4 (modif* or therap* or rehab* or change)
#50 MeSH descriptor Stress, Psychological explode all trees
#51 stress NEAR manage*
#52 cognitive* NEAR therap*
#53 MeSH descriptor Meditation explode all trees
#54 meditat*
#55 MeSH descriptor Anxiety, this term only
#56 (manage*) NEAR (anxiety or depres*)
#57 CBT
#58 hypnotherap*
#59 goal NEAR/3 setting
#60 (psycho-educat*) or (psychoeducat*)
#61 motivat* NEAR interv*
#62 MeSH descriptor Psychopathology explode all trees
#63 psychopathol*
#64 MeSH descriptor Autogenic Training explode all trees
#65 autogenic*
#66 self near (manage* or care or motivat*)
#67 distress*
#68 psychosocial* or psycho-social
#69 MeSH descriptor Health Education explode all trees
#70 (nutrition or diet or health) NEAR education
#71 heart manual
#72 (#25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37)
#73 (#38 OR #39 OR #40 OR #41 OR #42 OR #43 OR #44 OR #45 OR #46 OR #47 OR #48 OR #49 OR #50 OR #51 OR #52 OR #53 OR #54 OR #55 OR #56 OR #57 OR #58 OR #59 OR #60 OR #61 OR #62 OR #63 OR #64 OR #65 OR #66 OR #67 OR #68 OR #69 OR #70 OR #71)
#74 (#72 OR #73)
#75 (#74 AND #24)

MEDLINE DIALOG 1950 to week 1 2008

1. SEARCH: MYOCARDIAL-ISCHEMIA#.DE.
2. SEARCH: MYOCARD$4 NEAR (ISCHAEMI$2 OR ISCHEMI$2)
3. SEARCH: (ISCHAEMI$2 OR ISCHEMI$2) NEAR HEART
4. SEARCH: CORONARY-ARTERY-BYPASS#.DE.

5. SEARCH: CORONARY.TI,AB.
6. SEARCH: CORONARY-DISEASE#.DE.
7. SEARCH: MYOCARDIAL-REVASCULARIZATION#.DE.
8. SEARCH: MYOCARDIAL-INFARCTION#.DE.
9. SEARCH: MYOCARD$5 NEAR INFARCT$5
10. SEARCH: HEART NEAR INFARCT$5
11. SEARCH: ANGINA-PECTORIS#.DE.
12. SEARCH: ANGINA.TI,AB.
13. SEARCH: HEART-FAILURE-CONGESTIVE#.DE.
14. SEARCH: HEART NEAR FAILURE
15. SEARCH: 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14
16. SEARCH: HEART-DISEASES#.DE.
17. SEARCH: (HEART NEAR DISEASE$2).TI,AB.
18. SEARCH: MYOCARD$5.TI,AB.
19. SEARCH: CARDIAC$2.TI,AB.
20. SEARCH: CABG
21. SEARCH: PTCA
22. SEARCH: STENT$4 AND (HEART OR CARDIAC$4)
23. SEARCH: HEART-BYPASS-LEFT#.DE. OR HEART-BYPASS-RIGHT#.DE.
24. SEARCH: 16 OR 17 OR 18 OR 19 OR 20 OR 21 OR 22 OR 23
25. SEARCH: REHABILITATION-CENTERS.DE.
26. SEARCH: EXERCISE-THERAPY#.DE.
27. SEARCH: REHABILITATION.W..DE.
28. SEARCH: SPORTS#.W..DE.
29. SEARCH: EXERTION#.W..DE.
30. SEARCH: EXERCISE#.W..DE.
31. SEARCH: REHABILITAT$5.TI,AB.
32. SEARCH: PHYSICAL$4 NEAR (FIT OR FITNESS OR TRAIN$5 OR THERAP$5 OR ACTIVIT$5)
33. SEARCH: TRAIN$5 NEAR (STRENGTH$3 OR AEROBIC OR EXERCIS$4)
34. SEARCH: (EXERCISE$4 OR FITNESS) NEAR (TREATMENT OR INTERVENT$4 OR PROGRAM$2 OR THERAPY)
35. SEARCH: PATIENT-EDUCATION#.DE.
36. SEARCH: PATIENT$2 NEAR EDUCAT$4
37. SEARCH: (LIFESTYLE OR LIFE-STYLE) NEAR (INTERVENT$5 OR PROGRAM$2 OR TREATMENT$2)
38. SEARCH: SELF-CARE.DE.
39. SEARCH: SELF NEAR (MANAGE$5 OR CARE OR MOTIVAT$5)
40. SEARCH: AMBULATORY-CARE.DE.
41. SEARCH: PSYCHOTHERAPY#.W..DE.
42. SEARCH: PSYCHOTHERAP$2.TI,AB.
43. SEARCH: PSYCHOLOG$5 NEAR INTERVENT$5
44. SEARCH: RELAX$6.TI,AB.
45. SEARCH: RELAXATION-TECHNIQUES#.DE. OR MIND-BODY-AND-RELAXATION-TECHNIQUES#.DE.
46. SEARCH: COUNSELING#.W..DE.
47. SEARCH: (COUNSELLING OR COUNSELING).TI,AB.
48. SEARCH: COGNITIVE-THERAPY#.DE.
49. SEARCH: BEHAVIOR-THERAPY#.DE.
50. SEARCH: (BEHAVIOR$4 OR BEHAVIOUR$4) NEAR (MODIFY OR MODIFICAT$4 OR THERAP$2 OR CHANGE)
51. SEARCH: STRESS-PSYCHOLOGICAL#.DE.
52. SEARCH: STRESS NEAR MANAGEMENT
53. SEARCH: COGNITIVE NEAR THERAP$2
54. SEARCH: MEDITAT$4
55. SEARCH: MEDITATION#.W..DE.
56. SEARCH: ANXIETY#.W..DE.
57. SEARCH: MANAGE$5 NEAR (ANXIETY OR DEPRES$5)

58. SEARCH: CBT.TI,AB.
59. SEARCH: HYPNOTHERAP$5
60. SEARCH: GOAL NEAR SETTING
61. SEARCH: GOAL$2 NEAR SETTING
62. SEARCH: PSYCHO-EDUCAT$5 OR PSYCHOEDUCAT$5
63. SEARCH: MOTIVAT$5 NEAR (INTERVENTION OR INTERV$3)
64. SEARCH: PSYCHOPATHOLOGY#.W..DE.
65. SEARCH: PSYCHOPATHOL$4.TI,AB.
66. SEARCH: PSYCHOSOCIAL$4.TI,AB.
67. SEARCH: DISTRESS$4.TI,AB.
68. SEARCH: HEALTH-EDUCATION#.DE.
69. SEARCH: HEALTH NEAR EDUCATION
70. SEARCH: HEART ADJ MANUAL
71. SEARCH: AUTOGENIC-TRAINING#.DE.
72. SEARCH: AUTOGENIC$5.TI.AB.
73. SEARCH: 25 OR 26 OR 27 OR 28 OR 29 OR 30 OR 31 OR 32 OR 33 OR 34 OR 35 OR 36 OR 37 OR 38
74. SEARCH: 39 OR 40 OR 41 OR 42 OR 43 OR 44 OR 45 OR 46 OR 47 OR 48 OR 49 OR 50 OR 51 OR 52 OR 53 OR 54 OR 55 OR 56 OR 57 OR 58 OR 59 OR 60 OR 61 OR 62 OR 63 OR 64 OR 65 OR 66 OR 67 OR 68 OR 69 OR 70 OR 71 OR 72
75. SEARCH: 15 OR 24
76. SEARCH: 73 or 74
77. SEARCH: 75 AND 76
78. SEARCH: RANDOMIZED-CONTROLLED-TRIALS#.DE.
79. SEARCH: PT=RANDOMIZED-CONTROLLED-TRIAL
80. SEARCH: PT=CONTROLLED-CLINICAL-TRIAL
81. SEARCH: CONTROLLED-CLINICAL-TRIALS#.DE.
82. SEARCH: RANDOM-ALLOCATION#.DE.
83. SEARCH: DOUBLE-BLIND-METHOD#.DE.
84. SEARCH: SINGLE-BLIND-METHOD#.DE.
85. SEARCH: (RANDOM$ OR PLACEBO$).TI,AB.
86. SEARCH: ((SINGL$3 OR DOUBL$3 OR TRIPL$3 OR TREBL$3) NEAR (BLIND$3 OR MASK$3)).TI,AB.
87. SEARCH: RESEARCH-DESIGN#.DE.
88. SEARCH: PT=CLINICAL-TRIAL#
89. SEARCH: CLINICAL-TRIALS#.DE.
90. SEARCH: (CLINIC$3 ADJ TRIAL$2).TI,AB.
91. SEARCH: 77 AND 90
92. SEARCH: (ANIMALS NOT HUMANS).SH.
93. SEARCH: 91 NOT 92
94. SEARCH: LIMIT 93 TO 2001-DATE

EMBASE DIALOG 1980 to week 1 2008

1. HEART-DISEASE#.DE.
2. (MYOCARD$4 NEAR (ISCHAEMI$2 OR ISCHEMI$2)).TI,AB.
3. ((ISCHAEMI$2 OR ISCHEMI$2) NEAR HEART).TI,AB.
4. CORONARY-ARTERY-DISEASE#.DE.
5. TRANSLUMINAL-CORONARY-ANGIOPLASTY#.DE.
6. (CORONARY NEAR (DISEASE$2 OR BYPASS$2 OR THROMBO$5 OR ANGIOPLAST$2)).TI,AB.
7. HEART-INFARCTION#.DE.
8. (MYOCARD$4 NEAR INFARCT$5).TI,AB.
9. (HEART NEAR INFARC$5).TI,AB.
10. HEART-MUSCLE-REVASCULARIZATION#.DE.
11. ANGINA-PECTORIS#.DE.
12. ANGINA.TI,AB.

13. CONGESTIVE-HEART-FAILURE#.DE.
14. (HEART NEAR FAILURE).TI,AB.
15. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14
16. (HEART NEAR DISEASE$2).TI,AB.
17. CARDIAC$2.TI,AB.
18. CABG.TI,AB.
19. PTCA.TI,AB.
20. STENT$4.TI,AB. AND HEART.TI,AB.
21. EXTRACORPOREAL-CIRCULATION#.DE.
22. 16 OR 17 OR 18 OR 19 OR 20 OR 21
23. 15 OR 22
24. PSYCHOTHERAPY#.W..DE.
25. PSYCHOTHERAP$2.TI,AB.
26. PSYCHOLOG$5 NEAR INTERVENT$5
27. RELAX$6.TI,AB.
28. RELAXATION-TRAINING#.DE.
29. COUNSELING#.W..DE.
30. (COUNSELLING OR COUNSELING).TI,AB.
31. (BEHAVIOR$4 OR BEHAVIOUR$4) NEAR (MODIFY OR MODIFICAT$4 OR THERAPY$2 OR CHANGE)
32. STRESS-MANAGEMENT#.DE.
33. STRESS NEAR MANAGEMENT
34. MEDITATION#.W..DE.
35. MEDITAT$5.TI,AB.
36. MANAGE$5 NEAR (ANXIETY OR DEPRES$5)
37. CBT.TI,AB.
38. HYPNOTHERAP$2.TI,AB.
39. GOAL$2 NEAR SETTING
40. PSYCHO-EDUCAT$5 OR PSYCHOEDUCAT$5
41. MOTIVAT$5 NEAR INTERVENT$6
42. PSYCHOSOCIAL-CARE#.DE. OR PSYCHOSOCIAL-REHABILITATION#.DE.
43. PSYCHOSOCIAL.TI,AB.
44. HEALTH-EDUCATION#.DE.
45. HEALTH NEAR EDUCATION
46. HEART ADJ MANUAL
47. AUTOGENIC-TRAINING#.DE.
48. AUTOGENIC.TI,AB.
49. REHABILITATION#.W..DE.
50. REHABILITATION-CENTER#.DE.
51. REHABIL$.TI,AB.
52. SPORT#.W..DE.
53. KINESIOTHERAPY#.W..DE.
54. EXERCISE#.W..DE.
55. PHYSIOTHERAPY#.W..DE.
56. PHYSICAL$4 NEAR (FIT OR FITNESS OR TRAIN$5 OR THERAP$5 OR ACTIVIT$5)
57. TRAIN$5 NEAR (STRENGTH$3 OR AEROBIC OR EXERCIS$4)
58. (EXERCISE$4 OR FITNESS) NEAR (TREATMENT OR INTERVENT$4 OR PROGRAM$2 OR THERAPY)
59. AEROBIC$4 NEAR EXERCISE$4
60. (KINESIOTHERAPY OR PHYSIOTHERAPY).TI,AB.
61. PATIENT-EDUCATION#.DE.
62. PATIENT$2 NEAR EDUCAT$4
63. (LIFESTYLE OR LIFE ADJ STYLE OR LIFE-STYLE) NEAR (INTERVENT$5 OR PROGRAM$2 OR TREATMENT$2)
64. SELF-CARE#.DE.
65. SELF NEAR (MANAGE$5 OR CARE OR MOTIVAT$5)

66. AMBULATORY-CARE#.DE.
67. PSYCHO-EDUCAT$5 OR PSYCHOEDUCAT$5
68. MOTIVAT$5 NEAR INTERVENT$6
69. PSYCHOSOCIAL-CARE#.DE. OR PSYCHOSOCIAL-REHABILITATION#.DE.
70. PSYCHOSOCIAL.TI,AB.
71. HEALTH-EDUCATION#.DE.
72. HEALTH NEAR EDUCATION
73. HEART ADJ MANUAL
74. AUTOGENIC-TRAINING#.DE.
75. AUTOGENIC.TI,AB.
76. PSYCHO-EDUCAT$5 OR PSYCHOEDUCAT$5
77. MOTIVAT$5 NEAR INTERVENT$6
78. PSYCHOSOCIAL-CARE#.DE. OR PSYCHOSOCIAL-REHABILITATION#.DE.
79. PSYCHOSOCIAL.TI,AB.
80. HEALTH-EDUCATION#.DE.
81. HEALTH NEAR EDUCATION
82. HEART ADJ MANUAL
83. 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49
84. 50 OR 51 OR 52 OR 53 OR 54 OR 55 OR 56 OR 57 OR 58 OR 59 OR 60 OR 61 OR 62 OR 63 OR 64 OR 65 OR 66 OR 67 OR 68 OR 69 OR 70 OR 71 OR 72 OR 73 OR 74 OR 75 OR 76 OR 77 OR 78 OR 79 OR 80 OR 81 OR 82
85. 83 OR 84
86. (RANDOM$ OR PLACEBO$).TI,AB.
87. (SINGL$4 OR DOUBLE$4 OR TRIPLE$4 OR TREBLE$4).TI,AB. AND (BLIND$4 OR MASK$4).TI,AB. 88. (CONTROLLED ADJ CLINICAL ADJ TRIAL).TI,AB.
89. RANDOMIZED-CONTROLLED-TRIAL#.DE.
90. 1 OR 2 OR 3 OR 4
91. 23 AND 85
92. 91 AND 92
93. LIMIT 92 TO 2001-2008

CINAHL DIALOG 1980 to week 1 2008

1. ((MYOCARD$4 OR HEART) NEAR (ISCHAEMI$2 OR ISCHEMI$2)).TI,AB.
2. CORONARY.TI,AB.
3. ((MYOCARD$4 OR HEART) NEAR INFARC$5).TI,AB.
4. ANGINA.TI,AB.
5. (HEART NEAR FAILURE).TI,AB.
6. (HEART NEAR DISEAS$2).TI,AB.
7. CARDIAC$2.TI,AB.
8. CABG
9. PTCA
10. STENT$4.TI,AB. AND (HEART OR CARDIAC$4).TI,AB.
11. MYOCARDIAL-ISCHEMIA#.DE.
12. MYOCARDIAL-INFARCTION#.DE.
13. CORONARY-ARTERY-BYPASS#.DE.
14. CORONARY-DISEASE#.DE.
15. CARDIAC-PATIENTS#.DE.
16. MYOCARDIAL-DISEASES#.DE.
17. MYOCARDIAL-REVASCULARIZATION#.DE.
18. HEART-DISEASES#.DE.
19. CARDIOVASCULAR-DISEASES#.DE.
20. HEART-FAILURE-CONGESTIVE#.DE.

21. ANGINA-PECTORIS#.DE.
22. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16 OR 17 OR 18 OR 19 OR 20 OR 21
23. REHABILITATION#.W..DE.
24. SPORTS#.W..DE.
25. EXERCISE#.W..DE.
26. PHYSICAL-ACTIVITY#.DE.
27. MUSCLE-STRENGTHENING#.DE.
28. AEROBIC-EXERCISES#.DE.
29. PHYSICAL-FITNESS#.DE.
30. PATIENT-EDUCATION#.DE.
31. THERAPEUTIC-EXERCISE#.DE.
32. REHABILITAT$5.TI,AB.
33. (PHYSICAL$4 NEAR (FIT OR FITNESS OR TRAIN$4 OR THERAP$5 OR ACTIVIT$4)).TI,AB.
34. (TRAIN$4 NEAR (STRENGTH$3 OR AEROBIC OR EXERCIS$4)).TI,AB.
35. ((EXERCISE$4 OR FITNESS) NEAR (TREATMENT OR INTERVENT$4 OR PROGRAM$2 OR THERAPY)).TI,AB.
36. (PATIENT$2 NEAR EDUCAT$4).TI,AB.
37. ((LIFESTYLE OR LIFE-STYLE) NEAR (INTERVENT$5 OR PROGRAM$2 OR TREATMENT$2)).TI,AB.
38. SELF-CARE#.DE.
39. (SELF NEAR (MANAGE$5 OR CARE OR MOTIVAT$5)).TI,AB.
40. AMBULATORY-CARE#.DE.
41 AEROBIC.TI,AB.
42. RESISTANCE ADJ TRAIN$4
43. MUSCLE ADJ STRENGTH$5
44. AEROBIC.TI,AB.
45. RESISTANCE ADJ TRAIN$4
46. MUSCLE ADJ STRENGTH$5
47. PSYCHOTHERAPY#.W..DE.
48. PSYCHOTHERAP$2.TI,AB.
49. (PSYCHOLOG$5 NEAR INTERVENT$5).TI,AB.
50. RELAX.TI,AB.
51. RELAXATION-TECHNIQUES#.DE.
52. (COUNSELLING OR COUNSELING).TI,AB.
53. COUNSELING#.W..DE.
54. ((BEHAVIOR$4 OR BEHAVIOUR$4) NEAR (MODIFY OR MODIFICAT$4 OR THERAP$2 OR CHANGE)).TI,AB.
55. STRESS-MANAGEMENT#.DE.
56. (STRESS NEAR MANAG$5).TI,AB.
57. (COGNITIVE NEAR THERAP$2).TI,AB.
58. MEDITATION#.W..DE.
59. MEDITAT$5.TI,AB.
60. ANXIETY#.W..DE.
61. (MANAGE$5 NEAR (ANXIETY OR DEPRESS$5)).TI,AB.
62. CBT.TI,AB.
63. HYPNOTHERAP$5.TI,AB.
64. (GOAL$2 NEAR SETTING).TI,AB.
65. (PSYCHO-EDUCAT$5 OR PSYCHOEDUCAT$5).TI,AB.
66. (MOTIVAT$5 NEAR (INTERV$3 OR INTERVENT$5)).TI,AB.
67. PSYCHOSOCIAL$4.TI,AB.
68. HEALTH-EDUCATION#.DE.
69. (HEALTH NEAR EDUCAT$5).TI,AB.
70. HEART ADJ MANUAL
71. AUTOGENIC$3.TI,AB.

72. 23 OR 24 OR 25 OR 26 OR 27 OR 28 OR 29 OR 30 OR 31 OR 32 OR 33 OR 34 OR 35 OR 36 OR 37 OR 38 OR 39 OR 40 OR 41 OR 42 OR 43 OR 44 OR 45 OR 46
73. 47 OR 48 OR 49 OR 50 OR 51 OR 52 OR 53 OR 54 OR 55 OR 56 OR 57 OR 58 OR 59 OR 60 OR 61 OR 62 OR 63 OR 64 OR 65 OR 66 OR 67 OR 68 OR 69 OR 70 OR 71
74. 72 OR 73
75. 22 AND 74
76. PT=CLINICAL-TRIAL
77. CLINICAL-TRIALS#.DE.
78. (RANDOM$5 OR PLACEBO$2).TI,AB.
79. (SINGL$ OR DOUBLE$ OR TRIPLE$ OR TREBLE$).TI,AB. AND (BLIND$ OR MASK$).TI,AB.
80. CONTROLLED ADJ CLINICAL ADJ TRIALS
81. 76 OR 77 OR 78 OR 79 OR 80
82. 75 AND 81
83. LIMIT 82 TO 2001-2008

PsycINFO DIALOG 1972 to Jan week 1

1. SEARCH: HEART-DISORDERS#.DE.
2. SEARCH: MYOCARDIAL-INFARCTIONS.DE.
3. SEARCH: ISCHEMIA#.W..DE.
4. SEARCH: HEART-SURGERY.DE.
5. SEARCH: ANGIOPLASTY
6. SEARCH: HEART ADJ BYPASS
7. SEARCH: CORONARY.TI,AB.
8. SEARCH: (ISCHEMI$3 OR ISCHAEMI$3).TI,AB.
9. SEARCH: (MYOCARD$5 NEAR INFARCT$5).TI,AB.
10. SEARCH: (HEART NEAR (INFARC$5 OR FAILURE OR ATTACK)).TI,AB.
11. SEARCH: ANGINA.TI,AB.
12. SEARCH: (HEART NEAR DISEASE$2).TI,AB.
13. SEARCH: MYOCARD$5.TI,AB.
14. SEARCH: CARDIAC$4.TI,AB.
15. SEARCH: CABG.TI,AB.
16. SEARCH: PTCA.TI,AB.
17. SEARCH: 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16
18. SEARCH: PHYSICAL-ACTIVITY#.DE.
19. SEARCH: SPORTS#.W..DE.
20. SEARCH: PHYSICAL-EDUCATION.DE.
21. SEARCH: HEALTH-BEHAVIOR#.DE.
22. SEARCH: PHYSICAL-FITNESS.DE.
23. SEARCH: (PHYSICAL ADJ EDUCATION).TI,AB.
24. SEARCH: EXERTION.TI,AB.
25. SEARCH: REHABILITAT$6.TI,AB.
26. SEARCH: (PHYSICAL NEAR (FIT$5 OR TRAIN$5 OR THERAP$5 OR ACTIVIT$4)).TI,AB.
27. SEARCH: (TRAIN$4 NEAR (STRENGTH$4 OR AEROBIC OR EXERCISE$2)).TI,AB.
28. SEARCH: ((EXERCISE$3 OR FITNESS) NEAR (TREATMENT OR INTERVENT$4 OR PROGRAM$4 OR THERAP$2)).TI,AB.
29. SEARCH: (PATIENT WITH EDUCATION).TI,AB.
30. SEARCH: CLIENT-EDUCATION#.DE.
31. SEARCH: HEALTH-PROMOTION#.DE.
32. SEARCH: ((LIFESTYLE OR LIFE-STYLE) NEAR (INTERVENT$5 OR PROGRAM$2 OR TREATMENT$2)).TI,AB.
33. SEARCH: OUTPATIENT-TREATMENT#.DE.
34. SEARCH: 18 OR 19 OR 20 OR 21 OR 22 OR 23 OR 24 OR 25 OR 26 OR 27 OR 28 OR 29 OR 30 OR 31 OR 32 OR 33
35. SEARCH: PSYCHOTHERAPY#.W..DE.

36. SEARCH: PSYCHOTHERAP$2.TI,AB.
37. SEARCH: TREATMENT#.W..DE.
38. SEARCH: (PSYCHOLOG$4 NEAR INTERVENT$5).TI,AB.
39. SEARCH: COUNSELING#.W..DE.
40. SEARCH: COPING-BEHAVIOR#.DE.
41. SEARCH: MEDITATION.W..DE.
42. SEARCH: AUTOGENIC-TRAINING.DE.
43. SEARCH: HEALTH-EDUCATION#.DE.
44. SEARCH: RELAX$6.TI,AB.
45. SEARCH: (COUNSELLING OR COUNSELING).TI,AB.
46. SEARCH: ((BEHAVIOUR OR BEHAVIOR) NEAR (MODIF$5 OR THERAP$5 OR REHABILIT$5 OR CHANGE)).TI,AB.
47. SEARCH: (STRESS NEAR MANAGE$5).TI,AB.
48. SEARCH: MEDITAT$5.TI,AB.
49. SEARCH: (MANAGE$5 NEAR (ANXIETY OR DEPRES$5)).TI,AB.
50. SEARCH: (CBT OR COGNITIV$2 NEAR THERAP$3).TI,AB.
51. SEARCH: HYPNOTHERAP$3.TI,AB.
52. SEARCH: (PSYCHO-EDUCAT$6 OR PSYCHOEDUCAT$6).TI,AB.
53. SEARCH: (MOTIVAT$5 NEAR INTERVENT$5).TI,AB.
54. SEARCH: (SELF NEAR MANAG$6).TI,AB.
55. SEARCH: AUTOGENIC$3.TI,AB.
56. SEARCH: (GOAL NEAR SETTING).TI,AB.
57. SEARCH: (HEALTH NEAR EDUCATION).TI,AB.
58. SEARCH: (HEART ADJ MANUAL).TI,AB.
59. SEARCH: 35 OR 36 OR 37 OR 38 OR 39 OR 40 OR 41 OR 42 OR 43 OR 44 OR 45 OR 46 OR 47 OR 48 OR 49 OR 50 OR 51 OR 52 OR 53 OR 54 OR 55 OR 56 OR 57 OR 58
60. SEARCH: 17 AND (34 OR 59)
61. SEARCH: (RANDOM$5 OR PLACEBO$5).TI,AB.
62. SEARCH: (DOUBLE$4 OR SINGLE$4 OR TRIPLE$4).TI,AB. AND (BLIND$4 OR MASK OR SHAM$4 OR DUMMY).TI,AB.
63. SEARCH: RCT.TI,AB.
64. SEARCH: AT=TREATMENT$
65. SEARCH: 61 OR 62 OR 63 OR 64
66. SEARCH: 60 AND 66
67. SEARCH: LIMIT 66 TO YRS=2001-2008

ISI Proceedings

#5 and #6
Databases=STP Timespan=2001-2008
# 6 TS=(rehab* or educat*)
Databases=STP Timespan=2001-2008
# 5 #4 OR #3 OR #2 OR #1
Databases=STP Timespan=2001-2008
# 4 TS=(angina or cardiac* or PTCA or CABG)
Databases=STP Timespan=2001-2008
# 3 TS=((heart) SAME (infarct* or isch?emia or failure or attack)) Databases=STP Timespan=2001-2008
# 2 TS=((coronary* or heart*) SAME (by?pass or disease*)) Databases=STP Timespan=2001-2008
# 1 TS=((myocard*) SAME (isch?emia or infarct* or revasculari?*)) Databases=STP Timespan=2001-2008

Appendix 2. Search strategies 2013

The Cochrane Library

#1 MeSH descriptor: [Myocardial Ischemia] explode all trees
#2 (myocard* near/3 isch?mi*)
#3 (isch?mi* near/3 heart)
#4 MeSH descriptor: [Coronary Artery Bypass] explode all trees
#5 coronary
#6 MeSH descriptor: [Coronary Disease] explode all trees
#7 MeSH descriptor: [Myocardial Revascularization] explode all trees
#8 MeSH descriptor: [Myocardial Infarction] explode all trees
#9 (myocard* near/3 infarct*)
#10 (heart near/3 infarct*)
#11 MeSH descriptor: [Angina Pectoris] explode all trees
#12 angina
#13 MeSH descriptor: [Heart Failure] explode all trees
#14 (heart near/3 (failure or attack))
#15 MeSH descriptor: [Heart Diseases] explode all trees
#16 (heart near/3 disease*)
#17 myocard*
#18 cardiac*
#19 CABG
#20 PTCA
#21 (stent* near/3 (heart or cardiac*))
#22 MeSH descriptor: [Heart Bypass, Left] explode all trees
#23 MeSH descriptor: [Heart Bypass, Right] explode all trees
#24 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or # 20 or #21 or #22 or #23
#25 MeSH descriptor: [Rehabilitation Centers] this term only
#26 MeSH descriptor: [Exercise Therapy] explode all trees
#27 MeSH descriptor: [Sports] this term only
#28 MeSH descriptor: [Physical Exertion] explode all trees
#29 rehabilitat*
#30 (physical* near/3 (fit* or train* or therap* or activit*))
#31 MeSH descriptor: [Exercise] explode all trees
#32 (train* near/3 (strength* or aerobic or exercise*))
#33 ((exercise* or fitness) near/3 (treatment or intervent* or program*))
#34 MeSH descriptor: [Rehabilitation] explode all trees
#35 MeSH descriptor: [Patient Education as Topic] explode all trees
#36 (patient* near/3 educat*)
#37 ((lifestyle or life-style) near/3 (intervent* or program* or treatment*))
#38 MeSH descriptor: [Self Care] explode all trees
#39 MeSH descriptor: [Ambulatory Care] explode all trees
#40 MeSH descriptor: [Psychotherapy] explode all trees
#41 psychotherap*
#42 (psycholog* near/3 intervent*)
#43 relax*
#44 MeSH descriptor: [Mind-Body Therapies] explode all trees
#45 MeSH descriptor: [Counseling] explode all trees
#46 counsel?ing
#47 MeSH descriptor: [Cognitive Therapy] explode all trees

#48 MeSH descriptor: [Behavior Therapy] explode all trees
#49 (behavio*r* near/4 (modif* or therap* or rehab* or change))
#50 MeSH descriptor: [Stress, Psychological] explode all trees
#51 (stress near/3 manage*)
#52 (cognitive* near/3 therap*)
#53 MeSH descriptor: [Meditation] explode all trees
#54 meditat*
#55 MeSH descriptor: [Anxiety] this term only
#56 (manage* near/3 (anxiety or depres*))
#57 CBT
#58 hypnotherap*
#59 (goal near/3 setting)
#60 (psycho-educat* or psychoeducat*)
#61 (motivat* near/3 interv*)
#62 MeSH descriptor: [Psychopathology] explode all trees
#63 psychopathol*
#64 MeSH descriptor: [Autogenic Training] explode all trees
#65 autogenic*
#66 (self near/3 (manage* or care or motivat*))
#67 distress*
#68 (psychosocial* or psycho-social*)
#69 MeSH descriptor: [Health Education] explode all trees
#70 ((nutrition or diet or health) near/3 education)
#71 heart manual
#72 secondary near/5 prevent* near/10 (intervent* or program* or treatment* or plan* or regimen*)
#73 #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 or #39 or #40 or #41 or #42 or #43 or #44 or #45 or #46 or #47 or #48 or #49 or #50 or #51 or #52 or #53 or #54 or #55 or #56 or #57 or #58 or #59 or #60 or #61 or #62 or #63 or #64 or #65 or #66 or #67 or #68 or #69 or #70 or #71 or #72
#74 MeSH descriptor: [Patient Compliance] this term only
#75 (increase* near/10 participat*)
#76 (comply or complian*)
#77 remain*
#78 adhere*
#79 uptake or “take up”
#80 “sign up” or “ sign on”
#81 effectiv*
#82 “follow up”
#83 engage*
#84 attend*
#85 #74 or #75 or #76 or #77 or #78 or #79 or #80 or #81 or #82 or #83 or #84
#86 #24 and #73 and #85 from 2008 to 2013

MEDLINE Ovid

1. exp Myocardial Ischemia/
2. (myocard* adj3 isch?mi*).tw.
3. (isch?mi* adj3 heart).tw.
4. exp Coronary Artery Bypass/
5. coronary.tw.
6. exp Coronary Disease/
7. exp Myocardial Revascularization/
8. exp Myocardial Infarction/
9. (myocard* adj3 infarct*).tw.

10. (heart adj3 infarct*).tw.
11. exp Angina Pectoris/
12. angina.tw.
13. exp Heart Failure/
14. (heart adj3 (failure or attack)).tw.
15. Angioplasty, Balloon, Coronary/
16. CABG.tw.
17. PTCA.tw.
18. ami.tw.
19. (cardia* adj3 infarct*).tw.
20. (acute adj3 infarct*).tw.
21. (heart adj3 bypass*).tw.
22. ((cardiac or mycardial) adj (failure or insufficiency)).tw.
23. or/1-22
24. Patient Compliance/
25. (increase* adj10 participat*).tw.
26. (comply or complian*).tw.
27. remain*.tw.
28. adhere*.tw.
29. (uptake or take up).tw.
30. (sign adj2 (up or on)).tw.
31. effectiv*.tw.
32. follow up.tw.
33. engage*.tw.
34. attend*.tw.
35. or/24-34
36. Rehabilitation Centers/
37. exp Exercise Therapy/
38. Sports/
39. exp Physical Exertion/
40. rehabilitat*.tw.
41. (physical* adj3 (fit* or train* or therap* or activit*)).tw.
42. exp Exercise/
43. (train* adj3 (strength* or aerobic or exercise*)).tw.
44. ((exercise* or fitness) adj3 (treatment or intervent* or program*)).tw.
45. exp Rehabilitation/
46. exp Patient Education as Topic/
47. (patient* adj3 educat*).tw.
48. ((lifestyle or life-style) adj3 (intervent* or program* or treatment*)).tw.
49. exp Self Care/
50. exp Ambulatory Care/
51. exp Psychotherapy/
52. psychotherap*.tw.
53. (psycholog* adj3 intervent*).tw.
54. relax*.tw.
55. exp Mind-Body Therapies/
56. exp Counseling/
57. counsel?ing.tw.
58. exp Cognitive Therapy/
59. exp Behavior Therapy/
60. (behavio*r* adj4 (modif* or therap* or rehab* or change)).tw.
61. exp Stress, Psychological/
62. (stress adj3 manage*).tw.

63. (cognitive* adj3 therap*).tw.
64. exp Meditation/
65. meditat*.tw.
66. Anxiety/
67. (manage* adj3 (anxiety or depres*)).tw.
68. CBT.tw.
69. hypnotherap*.tw.
70. (goal adj3 setting).tw.
71. (psycho-educat* or psychoeducat*).tw.
72. (motivat* adj3 interv*).tw.
73. exp Psychopathology/
74. psychopathol*.tw.
75. exp Autogenic Training/
76. autogenic*.tw.
77. (self adj3 (manage* or care or motivat*)).tw.
78. distress*.tw.
79. (psychosocial* or psycho-social*).tw.
80. exp Health Education/
81. ((nutrition or diet or health) adj3 education).tw.
82. heart manual.tw.
83. (secondary adj5 prevent$ adj10 (intervent* or program* or treatment* or plan* or regimen*)).tw.
84. or/36-83
85. 23 and 35 and 84
86. randomised controlled trial.pt.
87. controlled clinical trial.pt.
88. randomized.ab.
89. placebo.ab.
90. drug therapy.fs.
91. randomly.ab.
92. trial.ab.
93. groups.ab.
94. 86 or 87 or 88 or 89 or 90 or 91 or 92 or 93
95. exp animals/ not humans.sh.
96. 94 not 95
97. 85 and 96
98. (2008* or 2009* or 2010* or 2011* or 2012* or 2013*).ed.
99. 97 and 98

EMBASE Ovid

1. exp Myocardial Ischemia/
2. (myocard* adj3 isch?mi*).tw.
3. (isch?mi* adj3 heart).tw.
4. exp Coronary Artery Bypass/
5. coronary.tw.
6. exp Coronary Disease/
7. exp Myocardial Revascularization/
8. exp Myocardial Infarction/
9. (myocard* adj3 infarct*).tw.
10. (heart adj3 infarct*).tw.
11. exp Angina Pectoris/
12. angina.tw.
13. exp Heart Failure/

14. (heart adj3 (failure or attack)).tw.
15. exp Heart Diseases/
16. (heart adj3 disease*).tw.
17. myocard*.tw.
18. cardiac*.tw.
19. CABG.tw.
20. PTCA.tw.
21. (stent* adj3 (heart or cardiac*)).tw.
22. exp Heart Bypass, Left/
23. exp Heart Bypass, Right/
24. or/1-23
25. Rehabilitation Centers/
26. exp Exercise Therapy/
27. Sports/
28. exp Physical Exertion/
29. rehabilitat*.tw.
30. (physical* adj3 (fit* or train* or therap* or activit*)).tw.
31. exp Exercise/
32. (train* adj3 (strength* or aerobic or exercise*)).tw.
33. ((exercise* or fitness) adj3 (treatment or intervent* or program*)).tw.
34. exp Rehabilitation/
35. exp Patient Education as Topic/
36. (patient* adj3 educat*).tw.
37. ((lifestyle or life-style) adj3 (intervent* or program* or treatment*)).tw.
38. exp Self Care/
39. exp Ambulatory Care/
40. exp Psychotherapy/
41. psychotherap*.tw.
42. (psycholog* adj3 intervent*).tw.
43. relax*.tw.
44. exp Mind-Body Therapies/
45. exp Counseling/
46. counsel?ing.tw.
47. exp Cognitive Therapy/
48. exp Behavior Therapy/
49. (behavio*r* adj4 (modif* or therap* or rehab* or change)).tw.
50. exp Stress, Psychological/
51. (stress adj3 manage*).tw.
52. (cognitive* adj3 therap*).tw.
53. exp Meditation/
54. meditat*.tw.
55. Anxiety/
56. (manage* adj3 (anxiety or depres*)).tw.
57. CBT.tw.
58. hypnotherap*.tw.
59. (goal adj3 setting).tw.
60. (psycho-educat* or psychoeducat*).tw.
61. (motivat* adj3 interv*).tw.
62. exp Psychopathology/
63. psychopathol*.tw.
64. exp Autogenic Training/
65. autogenic*.tw.
66. (self adj3 (manage* or care or motivat*)).tw.

67. distress*.tw.
68. (psychosocial* or psycho-social*).tw.
69. exp Health Education/
70. ((nutrition or diet or health) adj3 education).tw.
71. heart manual.tw.
72. (secondary adj5 prevent$ adj10 (intervent* or program* or treatment* or plan* or regimen*)).tw.
73. or/25-72
74. patient compliance/
75. (increase* adj10 participat*).tw.
76. (comply or complian*).tw.
77. remain*.tw.
78. adhere*.tw.
79. (uptake or take up).tw.
80. (sign adj2 (up or on)).tw.
81. effectiv*.tw.
82. engage*.tw.
83. follow up.tw.
84. attend*.tw.
85. or/74-84
86. 24 and 73 and 85
87. random$.tw.
88. factorial$.tw.
89. crossover$.tw.
90. cross over$.tw.
91. cross-over$.tw.
92. placebo$.tw.
93. (doubl$ adj blind$).tw.
94. (singl$ adj blind$).tw.
95. assign$.tw.
96. allocat$.tw.
97. volunteer$.tw.
98. crossover procedure/
99. double blind procedure/
100. randomised controlled trial/
101. single blind procedure/
102. 87 or 88 or 89 or 90 or 91 or 92 or 93 or 94 or 95 or 96 or 97 or 98 or 99 or 100 or 101
103. (animal/ or nonhuman/) not human/
104. 102 not 103
105. 86 and 104
106. (2008* or 2009* or 2010* or 2011* or 2012* or 2013*).em.
107. 105 and 106
108. limit 107 to embase

CINAHL

S86 S82 AND S85
S85 S83 OR S84
S84 (MH "Randomized Controlled Trials") OR (MH "Single-Blind Studies") OR (MH "Triple-Blind Studies") OR (MH "Double-Blind Studies")
S83 (random* or blind* or allocat* or assign* or trial* or placebo* or crossover* or cross-over*)
S82 S22 AND S69 AND S81
S81 S70 OR S71 OR S72 OR S73 OR S74 OR S75 OR S76 OR S77 OR S78 OR S79 OR S80
S80 attend*

S79 engage*
S78 “follow up”
S77 effectiv*
S76 “sign up” or “sign on”
S75 uptake or “take up”
S74 adhere*
S73 remain*
S72 comply or complian*
S71 (increase* N10 participat*)
S70 (MH “Patient Compliance”)
S69 S23 or S24 or S25 or S26 or S27 or S28 or S29 or S30 or S31 or S32 or S33 or S34 or S35 or S36 or S37 or S38 or S39 or S40 or S41 or S42 or S43 or S44 or S45 or S46 or S47 or S48 or S49 or S50 or S51 or S52 or S53 or S54 or S55 or S56 or S57 or S58 or S59 or S60 or S61 or S62 or S63 or S64 or S65 or S66 or S67 or S68
S68 (heart manual)
S67 ((nutrition or diet or health) N3 education)
S66 (MH “Health Education+”)
S65 (psychosocial* or psycho-social*)
S64 (distress*)
S63 (autogenic*)
S62 (MH “Autogenic Training (Iowa NIC)”)
S61 (psychopathol*)
S60 (MH “Psychopathology”)
S59 (motivat* N3 interv*)
S58 (psycho-educat* or psychoeducat*)
S57 (goal N3 setting)
S56 (hypnotherap*)
S55 CBT
S54 (manage* N3 (anxiety or depres*))
S53 (MH “Anxiety”)
S52 (meditat*)
S51 (MH “Meditation”)
S50 (cognitive* N3 therap*)
S49 (stress N3 manage*)
S48 (MH “Stress, Psychological+”)
S47 (behavio*r* N4 (modif* or therap* or rehab* or change))
S46 (MH “Behavior Therapy+”)
S45 (MH “ Cognitive Therapy”)
S44 (counsel?ing)
S43 (MH “Counseling+”)
S42 (MH “Mind Body Techniques+”)
S41 (relax*)
S40 (psycholog* N3 intervent*)
S39 (psychotherap*)
S38 (MH “Psychotherapy+”)
S37 (MH “Ambulatory Care”)
S36 (MH “Self Care+”)
S35 ((lifestyle or life-style) N3 (intervent* or program* or treatment*))
S34 (patient* N3 educat*)
S33 (MH “Patient Education+”)
S32 (MH “Rehabilitation+”)
S31 ((exercise* or fitness) N3 (treatment or intervent* or program*))
S30 (train* N3 (strength* or aerobic or exercise*))
S29 (MH “Exercise+”)

S28 (physical* N3 (fit* or train* or therap* or activit*))
S27 rehabilitat*
S26 (MH "Physical Activity")
S25 (MH "Sports")
S24 (MH "Therapeutic Exercise+")
S23 (MH "Rehabilitation Centers")
S22 S1 or S2 or S3 or S4 or S5 or S6 or S7 or S8 or S9 or S10 or S11 or S12 or S13 or S14 or S15 or S16 or S17 or S18 or S19 or S20 or S21
S21 (stent* N3 (heart or cardiac*))
S20 PTCA
S19 CABG
S18 (cardiac*)
S17 (myocard*)
S16 (heart N3 disease*)
S15 (MH "Heart Diseases+")
S14 (heart N3 (failure or attack))
S13 (MH "Heart Failure+")
S12 (angina)
S11 (MH "Angina Pectoris+")
S10 (heart N3 infarct*)
S9 (myocard* N3 infarct*)
S8 (MH "Myocardial Infarction+")
S7 (MH "Myocardial Revascularization+")
S6 (MH "Coronary Disease+")
S5 (coronary)
S4 (MH "Coronary Artery Bypass+")
S3 (isch?mi* N3 heart)
S2 (myocard* N3 isch?mi*)
S1 (MH "Myocardial Ischemia+")

Web of Science

#40 #39
#39 #38 AND #37 AND #34 AND #7
#38 TS=((random* or blind* or allocat* or assign* or trial* or placebo* or crossover* or cross-over*))
#37 #36 OR #35
#36 TS=(comply or complian* or remain* or adhere* or uptake or "take up" or "sign up" or "sign on" or effectiv* or "follow up" or engage* or attend*)
#35 TS=(increase* near/10 participat*)
#34 #33 OR #32 OR #31 OR #30 OR #29 OR #28 OR #27 OR #26 OR #25 OR #24 OR #23 OR #22 OR #21 OR #20 OR #19 OR #18 OR #17 OR #16 OR #15 OR #14 OR #13 OR #12 OR #11 OR #10 OR #9 OR #8
#33 TS=heart manual
#32 TS=(((nutrition or diet or health) near/3 education))
#31 TS=((psychosocial* or psycho-social*))
#30 Topic=((distress*))
#29 Topic=((self near/3 (manage* or care or motivat*)))
#28 Topic=((self near/3 (manage* or care or motivat*)))
#27 TS=((psychopathol* OR autogenic*))
#26 Topic=((motivat* near/3 interv*))
#25 Topic=((psycho-educat* or psychoeducat*))
#24 Topic=((goal near/3 setting))
#23 Topic=((hypnotherap*))
#22 Topic=(CBT)

#21 Topic=((manage* near/3 (anxiety or depres*)))
#20 Topic=((meditat*))
#19 Topic=((cognitive* near/3 therap*))
#18 Topic=((stress near/3 manage*))
#17 Topic=((behavio*r* near/4 (modif* or therap* or rehab* or change)))
#16 TS=((relax* OR counsel?ing))
#15 Topic=((psycholog* near/3 intervent*))
#14 Topic=((psychotherap*))
#13 Topic=(((lifestyle or life-style) near/3 (intervent* or program* or treatment*)))
#12 Topic=((patient* near/3 educat*))
#11 Topic=(((exercise* or fitness) near/3 (treatment or intervent* or program*)))
#10 Topic=((train* near/3 (strength* or aerobic or exercise*)))
#9 Topic=((physical* near/3 (fit* or train* or therap* or activit*)))
#8 Topic=(rehabilitat*)
#7 #6 OR #5 OR #4 OR #3 OR #2 OR #1
#6 Topic=((stent* near/3 (heart or cardiac*)))
#5 TS=(heart near/3 (failure or attack or infarct* or disease*))
#4 Topic=((myocard* near/3 infarct*))
#3 TS=(coronary or angina or myocard* or cardiac* or CABG or PTCA)
#2 Topic=((isch?mi* near/3 heart))
#1 Topic=((myocard* near/3 isch?mi*))

WHAT'S NEW

Last assessed as up-to-date: 23 January 2013.

Date	Event	Description
3 October 2013	New citation required but conclusions have not changed	Eight new trials were identified but the conclusions remains unchanged
23 January 2013	New search has been performed	Search was updated in January 2013.

CONTRIBUTIONS OF AUTHORS

Karmali K was responsible for coordinating the update, selecting studies for inclusion, data extraction and risk of bias assessment, data management and analysis, and drafting the manuscript.

Davies P was responsible for the design of the review, selecting studies for inclusion, data extraction and risk of bias assessment, data management and analysis, and drafting the manuscript.

Taylor F was responsible for the design of the review, data extraction and risk of bias assessment, commenting critically on the intellectual content of drafts of the manuscript, and final approval prior to publication.

Beswick A was responsible for the design of the review, selecting studies for inclusion, commenting critically on the intellectual content of drafts of the manuscript, and final approval prior to publication.

Martin N was responsible for the design of the search strategy, commenting critically on the intellectual content of drafts of the manuscript, and final approval prior to publication.

Ebrahim S was responsible for the design of the review, providing methodologic and clinical advice, commenting critically on the intellectual content of drafts of the manuscript, and final approval prior to publication.

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None known.

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INDEX TERMS

Medical Subject Headings (MeSH)

Angina Pectoris [rehabilitation]; Angioplasty, Balloon, Coronary [rehabilitation]; Coronary Artery Bypass [rehabilitation]; Coronary Disease [*rehabilitation]; Exercise; Heart Failure [rehabilitation]; Myocardial Infarction [rehabilitation]; Patient Acceptance of Health Care [*statistics & numerical data]; Patient Compliance [statistics & numerical data]; Randomized Controlled Trials as Topic

MeSH check words

Adult; Humans; Middle Aged