The SIGN guideline on cardiac rehabilitation

THE GUIDELINE DEVELOPMENT GROUP ON CARDIAC REHABILITATION FOR THE ROYAL COLLEGE OF PHYSICIANS, EDINBURGH

Abstract

The SIGN guideline on cardiac rehabilitation was published in January 2002 and endorsed by the British Association of Cardiac Rehabilitation. This paper summarises the recommendations, which cover all four phases of recovery and the three main cardiac rehabilitation interventions.

Key words: cardiac rehabilitation, guidelines, SIGN.

Br J Cardiol 2003;**10**:29–34

Introduction

Coronary heart disease (CHD) is the leading cause of death in the UK among men and women accounting for over 140,000 deaths a year: approximately one in four deaths in men and one in five deaths in women. Around 300,000 people in the UK suffer a heart attack each year, approximately 1.4 million people suffer from angina and about half a million people have heart failure.[1] The recovery and maintenance of physical and psychosocial health in such patients is a major challenge in preventive care; cardiac rehabilitation is the process by which these goals are achieved. The interventions that comprise cardiac rehabilitation can be grouped into three main categories: exercise training, psychological and educational. These may all be appropriate at each of four phases of recovery: in-patient care; the early post-discharge period; exercise training, education and risk factor management; and finally long-term follow-up, as shown in figure 1.

Methods

The evidence base for this guideline was constructed using SIGN methodology, which has been described previously.[2] Briefly, existing guidelines, systematic reviews and meta-analyses were identified by a range of general and specialist search engines, and specific medical sites such as the National Guideline Clearinghouse, in addition to Medline, Healthstar, Embase, PsychINFO, Cinahl and the Cochrane Library, for the period January 1991 to May 2000. A search for economic literature was performed in Medline, Healthstar, Embase, the Cochrane Library and NEED. Additional searches were performed during the period January 1995 to September 2000 to bring the literature up to date for randomised controlled trials. Recommendations were graded A, B, C or D according to levels of evidence agreed by two reviewers for each paper (see table 1).

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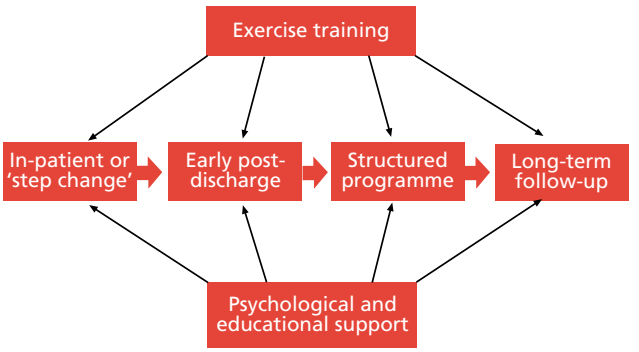
Figure 1. The three intervention and the four phases of cardiac rehabilitation



Uptake

Although beneficial outcomes can be anticipated post-myocardial infarction (MI) (A grade recommendation), post-coronary bypass and angioplasty (A), in stable angina (A), chronic heart failure (A), older patients (B) and in women (B), only a minority participate. A recent UK survey found that 14–23% of infarct patients, 33–56% of coronary bypass patients and 6–10% of angioplasty patients were enrolled into cardiac rehabilitation programmes.[3] A number of reasons for low uptake have been reported including availability, resources, social deprivation, level of education and negative cultural attitudes towards rehabilitation from patients' partners and families. Reported rates of uptake of cardiac rehabilitation must nevertheless underestimate the true level of activity because in-patient rehabilitation and the contribution made by home-based programmes, such as the 'Heart Manual', are not included in the figures.

Psychological and educational interventions

A meta-analysis of 8,988 patients in 37 trials found that cardiac rehabilitation, including psychological and/or educational interventions, results in a 34% reduction in cardiac mortality and a 29% reduction in recurrent MI at one to 10 years of follow-up.[4]

Table 1. Key to grades of recommendations and evidence statements

Grades of recommendation

A At least one meta-analysis, systematic review, or RCT rated as 1^{++} and directly applicable to the target population; or
A body of evidence consisting principally of studies rated as 1^{+}, directly applicable to the target population, and demonstrating overall consistency of results

B A body of evidence including studies rated as 2^{++} , directly applicable to the target population and demonstrating overall consistency of results; or
Extrapolated evidence from studies rated as 1^{++} or 1^{+}

C A body of evidence including studies rated as 2^{+}, directly applicable to the target population and demonstrating overall consistency of results; or
Extrapolated evidence from studies rated as 2^{++}

D Evidence level 3 or 4; or
Extrapolated evidence from studies rated as 2^{+}

Levels of evidence

1^{++} High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias

1^{+} Well-conducted meta-analyses, systematic reviews, or RCTs with a low risk of bias

1^{-} Meta-analyses, systematic reviews, or RCTs with a high risk of bias

2^{++} High quality systematic reviews of case control or cohort studies
High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal

2^{+} Well-conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal

2^{-} Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal

3 Non-analytic studies, e.g. case reports, case series

4 Expert opinion

Key: RCT = randomised clinical trial

Studies with the greatest response to intervention showed the largest reduction in cardiac mortality and recurrent MI, implying that success with risk factors, related behaviours or emotional distress contributes to the reduction in cardiac events. Similar cardiovascular outcomes were reported by two earlier meta-analyses.[5,6] These data support the view that cardiac rehabilitation programmes should include both psychological and educational interventions, delivered using established principles of adult education and behavioural change (A).

Behavioural change is an important part of secondary prevention and reduction of disability. Evidence indicates that use of established psychological models of behavioural change improves compliance and therapeutic outcome. These include interventions based on cognitive behavioural approaches, the Health Belief and Illness Representation Models, and motivational interviewing. The 'Heart Manual', a six-week programme designed for use in the immediate post-MI period to correct misconceptions about the cause of heart attack, helps patients achieve behavioural change with risk factors and also to develop strategies to deal with stress. This programme is recommended to facilitate comprehensive cardiac rehabilitation (A).[7] Education is most likely to be effective if delivered using the five principles of adult learning: relevance, individualisation, feedback, reinforcement and facilitation (A).[8] Provision of information alone is less effective.

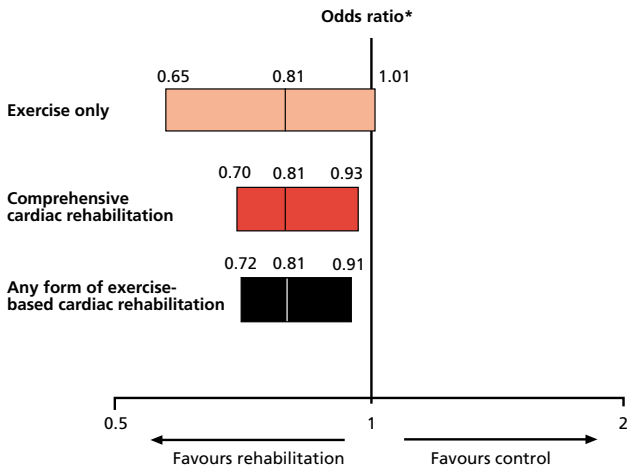
Current expert opinion and evidence indicates that it is more effective to target psychological and educational interventions to those identified as either more 'distressed' or in greater need of behavioural change, rather than deliver all aspects of a programme to every patient (B). Patients who are unduly anxious or depressed may be identified using a validated assessment tool such as the Hospital Anxiety and Depression (HAD) scale (B) which can also be used to assess response to therapy.[9] Screening should take place at discharge, six to twelve weeks post-MI or following a decision on surgical intervention, and be repeated at three month intervals if appropriate. Rehabilitation staff should identify and help address cardiac misconceptions which are incorrect or muddled beliefs about heart problems that frequently lead people to be over cautious and to respond inappropriately (B). Other domains of health status may also need to be evaluated and a variety of instruments are available for this purpose.[10-12] Basic level psychological therapy may be appropriate for those with mild psychological distress and can be delivered effectively by rehabilitation staff sensitive to patients needs. It is often helpful to involve partners. Patients with more complex problems need treatment from therapists with specialist training and experience in techniques such as cognitive behaviour therapy (B).[13]

All cardiac patients in whom anxiety and depression are diagnosed should be treated appropriately,[14] although caution must be exercised in selecting an antidepressant which does not have significant cardiac side effects (A).[15] While a degree of anxiety and depression and associated symptoms such as poor sleep, poor concentration, lack of energy, mildly low mood are common in patients with CHD, persistent significant unhappiness or anxiety is not usual and should not be accepted as an appropriate reaction. Major disturbances of mood are too commonly considered a normal response to severe illness when they are abnormal and might respond to treatment. Antidepressant medication is effective for those who have clear symptoms of major depression and should be prescribed whenever there is a persistent lowering of mood characterised by pessimism and lack of pleasure in life. It is much less common than mild depression, which is best treated in other ways, but is under recognised and under treated in patients with cardiac disease.[15]

Exercise training

Exercise training should form a core element of cardiac rehabilitation (A). The exercise component of cardiac rehabilitation has evolved from the recognition that physical deconditioning occurs following MI, and the knowledge that regular exercise protects against cardiovascular disease.[16] A Cochrane review of men and women of all ages with previous MI, revascularisation or angina

Figure 2. Cochrane review of exercise-based cardiac rehabilitation showing odds ratios with 95% confidence intervals for exercise only cardiac rehabilitation, comprehensive cardiac rehabilitation and any form of exercise-based cardiac rehabilitation on a combined end point of all-cause mortality, non-fatal myocardial infarction and revascularisation



Key: * = for mortality, non-fatal myocardial infarction and infarction and revascularisation

Table 2. Correlation of training level with perceived exertion and heart rate

Exercise training level	Rate of perceived exertion (Borg)	Perceived breathing rate	% Maximal heart rate from symptom limited exercise test
	6 No exertion at all		
	7 Very, very light		
	8		
	9 Very light		
	10		
LOW	11 Fairly Light	SING	50–60
	12		
MODERATE	13 Somewhat hard	TALK	60–75
	14		
HIGH	15 Hard (heavy)	GASP	75–85
	16		
	17 Very hard		
	18		
	19 Very, very hard		
	20 Maximal exertion		

found that exercise only cardiac rehabilitation reduced all-cause mortality by 27% (95%CI 44%, 2%), cardiac death by 31% (49%, 6%), and a combined end point of mortality, non-fatal MI and revascularisation by 19% (35%, +1%).[17] The benefits accrued over an average of 2.4 years. There was no effect on non-fatal MI alone and there was no apparent additional benefit from comprehensive cardiac rehabilitation (see figure 2). Most subjects were low-risk, middle-aged men post-MI. Patients with heart transplants, artificial valves and heart failure were excluded.

There are two possible explanations for the apparent failure of comprehensive cardiac rehabilitation to show additional benefit. One is that exercise only cardiac rehabilitation is likely to include psychological and educational support, even if this is not offered in a structured fashion. The other is that most of the exercise only trials were conducted in the pre-thrombolytic era, whereas most of the comprehensive rehabilitation trials were published more recently. This means that the benefits in the comprehensive trials are likely to be additional to those of thrombolysis, prophylactic medication and/or revascularisation.

Available evidence supports the concept of 'low cost low tech' exercise training in cardiac rehabilitation. For most patients, clinical risk stratification based on history, examination and resting electrocardiograph (ECG)[18] (D) combined with a functional capacity test, such as a shuttle walking test[19] or six minute walking test[20] (D) will be sufficient. Functional capacity can be re-evaluated on completion of exercise training to assess the degree of improvement in physical fitness. Exercise testing and echocardiography are recommended to assess residual ischaemia and ventricular function respectively but are not a necessary part of cardiac rehabilitation except for high intensity exercise or in high-risk patients (D).[18]

Aerobic low to moderate intensity exercise, designed to suit a range of fitness levels, is recommended for most patients undergoing exercise training, (B)[17] and can be undertaken as safely and effectively in the home or community as in a hospital setting, (B).[21] Exercise training for high-risk subjects and for those who require high intensity exercise should be hospital based or in a venue with full resuscitation facilities (D). For patients undertaking hospital-based classes, the ratio of patients to trained staff during exercise should be no more than 10:1 (D). Staff with basic life support training and the ability to use a defibrillator are required for group exercise of low- to moderate-risk patients (D). Immediate access to on-site staff with advanced life support training is required for high-risk patients or classes offering high intensity training (D).

Exercise intensity may be monitored either by perceived exertion using Borg's scale[22] or by heart rate using a pulse monitor (D).[23] The aim is to enable patients to achieve a level of 'comfortable breathlessness' while exercising and so distinguish between high intensity and low to moderate intensity exercise (see table 2). Once taught the principles of self monitoring necessary to use a Borg Scale effectively, most patients can learn to pace their activities at an appropriate exercise intensity, without the need for pulse monitoring.

Meta-analyses support the view that the formal exercise component of cardiac rehabilitation should be offered at least twice weekly for a minimum of eight weeks if cardiac and all-cause mortality are to be reduced (A).[24] Once weekly group exercise with two equivalent home-based sessions improves exercise capacity as effectively as thrice weekly hospital-based exercise

(C). Low to moderate risk cardiac patients can safely undertake resistance training (C).[25] Patients may benefit from supervised aerobic training prior to resistance training to allow them to master the skills of self monitoring and regulating exercise intensity.

Long-term follow-up

Once the process of short-term recovery is complete, the emphasis of cardiac rehabilitation shifts to long-term maintenance of physical activity and lifestyle change with appropriate secondary prophylactic drug therapy. The boundaries between cardiac rehabilitation, secondary prevention and normal medical care are blurred. The overall aim is comprehensive cardiac care. The main responsibility for long-term follow-up lies with the individual, facilitated by primary care.

If the benefits of exercise are to be sustained, moderate intensity aerobic activity should continue long term (B).[26] This often proves difficult once supervision is withdrawn. Some people may devise their own exercise programme, return to previous sports, join a self help group or a sports centre, or use walking-based home exercise programmes. Others prefer formal, class-based cardiac exercise programmes. There is no good evidence that any of these options is better than any other, so the choice should be determined by patient preference. Clearly it is helpful if as many options as possible are available locally. Fitness instructors supervising long-term exercise programmes should hold an S/NVQ Level 3 instructor qualification.

CHD patients with limiting symptoms or awaiting coronary revascularisation should be referred for further comprehensive cardiac rehabilitation (A). People with coronary disease require frequent admissions to hospital and have a high rate of infarction or re-infarction.[27] A healthy lifestyle can substantially reduce the risk of further coronary events but is difficult to achieve and maintain. Drug treatment is effective, but uptake and compliance are often suboptimal. Recommendations on lifestyle modification and secondary drug treatment are summarised in table 3.[28,29] The recently completed Heart Protection Study seems likely to extend the indications for statin therapy to all patients with coronary disease under 80 years of age provided their initial serum cholesterol is greater than 3.5 mmol/L.[30]

In a systematic review, structured secondary prevention programmes were found to improve prophylactic drug prescribing, risk factor profiles, health related quality of life and reduce hospital admissions.[31] Two randomised trials support a structured approach in primary care (A). In the first study in Belfast, health visitors were trained to give personal health education on diet, exercise and smoking and to monitor blood pressure levels.[32-4] After two years they reported significantly more physical activity and better diet in the intervention group, but no changes in smoking, blood pressure or lipids. Participants reported less angina and scored better for physical mobility on the Nottingham Health Profile. Total mortality was reduced in the intervention group. Three years after the intervention finished, however, most of the benefits that had been present at two years had disappeared.

In the second study, in Grampian, nurse-led secondary prevention clinics were used to promote medical and lifestyle components of secondary prevention.[35,36] At one year, significantly more patients took aspirin, had better blood pressure treatment and lipid treatment, were moderately physically active and had low fat diet; but there were no differences in smoking. The clinic improved patients' health related quality of life, especially the physical and functioning aspects (where they scored particularly poorly at baseline) and fewer patients required hospital admissions. Three other interventions have been tested: cardiac liaison nurses,[37] postal prompts to patients and their GPs,[38] and feedback of audit data with systematic recall to GP or nurse-led clinics.[39] There were few differences in outcome in these trials, emphasising that structured assessment must be coupled to appropriate drug prescribing.

Table 3. Lifestyle modification and drug therapy for secondary prevention of coronary heart disease

Drug therapy	Aspirin (75 mg) or clopidogrel Lipid lowering (if total cholesterol $\geq$ 5 mmol/L) Beta blocker ACE inhibitor
Hypertension	BP lowering (if BP $\geq$ 140/90 mmHg)
Smoking	Brief supportive advice, reinforced regularly Nicotine replacement therapy
Diet	Increase fruit and vegetables (at least five portions per day) Increase omega-3 fatty acid (oily fish or rapeseed oil) Replace saturated fat with unsaturated fat (e.g. olive or rapeseed oil) Weight loss if obese (BMI > 30 kg/m^2)
Exercise	Regular moderate intensity exercise (3–5 times per week)
Diabetes	Optimise glycaemic and blood pressure control

Key: BP = blood pressure; ACE = angiotensin-converting enzyme; BMI = body mass index

Implementation

Implementation of national clinical guidelines is the responsibility of each NHS Trust and is an essential part of clinical governance. Standards for cardiac rehabilitation for NHS Scotland are given in the Clinical Standards Board for Scotland (CSBS) recommendations for CHD, which have focussed initially on secondary prevention in a hospital setting.[40] Essentially similar standards for cardiac rehabilitation are given in the NSF for Coronary Heart Disease for England and Wales.[41] Managed clinical networks may prove to be the best way of ensuring the effective delivery and co-ordination of cardiac rehabilitation across primary and secondary care.[42]

Resource implications

The process of ensuring that rehabilitation programmes are best placed to deliver maximum health gain may not be resource neutral. Cardiac rehabilitation does compare favourably in cost-

effectiveness terms with other cardiovascular interventions such as treatment of hypertension, hyperlipidaemia, thrombolytics for inferior MI and angioplasty for patients with severe angina and single vessel disease.[43] Viewed in this way, expenditure on cardiac rehabilitation services may be considered a worthwhile use of scarce healthcare resources.

The most methodologically rigorous economic study examined the costs incurred and quality of life gained in a randomised trial of cardiac rehabilitation in moderately anxious or depressed patients.[44] Estimated survival benefit was determined from an earlier meta-analysis. The best estimates for cost effectiveness and cost utility were $21,800 per life year gained and $6,800 per QALY respectively (1991 prices). The most up to date conversions of this analysis for the UK estimated that the cost per life year gained was approximately £6,400 and the cost per QALY £2,700 (1999 prices).[45]

Audit

If audit of cardiac rehabilitation is to be efficient and ongoing then audit data will need to fall out of routinely collected clinical data. The use of stand alone IT systems for audit requires double entry of data, which is time consuming and should be discouraged. Recommended minimum data fields for the implementation of this guideline are given on the SIGN website (www.sign.ac.uk). These have been designed primarily to meet the requirements of both the Clinical Standards Board for Scotland and the CHD Task Force, and are not intended to limit or restrict in any way those who wish to collect and audit additional data fields.

Acknowledgements

We are grateful to Josephine Campbell and Anne Bray for their help in the preparation of this manuscript, and also to Juliet Miller, Joanne Topalian, Robin Harbour and Francesca Chappell of SIGN for their support during the development of the guideline.

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Key messages

- Cardiac rehabilitation including psychological and/or educational interventions results in a 34% reduction in cardiac mortality and a 29% reduction in recurrent MI – the better the response to the intervention, the greater the reduction
- It is more effective to target cardiac rehabilitation to the more 'distressed' patients and those in greater need of behavioural change
- Low to moderate intensity exercise training for low to moderate risk patients is as safe and effective in the home/community setting as in a hospital setting. Exercise programmes should be offered at least twice weekly for a minimum of eight weeks
- The individual is mainly responsible for long-term follow up facilitated by primary care. A healthy lifestyle and compliance with drug treatment greatly aid secondary prevention
- Implementation of national clinical guidelines is the responsibility of each NHS Trust. The cost-effectiveness of cardiac rehabilitation compares favourably with other cardiovascular interventions

Competing interests

None.

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