Scottish Intercollegiate Guidelines Network

57 Cardiac Rehabilitation

A national clinical guideline

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KEY TO EVIDENCE STATEMENTS AND GRADES OF RECOMMENDATIONS

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

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^{+}

GOOD PRACTICE POINTS

☑	Recommended best practice based on the clinical experience of the guideline development group

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1 Introduction

1.1 REMIT AND DEFINITIONS

This guideline provides evidence-based recommendations for best practice in cardiac rehabilitation. It is primarily concerned with rehabilitation following myocardial infarction (MI) or coronary revascularisation, but also addresses the rehabilitation needs of patients with angina or heart failure. Cardiac rehabilitation has much in common with secondary prevention. To appreciate the difference, it may be considered that cardiac rehabilitation facilitates recovery whereas secondary prevention prevents further illness. This guideline complements the existing SIGN guidelines on secondary prevention following MI,[1] stable angina,[2] and heart failure.[3]

There are many definitions of cardiac rehabilitation.[4,5] The guideline development group felt that the following definition contained the key elements of cardiac rehabilitation: *Cardiac rehabilitation is the process by which patients with cardiac disease, in partnership with a multidisciplinary team of health professionals, are encouraged and supported to achieve and maintain optimal physical and psychosocial health.* The involvement of partners, other family members, and carers is also important.

This guideline will be of interest to patients, general practitioners, cardiologists and physicians, primary and secondary care nurses, physiotherapists, physiologists, clinical psychologists, dietitians, occupational therapists, health service managers, and other health care professionals working with patients with cardiac disease.

1.2 THE FOUR PHASES OF CARDIAC REHABILITATION

It is useful to consider four phases of cardiac rehabilitation, as each represents a different component of the journey of care: inpatient care, the early post discharge period, exercise training, and finally long term follow up. Some countries recognise three phases only, by calling the early post discharge period Phase 2A and exercise training Phase 2B. Common to each phase, and irrespective of which model of cardiac rehabilitation is chosen, are the need to tailor interventions to the individual and the importance of good communication with specialist cardiac services, primary and community care. There is evidence that treatment plans are not carried out in the community because doctors and nurses wait for patients to consult. A proactive approach to patient participation and monitoring is therefore recommended.

Phase 1 occurs during the inpatient stage or after a 'step change' in the patient's cardiac condition (defined as any myocardial infarction, onset of angina, any emergency hospital admission for coronary heart disease (CHD), cardiac surgery or angioplasty, or first diagnosis of heart failure). During this phase medical evaluation, reassurance and education, correction of cardiac misconceptions, risk factor assessment, mobilisation and discharge planning are the key elements.[6] It is customary to involve family and partners from this early stage. A nurse counsellor can improve both the patient's and the partner's knowledge of heart disease and reduce anxiety and depression compared with those receiving routine care.[7]

Phase 2 is the early post discharge period, a time when many patients feel isolated and insecure. Support can be provided by home visiting, telephone contact,[8-13] and by supervised use of the Heart Manual.[14] This manual is a self-help programme for patients recovering from a heart attack that has been shown to reduce anxiety, depression and hospital readmission rate.

Phase 3 has historically taken the form of a structured exercise programme in a hospital setting with educational and psychological support and advice on risk factors. Increasingly it is recognised that both components can be undertaken safely and successfully in the community.[15,16] A menu-based approach recognises the need to tailor the delivery of services to the individual,[6,7] and is likely to include specific education to reduce cardiac misconceptions and encourage smoking cessation and weight management; vocational rehabilitation to assist return to work or retirement; and referral to a psychologist, cardiologist, or exercise physiologist.

Phase 4 involves the long term maintenance of physical activity and lifestyle change. Available evidence suggests that both must be sustained for cardiac benefits to continue.[17,18] Membership of a local cardiac support group, which involves exercise in a community centre such as a gym or leisure centre, may help maintain physical activity and behavioural change.

1.3 THE NEED FOR A GUIDELINE

Compared with the rest of the UK, Scotland has a disproportionately high incidence and prevalence of CHD.[19] Every year, the estimated 8,000 Scots surviving an MI, 13,000 angina patients requiring admission to hospital, and 6,000 patients who undergo coronary bypass surgery or angioplasty are potential candidates for cardiac rehabilitation. Around 6,000 patients with heart failure may also be eligible.[20] Some patients, for example those who experience a myocardial infarction and then go on to be revascularised, may require cardiac rehabilitation on more than one occasion.

1.4 CURRENT PROVISION

The provision of exercise-based cardiac rehabilitation in the UK has increased since a British Cardiac Society Working Party Report showed just 99 programmes in 1989.[21] 151 programmes were identified in 1992,[22] 273 in 1996,[23] and most recently 300 in 1997.[24] Unfortunately, the growth in quantity has not been matched by improvements in quality. Programmes tend to be inadequately resourced and do not adhere to national guidelines.[25] A survey of Scottish outpatient cardiac rehabilitation programmes in 1994 found that although most offered exercise, relaxation and education, only a small proportion did so in a manner likely to reproduce the benefits found in randomised trials.[26] Later surveys suggest that the measurement of exercise, psychological and quality of life parameters remains patchy,[24] and that psychosocial factors are still poorly assessed.[23]

The CHD Task Force identified 44 secondary care cardiac rehabilitation programmes in Scotland during the year 2000.[27] Two thirds of Phase 3 programmes were hospital-based at that time. One half used the Heart Manual either alone or in combination with Phase 3 exercise. 71% of patients attending a Phase 3 programme had survived a myocardial infarction, while 20% were post coronary bypass. Only small numbers of angioplasty, angina or heart failure patients attended such programmes. Median values for duration and frequency of exercise programmes were 11 weeks and twice per week respectively. Education programmes were often provided at separate times from exercise classes, depending on facilities available and lasted a median of six weeks. Most programmes offered psychological interventions, but only 16% had access to a clinical psychologist. 83% of programmes were co-ordinated by nurses and physiotherapists.

1.5 UPTAKE

Although beneficial outcomes from cardiac rehabilitation can be expected in most of these patients, only a minority participate.[28] 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.[29] Reported rates of uptake of cardiac rehabilitation nevertheless underestimate the true level of activity because inpatient cardiac rehabilitation and the contribution to cardiac rehabilitation made by home-based programmes such as the Heart Manual are not usually included in the figures.[36] The shortfall in Phase 3 uptake relates to ease of access to services.[31] Women and elderly patients are less likely to be invited to attend cardiac rehabilitation programmes.[32-34] Uptake and completion of Phase 3 cardiac rehabilitation is also predicted by social deprivation,[28] level of education[33] and negative attitudes towards rehabilitation from partner and family.[35] The provision of outreach classes in health and community centres is likely to increase uptake in rural areas.[36]

1.6 REVIEW AND UPDATING

This guideline was issued in January 2002 and will be considered for review in 2005, or sooner if new evidence becomes available. Any updates to the guideline will be noted on the SIGN website: **www.sign.ac.uk.**

2 Psychological and educational interventions

Comprehensive cardiac rehabilitation consists of exercise training together with education and psychological support. The purpose of these interventions is to facilitate a return to normal living and to encourage patients to make lifestyle changes in order to prevent further events. Educational and psychological support is also necessary to deal with psychological distress, which is common following MI.

2.1 PSYCHOLOGICAL PREDICTORS OF RISK

Research has shown that psychological distress and poor social support are powerful predictors of outcome following MI, independent of the degree of physical impairment.[37-43] Psychological distress is also an important predictor of hospitalisation costs frollowing a cardiac event, with distressed patients accruing four times the costs of non-distressed patients.[44] One study found that total health care costs over one year following MI were 41% higher for patients with elevated depression scores.[45] Depression and anxiety may also play a role in the aetiology of CHD.[43]

2.1.1 DEPRESSION

Estimates of the prevalence of depression in MI patients range from 15% to 45%.[39,46,47] Depression is associated with a three to four fold increase in cardiac mortality[38-40,48] and is strongly predictive of poor symptomatic, psychological, social and functional outcome at three and 12 months.[49] Depression is common in patients with angiographically proven CHD who have not had an infarction[50] and is associated with an increased risk of cardiac events in unstable angina. 2++

2.1.2 ANXIETY

High levels of anxiety may also have an adverse effect on outcome. Anxiety while in the coronary care unit is associated with an increased risk of acute coronary syndrome and arrhythmic events over the following 12 months.[40] The Cardiac Arrhythmia Suppression Trial showed increased mortality associated with higher state anxiety (i.e. anxiety at that point in time, rather than an enduring personality characteristic of anxiety).[51] 2++

B **Patients with coronary disease should be screened for anxiety and depression using a validated assessment tool** *(see sections 2.2 and 2.5.2).*

2.1.3 PERSONALITY

Early reports suggested that 'Type A behaviour', characterised by competitive and aggressive behaviour and hostility, was an independent risk factor for CHD.[52,53] A recent systematic review has not shown Type A behaviour as a risk factor, but concluded that hostility might still have an aetiological role. The same review found no studies supporting Type A or hostility as prognostic factors in CHD.[43] Successful coping with a hectic and stressful life is not harmful and it is important to avoid giving over-cautious messages to people who enjoy being busy and vigorous. 1+

2.1.4 CARDIAC MISCONCEPTIONS

Cardiac misconceptions are incorrect or muddled beliefs about heart problems, which frequently lead people to be over-cautious and to respond inappropriately. One study found that functional capacity at 12 months post-MI was strongly related to age and initial causal attribution.[51] Another study found that male angina patients are more likely to attribute causes of angina to controllable factors than female patients.[52] Where causes are thought to be less controllable, (e.g. *'my stressful job caused my MI'*), patients are likely to have more problems in return to work, domestic and social functioning, also sexual difficulties and poor attendance at cardiac rehabilitation,[56-58] irrespective of their level of anxiety and severity of their MI. 2++ 2+ 4

B **Rehabilitation staff should identify and address health beliefs and cardiac misconceptions in patients with coronary heart disease.**

2.2 MEASUREMENT OF PSYCHOLOGICAL WELLBEING

No consensus has been reached regarding the most appropriate instrument to use for measurement of psychological wellbeing, but the simplest and most widely used is the Hospital Anxiety and Depression Scale (HADS).[59] This is a generic 14 item questionnaire with separate subscales for anxiety and depression. A copy of the HAD Scale together with the scores for each answer is available on the SIGN website. Scores of 0-7 in respective subscales are considered normal, with 8-10 borderline, and 11 or over indicating clinical 'caseness'.

Timing of administration is important. It is quite natural for patients to be anxious and/or depressed in the immediate aftermath of a myocardial infarction or other acute cardiac event. However, persistent symptoms are associated with a poor prognosis (*see sections 2.1.1 and 2.1.2*) and should be treated appropriately. For this reason the HAD Scale should be repeated at 6-12 weeks after the event, if indicated. The HAD Scale is not a substitute for clinical assessment and common sense. Some anxious and depressed patients may wish to conceal their symptoms, possibly because they are embarrassed to admit they are experiencing difficulties, and the cardiac rehabilitation team should be prepared to ignore low scores under these circumstances.

☑ Screening for anxiety and depression should take place at discharge, 6-12 weeks post MI or following a decision on surgical intervention, and repeated at three month intervals if appropriate. This will allow measurement of baseline risk in order to assess prognosis and tailor treatment, and subsequent monitoring of improvement following intervention.

Other domains of health status may also need to be evaluated, and a variety of instruments are available.[91,93] These include generic instruments such SF-36, EQ-5D (formerly EuroQuol), and the Dartmouth COOP;[60,61] and instruments specifically developed for use in cardiac patients, such as the Quality of Life after Myocardial Infarction (QLMI) questionnaire[62] and the Cardiovascular Limitations and Symptoms Profile (CLASP).[63] Further details of these instruments and the permissions required for their use are provided with the electronic version of this guideline on the SIGN website.

2.3 EFFECTIVENESS OF PSYCHOLOGICAL AND EDUCATIONAL INTERVENTIONS

Psychological and educational interventions are diverse in nature and not always well described in the literature, creating problems when attempting to evaluate their efficacy. Psychological interventions include individual and group counselling, stress management, relaxation, group psychotherapy, cognitive-behavioural approaches, goal setting, and hypnotherapy.[64,65] Educational interventions include individual and group education on aspects of CHD, healthy eating and diet, smoking cessation, hypertension, exercise and MI; self-monitoring diaries; booklets; medication advice; and vocational counselling.[66,67]

2.3.1 CARDIOVASCULAR OUTCOMES

A meta-analysis of 8,988 patients in 37 trials[65] found that cardiac rehabilitation programmes including psychological and/or educational interventions resulted in a 34% reduction in cardiac mortality and a 29% reduction in recurrent MI at 1-10 years follow up. 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.[64,66] 1++ 1+

2.3.2 PSYCHOLOGICAL AND OTHER OUTCOMES

The evidence that educational and psychological treatments within cardiac rehabilitation will reduce risk factors and psychological distress is suggestive but not conclusive. Two meta-analyses support the use of such therapy[64,66] whereas a third did not.[65] The inclusion of two recent large trials which gave negative results for psychological outcomes may have been responsible.[68,69] Possible explanations for the lack of benefit in these trials are: the inclusion of subjects with low levels of psychological symptoms, outcome measures insufficiently sensitive to detect change, provision of a uniform treatment for a heterogeneous range of complaints, and a lack of appropriate training in cardiac psychological interventions.[47] 1++

Greater adherence to adult learning principles (*see section 2.4.3*) led to greater benefit in one of the earlier meta-analyses.[66] Two reviews suggest that targeted psychological and educational interventions, tailored to the needs of individuals do lead to measurable psychological benefits [47,70]

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A **Cardiac rehabilitation programmes should include both psychological and educational interventions as part of comprehensive rehabilitation.**

2.4 PRINCIPLES OF BEHAVIOURAL CHANGE

2.4.1 TARGETING THERAPY

Evidence suggests that it is more effective to target therapy 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.[64,65] This is reflected in the menu-driven approach or targeted therapy recommended by the British Association for Cardiac Rehabilitation (BACR) [71] and the Scottish Needs Assessment Programme (SNAP).[20]

1++
1

B **Psychological and behavioural interventions should be targeted at the needs of individual patients.**

2.4.2 PSYCHOLOGICAL PRINCIPLES AND MODELS OF BEHAVIOURAL CHANGE

Several psychological models have been shown to be effective in developing strategies for behavioural change:

- **Cognitive Behavioural Therapy** (CBT) is a structured therapy addressing individuals' core beliefs, assumptions, thinking patterns and behaviour. CBT approaches help an individual identify dysfunctional thoughts and the beliefs that underlie them, and provide a structured approach to managing change in behaviour, thinking and mood. CBT has been shown to be effective in a wide range of conditions, including anxiety, depression, post traumatic stress disorder, and medical conditions.[72] It has been used successfully with angina patients.[73]
- **Health Belief and Illness Representation models**, together with methods of enhancing self-efficacy, provide additional strengths in the behavioural change process *(see sections 2.1.4 and 2.5.1)*. These models also draw on cognitive-behavioural principles.
- **Motivational Interviewing** [74] is an approach to help individuals build commitment and reach a decision to change. It enhances intrinsic motivation so that change comes from within rather than being imposed, thereby strengthening the behavioural change. It has particular use where people are ambivalent or reluctant to change. It uses strategies drawn from several therapeutic models. Motivational Interviewing has clear application with cardiac patients and was used effectively in a randomised trial of behavioural change before coronary revascularisation.[75] Systematic reviews are currently being undertaken.

The above systematic and individualised approaches are qualitatively different from education, which alone may not be sufficient to produce behavioural change. The use of these principles is equally important in exercise programmes.

2.4.3 EDUCATIONAL PRINCIPLES

Analysis of studies of health education in cardiac patients has found that the most important determinant of effectiveness is the quality of the intervention,[76] defined as adherence to the five principles of adult learning:

1++

- relevance (tailored to patients' knowledge, beliefs, circumstances)
- individualisation (tailored to personal needs)
- feedback (informed regarding progress with learning or change)
- reinforcement (rewarded for progress)
- facilitation (provided with means to take action and/or reduce barriers).

Outcome was found to be poorer in studies that did not adhere to these principles. Behaviourally-orientated interventions tended to have larger effects, while studies showing change in knowledge only were less likely to produce behavioural change. A systematically developed intervention based on a theoretical model was more likely to be effective.[7,14] Behavioural techniques such as self-monitoring and personal communication, including written or audio-visual techniques, improved outcome. Information provision alone was less effective.[76] The type or duration of the intervention was found to be unrelated to effectiveness. 1++

A **Comprehensive cardiac rehabilitation should be delivered by healthcare staff using established principles of adult education and behavioural change.**

2.5 EDUCATIONAL AND PSYCHOLOGICAL INTERVENTIONS

2.5.1 THE HEART MANUAL

The Heart Manual is a six-week cognitive behavioural rehabilitation tool for use in the immediate post MI period. Developed from the Health Belief model, the programme is designed to correct misconceptions about the cause of heart attack and at the same time to help patients develop strategies for dealing with stress, in order to neutralise enduring misconceptions. It emphasises self-management, but must be recommended by a doctor and facilitated by specially trained nurses. The Heart Manual is one way of providing educational and psychological support for post MI patients, although it will not meet the needs of a minority who require additional help.

The initial randomised controlled trial evaluating the Heart Manual found that those receiving the manual had improved emotional states and fewer GP contacts and hospital readmissions at six months post MI.[14] Subsequent studies have found significantly fewer readmissions in treated patients[77] and improvement in emotional state and sense of control at six months.[78] 1+ 2+

A **Use of the Heart Manual is recommended to facilitate comprehensive cardiac rehabilitation.**

2.5.2 TREATMENT OF DEPRESSION AND ANXIETY

A Cochrane Review found that antidepressants reduced depression in patients with a wide range of physical diseases including CHD.[79] Several randomised trials have indicated that early psychological intervention can improve mood and other outcomes in cardiac patients.[7,14,80,81] 1++ 1+

Although a degree of anxiety and depression and associated symptoms such as poor sleep, poor concentration, lack of energy, or 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 in fact 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. Major depression 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.

A recent evidence-based guideline describes effective psychological therapies for anxiety and depression,[72] which should be considered along with medication. Guidelines for the use of antidepressant medication and psychological therapy in depressed patients with cardiac disease are given in a recent review.[70]

A **All cardiac patients in whom anxiety or depression is diagnosed should be treated appropriately.**

☑ Caution must be exercised in selecting an antidepressant which does not have significant cardiac side effects. Relevant guidelines should be consulted.[70]

2.5.3 PSYCHOLOGICAL THERAPY

Psychological therapy encompasses a continuum from generic counselling, where practitioners use psychological methods but have no specialist training in any one model, to psychotherapeutically-trained practitioners using specific theoretical models. Cardiac rehabilitation programmes currently have very limited access to trained therapists, which has implications for outcome for those with more marked psychological distress.

Simple psychological therapy, especially solution-focused therapy, may be appropriate for patients with mild 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 behavioural therapy.[72,82-84] As therapeutic expertise is an important predictor of successful outcome, appropriate supervision of staff providing therapy is essential. 1++ 1+

B **Patients with moderate to severe psychological difficulties should be treated by staff with specialist training in techniques such as cognitive behavioural therapy.**

2.6 ASPECTS OF BEHAVIOURAL CHANGE

2.6.1 SMOKING CESSATION

Smoking status should be ascertained in all patients and cessation methods employed in smokers. Brief advice from a health professional, tailored self help materials, individual and group counselling, bupropion with behavioural support, and nicotine replacement therapy can all increase rates of smoking cessation. (*This important topic has been reviewed in previous SIGN guidelines,[1,2] see in particular in the section on lifestyle modification in the SIGN guideline on management of diabetes.[85]*)

2.6.2 HEALTHY EATING AND DIET

The British Dietetic Association[86] have recently produced their own evidence-based accredited guidelines on secondary prevention of cardiovascular disease, which emphasise the increased consumption of omega-3 fatty acids (from oily fish or rapeseed oil) and increased intake of fruit and vegetables to a minimum of five portions per day. Reduction in saturated fats and total or partial replacement by unsaturated fats (rapeseed or olive oil) is also recommended. These guidelines highlight that concentrating dietary advice only on those patients in need of weight loss or lipid lowering is inappropriate.

2.6.3 SEXUAL ACTIVITY

The British Heart Foundation have published a Factfile on sexual activity following myocardial infarction.[87] *(See section 6 for sources of further information for patients and health professionals.)*

3 Exercise training

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.[88] Physical inactivity increases the risk of developing coronary heart disease two fold.[89] National surveys of physical activity in Scotland confirm that inactivity is high in the general population.[90] Structured exercise as a therapeutic intervention is central to cardiac rehabilitation.[20,71,91,146] Daily exercise should also be encouraged as part of an 'active living' philosophy.[92]

3.1 BENEFIT OF EXERCISE TRAINING

3.1.1 MORTALITY AND CARDIOVASCULAR OUTCOMES

Randomised trials distinguish between two types of exercise-based cardiac rehabilitation: exercise-only and exercise in addition to psychological and educational interventions, usually termed comprehensive cardiac rehabilitation.

A Cochrane review of men and women of all ages with previous MI, revascularisation or angina found that exercise-only cardiac rehabilitation reduced all cause mortality by 27%, cardiac death by 31% and a combined end point of mortality, non fatal myocardial infarction and revascularisation by 19%.[92] The benefits accrued over an average of 2.4 years. There was no effect on non fatal myocardial infarction alone and there was no apparent additional benefit from comprehensive cardiac rehabilitation. Most subjects were low risk middle aged men post MI. Patients with heart transplants, artificial valves and heart failure were excluded. 1+

There are two possible explanations for the 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 trials were published more recently. This means that the benefits in the comprehensive rehabilitation trial are likely to be additional to those of thrombolysis, prophylactic medication, and/or revascularisation.

3.1.2 PSYCHOLOGICAL AND OTHER OUTCOMES

There has been a wider acceptance in recent years that mortality and reinfarction are not the only methods of measuring the effectiveness of cardiac rehabilitation. Exercise alone has been shown to improve physical performance, muscle strength, and symptoms of breathlessness and angina. Comprehensive cardiac rehabilitation will in addition aid psychological function, social recovery, return to work, and biological risk factors.[91]

A **Exercise training should form a core element of cardiac rehabilitation programmes.**

3.2 SAFETY ISSUES

Most patients will benefit from and should be encouraged to undertake at least low to moderate intensity exercise. However, patients with clinically unstable cardiac disease or limiting co-morbid illness should be excluded from exercise training.

The incidence of serious adverse events during supervised exercise is low.[94,95] The most recent study of one rehabilitation centre documented four major complications (three cardiac arrests and one non fatal MI) over a nine year period.[96] There were no fatalities, giving a frequency of one major complication per 67,126 patient hours of exercise. All three cardiac arrests occurred in patients who had completed at least 12 weeks of exercise training and were enrolled in a maintenance programme.

3.3 ASSESSMENT BEFORE EXERCISE TRAINING

For most patients, clinical risk stratification based on history, examination and resting ECG combined with a functional capacity test such as a shuttle walking test[97] *(see section 3.3.1)* or a six minute walking test[98] will be sufficient.

High risk patients may be defined as those who have:

- experienced a myocardial infarction complicated by heart failure, cardiogenic shock and/or complex ventricular arrhythmias
- angina or breathlessness occurring at a low level of exercise, e.g. inability to complete the first four minutes of the shuttle walking test
- ST segment depression ≥1 mm on resting ECG
- undergone exercise testing with marked ST depression ≥2 mm or angina at <5 METS (e.g. three minutes of a Bruce protocol).

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Exercise testing and echocardiography are recommended to assess residual ischaemia and ventricular function respectively[1] but are not a necessary part of cardiac rehabilitation except for high intensity exercise or in high risk patients.

D **Clinical risk stratification is sufficient for low to moderate risk patients undergoing low to moderate intensity exercise.**

D **Exercise testing and echocardiography are recommended for high risk patients and/or high intensity exercise training (and to assess residual ischaemia and ventricular function where appropriate).**

D **Functional capacity should be evaluated before and on completion of exercise training using a valid and reliable measure.**

3.3.1 THE SHUTTLE WALKING TEST

The shuttle walking test was developed for patients with respiratory disease[99] but has recently been used to assess functional capacity before and after cardiac rehabilitation in patients who have undergone cardiac surgery[97,100] or pacemaker insertion,[101] and in patients with chronic heart failure.[102,103] The shuttle walking test is a low cost low tech alternative to exercise testing that informs the rehabilitation team on a suitable exercise programme and appropriate training heart rate, and allows assessment of progress during cardiac rehabilitation without the need for cardiac technicians, physicians or expensive equipment. The shuttle walking test protocol is given in Box 1 overleaf. Details of how to obtain copies of the tape are available on the SIGN website.

4

3.4 STAFFING

There is no consensus on staffing levels for Phase 3 exercise programmes. Current UK guidelines recommend that two trained staff should be present at all times during exercise training with a patient to staff ratio of not more than 5:1.[104] Australian guidelines recommend a ratio of no more than 10 patients to one staff member.[91] There is a similar lack of consensus on life support training: UK guidelines recommend basic life support training for all, provided at least one member of staff has advanced life support training,[104] whereas Australian guidelines make no such stipulation for patients undergoing low to moderate intensity exercise training.[91]

4

D **The ratio of patients to trained staff should be no more than 10:1 during exercise classes.**

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 (hospital emergency team) with advanced life support training is required for high risk patients and classes offering high intensity exercise training.**

Box 1

SHUTTLE WALKING TEST

Equipment required

- Calibrated cassette player and shuttle walk test tape.[99]
- Two marker cones and non slippery, flat walking surface at least 10 metres in length.
- Heart rate monitor with record facility and adjustable upper alarm limits.

Protocol

- Each subject should be screened by a member of the cardiac rehabilitation team for any exclusion criteria before proceeding *(see section 3.2)*.
- Place two cones exactly 9 metres apart, thus allowing the subjects to walk 10 metres when they go round the cone at the end of each shuttle.
- Subjects then listen to the instructions on the audio cassette. These should be repeated verbally to ensure that they understand what is expected during the test.
- Subjects walk around the 10 metre course aiming to be turning at the first marker cone when the first audio signal is given, and turning at the second cone at the next audio signal.
- Subjects should be accompanied around the first level of the test to help them keep pace with the audio signals. Thereafter the operator stands mid way between the two marker cones offering advice on completion of a level: *'Walk a bit faster now if you can'*.
- Progression to the next level of difficulty is indicated by a triple bleep which lets the subject know that an increase in walking speed is required.
- The full test comprises 12 levels each of one minute duration with walking speeds that rise incrementally from 1.2 miles per hour (1.9 km per hour) to 5.3 miles per hour (8.5 km per hour).
- The test is completed at 12 minutes or if one of the termination criteria are met.

Termination criteria

- Any anginal symptoms or feeling too breathless to continue.
- Feeling dizzy or faint.
- Leg pain limiting further exercise.
- Achieved level of perceived exertion ≥15 (Borg Scale)[128] *(see section 3.7)*.
- Achieved heart rate ≥85% predicted (detected by audible upper alarm limit).
- Failure to meet the speed requirements of the test – subject more than half a metre from the cone when the bleep sounds.[97,100]

Following the test

- Subjects should continue to walk slowly around the course a further four times to avoid any syncopal attacks associated with abrupt cessation of exercise.
- Subjects are then seated and asked to confirm their limiting symptom.
- Record total distance walked, heart rate and perceived exertion for each level completed, peak heart rate and reason for test termination.
- If subjects have fully recovered after 10 minutes then no further action is required. If they report continuing breathlessness or angina then a further rest period should follow during which they may receive sublingual nitrates, have an ECG or be seen by a doctor as appropriate.

3.5 LOCATION

A number of randomised trials [77,105-110] and large observational studies [15,111-117] have found that low to moderate intensity exercise for low to moderate risk patients can be provided as safely and as effectively in the home or community as in a hospital setting. Patients at high risk and those undergoing high intensity training should only exercise at venues with full resuscitation facilities and staff trained in advanced life support.

1+
2++
2+

B **Low to moderate intensity exercise training can be undertaken as safely and effectively in the home and community as in a hospital setting for low to moderate risk patients.**

D **Exercise training for high-risk patients and for those who require high intensity exercise** *(see section 3.6.1)* **should be hospital-based or in a venue with full resuscitation facilities.**

☑ Patients exercising at home should have access to regular review and support by cardiac rehabilitation staff.

3.6 EXERCISE CONTENT

Cardio-respiratory fitness requires aerobic training of low to moderate intensity, long duration and with repetitive movement of large muscle groups. The frequency, intensity and duration of exercise can be varied to achieve the desired training effect. The individual's preference best determines the appropriate mode of activity. All trials included in a recent Cochrane review[93] were of aerobic exercise such as cycling, walking, jogging, rowing or calisthenics. In the UK, aerobic circuit training is traditionally used for group exercise training[104] and is an effective method for achieving a training heart rate.

Exercise sessions should have:
- a 15-minute warm up period
- an aerobic conditioning phase of 20-30 minutes
  (resistance training, if appropriate, can be included after the conditioning phase)
- a 10-minute cool down period
- 5-10 minutes relaxation.

3.6.1 INTENSITY OF EXERCISE

Early studies of exercise-based cardiac rehabilitation randomised patients to high intensity exercise training plus usual care, or usual care alone.[146] Four randomised trials have since compared high intensity training versus low to moderate intensity training. Three found no differences in deaths or reinfarction, physical, psychological or social outcomes,[118,119] physical working capacity or quality of life at 12 months.[120] In one study, patients enrolled in a high intensity training group did have significantly greater improvements in maximal oxygen uptake and rest to maximal exercise ejection fraction at 12 months.[153]

1+
4

High intensity exercise training may be desirable for those whose work is physically demanding, and for younger men and women who wish to resume demanding sports. High intensity exercise involves training at a heart rate that is more than 75% of the maximum heart rate during a symptom limited exercise test, as indicated in Table 1.[90,91,130] Although high intensity exercise rarely provokes ventricular tachycardia or myocardial infarction,[94,95] it is suggested that patients should undergo a symptom limited exercise test first.[121] High risk patients should either be excluded from or carefully monitored during high intensity exercise.[122-126]

1+
3
4

B **Aerobic, low to moderate intensity exercise, designed to suit a range of fitness levels, is recommended for most patients undergoing exercise training.**

3.6.2 FREQUENCY AND LENGTH OF PROGRAMME

Most early trials of exercise-based cardiac rehabilitation consisted of three exercise sessions per week for eight weeks or longer.[93,146] Twice weekly exercise has since been found to increase maximum physical working capacity to the same extent as thrice weekly exercise.[127] A further study has suggested that once weekly, hospital-based exercise plus two equivalent home-based exercise sessions is as effective at improving physical work capacity as thrice weekly hospital-based exercise.[110] This suggests that incorporation of regular, sustained exercise into an individual's lifestyle is likely to be more important than the frequency or length of formal exercise training. 1+ 4

A **The formal exercise component of cardiac rehabilitation should be offered at least twice a week for a minimum of eight weeks.**

C **Once weekly group exercise with two equivalent home-based sessions improves exercise capacity as effectively as thrice weekly hospital-based exercise.**

3.7 MONITORING OF EXERCISE TRAINING

Exercise intensity may be monitored either by perceived exertion using Borg's scale[128] *(see Table 1)* or by pulse monitor.[104] A perceived exertion scale allows quantification of the subjective intensity of exercise. Ratings on Borg's scale have been found to relate closely to other objective measures of exercise intensity, namely oxygen uptake and heart rate.[129] The aim is to enable patients to achieve a level of 'comfortable breathlessness'[130] while exercising, and so distinguish between high intensity and low to moderate intensity exercise. Patients can take several sessions to become familiar with and competent in the use of this scale. Levels of perceived exertion should only be used as a guide to exercise intensity, as cardiac patients may report significantly lower scores of perceived exertion at a given intensity of exercise when compared to age-matched controls.[131] Pulse monitoring is best done by using pulse monitors, which may help patients until they are familiar with and competent in the use of the Borg scale. It is difficult to take one's own pulse while exercising, and this practice is not recommended. 4

D **Exercise intensity should be monitored and adjusted by perceived exertion using the Borg scale or by pulse monitor.**

☑ Patients should be taught how perceived exertion can be used to regulate exercise intensity.

Table 1: Correlation of training level with perceived exertion and heart rate [91]

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		

3.8 RESISTANCE TRAINING

A key outcome of cardiac rehabilitation is to return patients to a fully active lifestyle. This requires muscle strength as well as aerobic endurance. Resistance (or strength) training improves muscular strength, cardiovascular function, coronary risk factors and psychological well being.[146] In most studies, low to moderate intensity resistance training (< 70% maximum voluntary contraction) was incorporated after four weeks of supervised aerobic training,[146] but more recent studies have enrolled patients as early as four weeks post event.[132,133] Single set resistance training two or three times per week (where an exercise is performed as one set of 10-15 repetitions) is as effective and less time consuming than once weekly multiple set programmes (where the same muscle group is exercised two or more times at one session).[134]

1+
2+
4

C **Low to moderate risk cardiac patients can undertake resistance training.**

☑ 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.

☑ Blood pressure may increase more during resistance training than during aerobic training. Hypertensive patients should not be enrolled in such a programme until their blood pressure is well controlled.

3.9 LONG TERM EXERCISE TRAINING

See section 5.5.

4 Interventions in specific patient groups

Although cardiac rehabilitation has been defined as relevant to all patients with heart disease, most of the research to date concerns middle-aged white males with recent myocardial infarction or coronary artery surgery. Other groups, notably older patients, women and higher risk patients with heart failure or angina were excluded from most early trials [135,136,146] yet these groups make up the majority of patients with coronary heart disease.[137] A small, but increasing, amount of research has been conducted into the effects of cardiac rehabilitation in these subgroups. 1+

4.1 POST MYOCARDIAL INFARCTION

As discussed in section 3.1, both exercise-only and comprehensive cardiac rehabilitation reduce all cause mortality and cardiac death, non fatal myocardial infarction and revascularisation.[93,135,136] Exercise has also been shown to improve physical performance, muscle strength, and symptoms of breathlessness and angina, whilst comprehensive cardiac rehabilitation aids psychological function, social recovery, return to work and biological risk factors.[91] Rehabilitation programmes should be tailored to the needs of each individual patient *(see section 1.2)*.

A **Comprehensive cardiac rehabilitation is recommended following myocardial infarction.**

4.2 POST CORONARY BYPASS AND ANGIOPLASTY

The benefits of exercise-based cardiac rehabilitation for patients undergoing revascularisation were not considered separately in any of the reviews identified. Three randomised trials included in the Cochrane review reported the effects of exercise-based cardiac rehabilitation after bypass surgery,[138-140] while one comprised only patients who had undergone angioplasty.[141] None of the studies reviewed were designed or powered to show the effect of cardiac rehabilitation on cardiovascular morbidity or mortality post revascularisation. Comprehensive cardiac rehabilitation led to lower serum lipids[140] and a perception of improved health[138] after bypass surgery, while exercise-only cardiac rehabilitation was associated with improved exercise capacity but had no effect on lipids or body weight.[139] 1+

In the trial of cardiac rehabilitation following angioplasty included in the Cochrane review, the exercise group was less likely to require revascularisation during follow up.[141] Possibly because they have not undergone bypass surgery or survived an MI, angioplasty patients make fewer lifestyle changes than other cardiac patients[142] and are less likely to attend a cardiac rehabilitation programme.[143] Two additional randomised trials of cardiac rehabilitation post angioplasty were identified.[144,145] One found that comprehensive cardiac rehabilitation improved exercise capacity, diet and smoking but not quality of life or psychological factors,[144] while the other provided further evidence that comprehensive cardiac rehabilitation following angioplasty reduces the need for further revascularisation.[145]

A **Comprehensive cardiac rehabilitation is recommended for patients who have undergone coronary revascularisation.**

4.3 STABLE ANGINA

Systematic reviews of exercise-only cardiac rehabilitation for patients with angina have shown that exercise training improves exercise capacity, symptoms and ischaemia.[137,146-149] Comprehensive cardiac rehabilitation has shown similar benefits and either less progression or more regression of atherosclerosis in the intervention groups.[88,150] The programmes included in these studies were all more intensive than contemporary programmes in Scotland.[26] 1++ 1+

Three more recent trials of exercise-only cardiac rehabilitation confirm that exercise training improves exercise capacity. One found improvements in myocardial ischaemia on exercise testing.[151] One trial evaluated effects on quality of life and found improvements.[152] Evidence from two trials suggests a dose response: there were more benefits with higher exercise intensity.[152,153] 1+

Two recent randomised controlled trials of comprehensive cardiac rehabilitation have also reported benefits. In one trial there were fewer cardiac events in the intervention group,[154] and in the other patients waiting for non urgent coronary artery bypass graft (CABG) had improved quality of life, although length of stay in hospital was reduced by an average of only one day.[155] 1+

Comprehensive cardiac rehabilitation based predominantly on a cognitive behavioural approach was evaluated in one randomised trial involving 80 patients with angina.[73] There were improvements in exercise capacity, emotional distress, symptoms and disability. A randomised trial of health education for patients with angina in primary care found that it improved exercise, diet, and quality of life, but did not affect smoking rates, lipids, or blood pressure levels.[156,157]

A **Patients with stable angina should be considered for comprehensive cardiac rehabilitation if they have limiting symptoms.**

4.4 CHRONIC HEART FAILURE

Systematic reviews of exercise-based cardiac rehabilitation in stable, chronic heart failure have found benefits to exercise capacity and possibly to symptoms.[35,146-149] Benefit is probably derived from peripheral adaptations (vasodilation and improved muscle oxidative capacity) rather than improvements in ventricular function.[35,137,146] An RCT of exercise training in heart failure reported improvements in exercise capacity, myocardial perfusion, quality of life, total mortality and hospital admissions.[158] An overview of randomised trials in Europe [159] that included 134 patients concluded that exercise training improved exercise capacity and autonomic indices (e.g. heart rate variability), that training could be conducted either in hospital or at home, that 16 weeks was better than six and that a combination of cycle ergometry and calisthenics was better than cycle ergometry alone. Women did as well as men, and elderly patients were able to train free from complications and with benefit to symptoms, although less effectively than younger patients. 1+

In a systematic review of comprehensive disease management for heart failure, there were fewer hospital attendances, and improved quality of life, functional capacity, patient satisfaction and compliance with diet and medications.[160] The studies in the review were small with selected participants (who tended to be elderly) and the interventions included education, social support, nurse follow up at home, graduated exercise, and sometimes psychological and pharmacist input. In a more recent randomised trial in Scotland, specialist nurses provided follow up to patients with heart failure by home visits and telephone contact.[161] The intervention, which included education, disease monitoring and psychological support, reduced the risk of readmission to hospital for heart failure by more than half.

There is limited evidence on the effects of psychological and education only intervention in heart failure. One pre-post test study of 50 patients reported fewer hospital re-admissions.[162] In one recent randomised trial,[163] education in hospital with one home visit was found to increase self-care, but had no impact on hospital attendance rates. 2+ 1+

A **Patients with chronic heart failure should be considered for comprehensive cardiac rehabilitation if they have limiting symptoms.**

4.5 OLDER PATIENTS

Although many patients with coronary disease are older than 75 years, this group has been excluded from many trials of cardiac rehabilitation. Systematic reviews indicate that older patients benefit at least as much as younger patients from exercise-based cardiac rehabilitation.[146,147,149] A recent randomised trial of exercise-only cardiac rehabilitation in 101 elderly patients with coronary disease[164-166] reported not only greater exercise tolerance, but also improved physical activity, quality of life and well-being. 1+ 2++

One non-randomised controlled trial compared primary care-based comprehensive cardiac rehabilitation (counselling and exercise) with usual care.[167] Uptake of the exercise component was low (20%). Despite this, there were fewer hospital re-admissions and visits to emergency departments in the intervention group. 2+

These findings are in line with a systematic review of comprehensive disease management in patients with heart failure, most of whom were elderly.[160] 1+

B **Older people should be included in comprehensive cardiac rehabilitation programmes.**

4.6 WOMEN

Women were excluded from most of the early studies of cardiac rehabilitation, accounting for between only 4% and 11% of patients enrolled in exercise-only and comprehensive cardiac rehabilitation trials.

Systematic reviews indicate that women benefit from exercise-based cardiac rehabilitation in terms of functional capacity at least as much as men.[147,168] A review of 134 patients with heart failure undergoing exercise training found that women benefited as much as men in terms of increased exercise capacity and improved autonomic indices.[159] 2++ 2+

More women have been included in studies of psychological and educational interventions. In a recent review[65] up to 34% of patients in some studies were women, suggesting that the benefits reported are relevant to women as well as men. Another systematic review reported on 12 comprehensive programmes aimed at lifestyle change (most of which were based on education, although some included psychological interventions or exercise programmes) which included women. In most trials benefits were similar in women and men.[169] 1+ 2+

B **Women should be included in programmes of comprehensive cardiac rehabilitation.**

4.7 OTHER GROUPS

4.7.1 CARDIAC TRANSPLANT PATIENTS

Few studies have examined the effect of cardiac rehabilitation in patients following cardiac transplantation. One small RCT[170] compared a six-month exercise-based cardiac rehabilitation programme with usual care. There were improvements in exercise capacity of the exercise group. A series of five small observational studies also suggest that exercise-based cardiac rehabilitation improved exercise tolerance in these patients.[146] 1+ 2+

4.7.2 VALVE SURGERY PATIENTS

There is little evidence on the benefits of cardiac rehabilitation following valve surgery. One small non-randomised trial reported no differences in exercise tolerance between groups (nor in reported physical activity levels).[171] 1-

4.7.3 PATIENTS WITH CONGENITAL HEART DISEASE

In a non-randomised, controlled trial in Norway, children with congenital heart disease who undertook supervised exercise appeared to achieve some improvements in exercise capacity and psychological function compared to a control group.[172] Trials involving Chinese children (reviewed in abstract only) with congenital heart disease have found that behavioural and exercise training improved self care, compliance and reduced length of hospital stay.[173,174]

4.7.4 IMPLANTABLE CARDIOVERTER DEFIBRILLATORS

Patients with implantable cardioverter defibrillators (ICDs) have high levels of psychological distress and continue to be at risk of sudden cardiac death.[175] They may benefit from comprehensive cardiac rehabilitation but research in this area is needed.

5 Long term follow up

In the long term, most people with cardiac disease receive most or all of their care in primary care and the community. 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.

Although many patients make good recoveries, others continue to have substantially impaired health.[176,177] People with coronary disease require frequent admissions to hospital [177,181] and have a high rate of infarction or reinfarction.[178-181] A healthy lifestyle can reduce substantially the risk of further coronary events[1,2] but is difficult to achieve and maintain.[147,156,182,183] Drug treatment is effective but uptake and compliance are often suboptimal.[184] Recommendations on lifestyle modification and secondary drug treatment from the SIGN guidelines on secondary prevention following MI[1] and stable angina[2] are summarised in Table 2. The recently completed Heart Protection Study seems likely to extend the indications for statin therapy to all patients with coronary disease irrespective of their serum cholesterol.[185]

Table 2: Lifestyle modification and drug therapy for secondary prevention of CHD

Drug therapy	▪ Aspirin (75 mg/day) or clopidogrel (75 mg/day) ▪ Statin (if total cholesterol ≥5 mmol/l) ▪ β-blocker ▪ ACE-inhibitor
Hypertension	▪ BP lowering (if BP ≥140/90 mm Hg)
Smoking	▪ Brief supportive advice, reinforced regularly ▪ Nicotine replacement therapy
Diet	▪ Increase fruit and vegetables (at least 5 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 low to moderate intensity exercise (3-5 times per week)
Diabetes	▪ Optimise glycaemic and blood pressure control

5.1 TRANSITION TO PRIMARY CARE

The main responsibility for long term follow up in coronary disease lies with the individual and is facilitated by primary care. For patients who have been treated in hospital, care is transferred from secondary to primary care when it is evolving and complex. It also needs to be flexible and tailored to individual needs. There is plenty of opportunity for aspects of care to get lost during transfer, and plenty of evidence that this happens in practice.[183] Although there is little direct evidence about how best this transition can be improved,[190,191] good communication appears to be an essential first step.[186] In particular, tailored information should be provided with details of treatment and cardiac rehabilitation to date, ongoing monitoring required, and future treatment planned.

5.2 FOLLOW UP IN PRIMARY CARE

A systematic review of 12 randomised trials of secondary prevention programmes in coronary heart disease found that structured disease management programmes improved risk factor profiles and increased secondary preventive treatment.[187] They also reduced hospital admissions and enhanced quality of life. The programmes included in this review differed considerably – all were multi-faceted, with about half including medical and lifestyle treatments, and the rest being predominantly lifestyle and psychosocial. Most were based from hospitals, but two conducted in UK primary care suggest that a structured approach benefits health related quality of life and uptake of secondary prevention.

In the first study in Belfast, health visitors were trained to give health education on diet, exercise and smoking and how to monitor blood pressure levels.[17,156,157] 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. However, three years after the intervention finished most of the benefits that had been present at two years had disappeared.[17] 1+

In the second study, in Grampian, nurse-led secondary prevention clinics were used to promote medical and lifestyle components of secondary prevention.[177,188] At one year, significantly more patients took aspirin, had better blood pressure treatment and lipid treatment, were moderately physically active and had low fat diets; but there were no differences in smoking. The clinics improved patients' health related quality of life, especially physical and functioning aspects (where they scored particularly poorly at baseline) and fewer patients required hospital admission.

In a third study, nurse-led clinics were compared to GP recall and audit with feedback.[189] Secondary prevention improved in all three groups and was best in the nurse-led group for aspirin prescribing. Two other interventions have been tested: cardiac liaison nurses[190] and postal prompts to patients and their GPs.[191] Although the former increased follow up in primary care, neither showed benefit to secondary preventive drug prescribing or risk factors. These trials emphasise that structured follow up in primary care must be coupled to appropriate drug prescribing.

A **Structured care and follow up in primary care should be provided for patients with coronary heart disease.**

5.3 SHARED CARE

There is some evidence that patients with more complicated heart disease benefit from hospital-based clinics or a shared care approach. Comprehensive heart failure disease management clinics have been found to improve quality of life, functional capacity, patient satisfaction and compliance with medications, and to reduce hospital admissions in patients with heart failure.[160] These clinics were run in secondary care by staff with high levels of expertise. There is evidence from one RCT that similar benefits were not achieved by increasing less specialist follow up in primary care.[193] However, all of these studies were conducted overseas, and more research is needed in the UK. 1+

There are also benefits to patients with angina from courses of intensive and specialist hospital-based interventions. In particular, symptoms in patients with angina can be improved.[73] Hospital-based or shared care programmes for patients awaiting coronary revascularisation have been shown to reduce risk factors, improve quality of life, and shorten length of stay in hospital.[73,155,192]

A **Coronary heart disease patients with limiting symptoms or awaiting coronary revascularisation should be referred for further comprehensive cardiac rehabilitation.**

5.4 SELF-HELP GROUPS

In Scotland, there is a long history of self-help groups for patients with cardiac disease. Nineteen self-help groups were identified in 1994, located in sports and community centres, schools and universities, hospitals and church halls, and providing care following hospital-based programmes.[30,194] 3

In 2001, there were over 30 cardiac support groups in Scotland.[195] The structure and content of programmes varied widely and included exercise sessions, relaxation sessions, invited speakers, and group discussions. Many of the exercise programmes were professionally supervised by physiotherapists, nurses, or fitness instructors; but none were equipped with defibrillators. 3

There is no direct evidence about the effectiveness of self-help groups in cardiac rehabilitation. An important aspect of self help groups is the interaction between people and the opportunity to share experiences. Many patients value this, although others strongly dislike the idea.[30] Indirect evidence about group interaction from professionally-led programmes is mixed: some studies reported improvements in psychosocial functioning and others deterioration.[75,196-200] Self help groups depend entirely on the small numbers of dedicated people who organise them and the enthusiasm of their members. Their main limitation is that only a minority of patients with coronary disease attend them. 2+ 3 4

☑ Self help groups should be encouraged and enabled to use the same evidence-based approach to cardiac rehabilitation advocated for professionally led programmes.

5.5 LONG TERM EXERCISE PROGRAMMES

Meta analysis of exercise-based cardiac rehabilitation trials has shown that the greatest benefit is associated with exercising for 12 weeks or longer.[135] If the benefits of exercise are to be sustained, moderate physical activity should continue long term, but this proves difficult for most people with coronary disease once supervision is withdrawn.[147] Some people may devise their own exercise programmes, or return to previous sports, join a self help group or a sports centre, or use walking-based home exercise programmes.[201] Others prefer formal, class-based cardiac exercise programmes.[31] There is no good evidence that any one 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. 1+ 2+ 3 4

B **People with stable coronary disease should be encouraged to continue regular moderate intensity aerobic exercise.**

The British Association for Cardiac Rehabilitation has made the following recommendations for those who have completed a Phase 3 exercise programme and wish to undertake supervised long term exercise. Patients should:

- be clinically stable
- understand their symptoms (and if they have angina know how to use sublingual nitrates)
- be able to self monitor and regulate their exercise
- be able to achieve an exercise capacity of more than 5 METS (equivalent to three minutes of a Bruce Protocol).[202] 4

Referral for supervised long term exercise should include the following information (with consent):

- details of the cardiac event and other relevant medical history
- subsequent progress including complications and/or interventions
- the Phase 3 exercise prescription and summary of functional capacity
- results of exercise tolerance test if available
- details of the patient's medication.

☑ Fitness instructors delivering maintenance exercise programmes should be on the Exercise and Fitness Register and hold an S/NVQ Level 3 Instructor qualification.

☑ If more than five years has elapsed since the individual's last assessment, if cardiac symptoms have recurred, or if the patient is beginning long term supervised exercise without having first completed a Phase 3 programme, (re)assessment by clinical risk stratification and a test of functional capacity with or without a formal exercise test is recommended. *(See section 3.)*

6 Information for patients and professionals

6.1 NOTES FOR DISCUSSION WITH PATIENTS

These notes are provided for use by clinicians in discussing cardiac rehabilitation with patients. They are not intended for direct distribution to patients, but they might be incorporated into locally produced patient information materials.

Rehabilitation should start as soon as the patient is medically stable. Partners and other family members should be included in the process where possible.

- Patients should be advised on the basic workings of the heart, the nature of angina and MI, and the risk factors for CHD. Written information should be provided for patients to take home.
- Discuss modification of risk factors, e.g. that a smoker who quits after an MI can expect a 50% reduction in their risk of mortality in the next five years, along with other components of the education programme – e.g. diet, stress management, living with CHD, drug therapy, understanding CHD.
- Reassure the patient that cardiac rehabilitation encourages people with heart disease to recover faster and return to a full and productive life and that cardiac rehabilitation is safe.
- Almost everyone with heart disease can benefit from some type of cardiac rehabilitation. No one is too old or too young. Women benefit as much as men.
- The long term success of any cardiac rehabilitation programme is directly related to patient compliance.The most important person in the rehabilitation team is the patient. Patients should be encouraged to take charge of their own recovery.

PSYCHOLOGICAL ASPECTS OF CARDIAC REHABILITATION

- Patients should be warned that they may become weepy, or experience symptoms of acute anxiety in the days and weeks after suffering an MI and that this is normal.
- If they are not as able as they had hoped on their return home they should try not to view this as a setback.
- A lower mood after discharge is possible and has been called 'homecoming depression'. Patients may be grumpy and uncommunicative with their partner.
- In the weeks and months following the patient's MI, partners and other family members may all have concerns, and should be involved in the cardiac rehabilitation programme and encouraged to support each other.
- Sources of local community support available should be discussed, e.g. nurse counsellor, supervised use of the Heart Manual, GP, primary care secondary prevention clinic, self-help groups.
- The importance of ongoing contact with health care professionals should be reinforced.

EXERCISE

- Discuss exercise opportunities, risks and benefits, e.g. that exercise does not need to be intensive to bring benefits – brisk walking for 15 to 20 minutes, preferably daily or at least five times per week, is adequate exercise for most post MI patients.
- Patients should choose home or hospital-based exercise (or both) secure in the knowledge that low to moderate intensity exercise can be undertaken safely and effectively in either setting.
- Emphasise that if the benefits of exercise are to be sustained then exercise must continue long term.

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- Emphasise that if the benefits of exercise are to be sustained then exercise must continue long term.

6.2 SOURCES OF FURTHER INFORMATION

Action on Smoking and Health
www.ash.org.uk

Agency for Healthcare Research and Quality (US)
Recovering from heart problems through cardiac rehabilitation
AHCPR Publication No.96-0674 October 1995, NIH
http://hstat.nlm.nih.gov/hq/Hquest/db/local.ahcpr.consumer.crpp/screen/TocDisplay/s/54146/action/Toc

American Heart Association
www.americanheart.org

BBC Health
www.bbc.co.uk/health/

British Association for Cardiac Rehabilitation
www.bcs.com/bacr/

British Cardiac Society
www.bcs.com
9 Fitzroy Square, London
Tel: 020 7383 3887

British Heart Foundation
www.bhf.org.uk
The Gatehouse, 112 Park Hill Road, Harborne, Birmingham, B17 9HD

Chest Heart and Stroke Scotland
www.chss.org.uk
Tel: 0131 225 6963 24 hour advice line: 0845 0776000
(Details of local groups available from the head office)

Coronary Prevention Group
www.healthnet.org.uk

Diabetes UK
www.diabetes.org.uk

Family Heart Association
Tel: 01628 628 638

HealthTouch.com
www.healthtouch.com

Health Education Board for Scotland
www.hebs.scot.nhs.uk
Examples of cardiac rehabilitation practice in the United Kingdom:
www.hebs.scot.nhs.uk/topics/heart/heartproject.cfm

Heart Manual Office
Administration Building, Astley Ainslie Hospital, Grange Loan, Edinburgh EH9 2HL
Tel: 0131 537 9127
Email: heart.manual@lpct.scot.nhs.uk
The Heart Manual Project is a non-profit-making NHS organisation that supports the use of the Heart Manual within the health service. To maintain quality, as well as for safety reasons, the Heart Manual is not supplied directly to the public, or to untrained staff. The project maintains a register of 'qualified' facilitators and organises facilitator training.

Johns Hopkins Heart Health (US)
www.jhbmc.jhu.edu/cardiology/REHAB/

NHS Direct
www.nhs.direct.nhs.uk/healthy_living/

Scottish Health on the Web
www.show.scot.nhs.uk

7 Implementation and audit

7.1 STATEMENT OF INTENT

This guideline is not intended to be construed or to serve as a standard of medical care. Standards of care are determined on the basis of all clinical data available for an individual case and are subject to change as scientific knowledge and technology advance and patterns of care evolve. The ultimate judgement regarding a particular clinical procedure or treatment plan must be made in light of the clinical data presented by the patient and the diagnostic and treatment options available.

7.2 IMPLEMENTATION

Implementation of national clinical guidelines is the responsibility of each NHS Trust and is an essential part of clinical governance. It is acknowledged that every Trust cannot implement every guideline immediately on publication, but mechanisms should be in place to ensure that the care provided is reviewed against the guideline recommendations and the reasons for any differences assessed and, where appropriate, addressed.

Standards for cardiac rehabilitation for NHS Scotland are given in the Clinical Standards Board for Scotland (CSBS) recommendations for coronary heart disease, which have focused initially on secondary prevention in a hospital setting.[203] The CSBS peer review visits have included an examination of the provision of cardiac rehabilitation, which has highlighted the key role played by the cardiac rehabilitation team in the collection of data required to show that a Trust is meeting the standards. Essentially similar standards for cardiac rehabilitation are given in the National Service Framework for Coronary Heart Disease for England and Wales.[204]

Given the variation in provision of cardiac rehabilitation services in Scotland it would be prudent to have an initial focus on ensuring comprehensive and high quality services for MI survivors and those undergoing revascularisation. In particular, the inclusion of women and older patients should be addressed. As evidence of the cost benefit of extending services to other groups emerges, services can be extended in an incremental fashion. Managed Clinical Networks may prove to be the best way of ensuring the effective delivery and coordination of cardiac rehabilitation across primary and secondary care.[205]

7.3 RESOURCE IMPLICATIONS OF IMPLEMENTING THE GUIDELINE

The review of cost effectiveness literature considered economic evaluations of comprehensive cardiac rehabilitation based on three observational studies,[44,167,206] four randomised controlled trials [152,207-209] and three reworkings of previously published data.[210-212] The most methodologically rigorous economics study examined the costs incurred and quality of life gained in a randomised trial of cardiac rehabilitation in moderately anxious or depressed patients.[207] Estimated survival benefit was determined from an earlier meta-analysis.[135] The best estimates for cost-effectiveness and cost-utility were $21,800 per life year gained and $6,800 per Quality Adjusted Life Year (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).[211]

The process of ensuring that rehabilitation programmes are best placed to deliver maximum health gain may not be resource neutral. However, cardiac rehabilitation does compare favourably in cost-effectiveness terms with other cardiovascular interventions such as treatment of hypertension, hyperlipidaemia, thrombolytics for inferior myocardial infarction and angioplasty for patients with severe angina and single vessel disease.[213] Viewed in this way, expenditure on cardiac rehabilitation services may be considered a worthwhile use of scarce health care resources.

The guideline development group have developed an estimate of the staff resources required to deliver multidisciplinary cardiac rehabilitation to patients with a wide range of needs. These represent the staff likely to be required to rehabilitate 500 patients. The following assumptions have been made:

- The 500 patients will be a mixture of post MI, revascularisation, angina, and heart failure patients, with post MI and revascularisation patients predominating.
- All patients with be suitable for some form of rehabilitation, with 250 (50%) opting for group exercise training, 150 (30%) preferring a home-based programme, and 100 (20%) not interested in any rehabilitation.
- Patients attending Phase 3 group classes and those who undertake home-based programmes will each have a formal assessment of functional capacity at the beginning and end of their programmes.
- Group exercise classes will run twice a week for eight weeks and will accommodate 12-15 patients at any one time. It follows that six separate classes will be required each week.
- The population served will be predominantly urban, arbitrarily defined as 80% of patients living within 10 miles of a district general or teaching hospital. For Health Boards with a significant rural population, costs are likely to be higher because of smaller class sizes and longer travelling times.
- The first point of contact for patients with psychological distress will be a nurse therapist with training in cognitive behavioural therapy, rather than a clinical psychologist. A smaller number of clinical psychologist hours will then be required to help those patients whose anxiety or depression does not resolve with the advice and treatment provided by their nurse therapists.

These assumptions allow the following estimates of whole time equivalent (WTE) staff requirements to be made for Health Boards with and without a significant rural population:

Staff	*WTE*
G Grade nurse	*3.0*
Senior 1 Physiotherapist	*2.0*
Senior 1 Dietitian	*0.3*
D grade Pharmacist	*0.2*
Clinical Psychologist (Grade A)	*0.2*
Audit and Clerical (Grade 3)	*0.5*
Rural supplement	
G Grade nurse	*0.5*

These estimates reflect the likely requirement for cardiac rehabilitation if the targets set by the Clinical Standards Board for Scotland are to be met. Health Boards may wish to vary the amount spent on cardiac rehabilitation according to local needs and priorities. The cost of providing cardiac rehabiltiation services in Scotland has also been considered by the Scottish Needs Assessment Programme.[20]

A review of the cost-effectiveness literature and details of the derivation of these staffing requirements, together with an estimation of the associated costs is provided on the SIGN website: **www.sign.ac.uk.**

7.4 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 in addition to the CHD Task Force minimum data set for the implementation of this guideline are detailed overleaf. 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.

INITIATING EVENT FOR CARDIAC REHAB			
Angina	Y/N/NR	Valve surgery	Y/N/NR
Myocardial infarction	Y/N/NR	Heart failure	Y/N/NR
Bypass surgery	Y/N/NR	Internal cardiac defibrillator	Y/N/NR
Angioplasty	Y/N/NR	Other	Y/N/NR
HOSPITAL			
Seen by Rehab Nurse		Y/N/NR	
Rehab programme	Exercise only	Education only	Comprehensive CR
Invited	Y/N/NR	Y/N/NR	Y/N/NR
Started	Y/N/NR	Y/N/NR	Y/N/NR
Completed (≥ 75%)	Y/N/NR	Y/N/NR	Y/N/NR
HOME			
Heart Manual issued		Y/N/NR	
Heart Manual completed		Y/N/NR	
ENTRY TO PROGRAMME Day/Month/Year		**EXIT FROM PROGRAMME** Day/Month/Year	
REASONS FOR NOT COMPLETING AT LEAST ONE FORM OF REHAB			
Patient not interested		Undergoing investigations	
No transport		Return to work	
Too far to travel		Physical incapacity	
Holidaymaker		Mental incapacity	
Died		Other	
ASSESSMENTS			
HAD score before discharge		A=/D=/Refused/NR	
Follow up HAD score (for values 8 or more)		A=/D=/NI/Refused/NR	
Functional capacity before training programme		Y/N/NR	
Functional capacity after training programme		Y/N/NR	
ADVICE			
Cardiac misconceptions		Y/N/NR	
Written information given		Y/N/NR	
Video viewed		Y/N/NR	
Carers seen		Y/N/No carer/NR	
Basic life support discussed with carer		Y/N/NR	
REFERRAL			
Secondary prevention clinic		Y/N/NI/NR	
BACR Phase 4 exercise		Y/N/NI/NR	
Self help group		Y/N/NI/NR	
Cardiology Clinic		Y/N/NI/NR	
Dietitian		Y/N/NI/NR	
Occupational Therapist		Y/N/NI/NR	
Physiotherapy		Y/N/NI/NR	
Psychology		Y/N/NI/NR	
Smoking cessation		Y/N/NI/NR	
Exercise physiologist		Y/N/NI/NR	

NI = not indicated NR = not recorded

8 Development of the guideline

SIGN is a collaborative network of clinicians, other health care professionals, and patient organisations, funded by the Clinical Resource and Audit Group (CRAG) of the Scottish Executive Health Department. SIGN guidelines are developed by multidisciplinary groups using a standard methodology based on a systematic review of the evidence. Further details about SIGN and the guideline development methodology are contained in *SIGN 50: A guideline developer's handbook*, available at **www.sign.ac.uk.**

8.1 THE GUIDELINE DEVELOPMENT GROUP

Dr Chris Isles *(Chairman)*	*Consultant Physician, Dumfries & Galloway Royal Infirmary*
Ms Gillian Armstrong	*Physiotherapist, Glasgow Royal Infirmary*
Dr Alan Begg	*General Practitioner, Montrose*
Dr John Bowbeer	*General Practitioner, Ayr (resigned from group in 2000)*
Dr Anthony Breslin	*Consultant in Public Health, Forth Valley Health Board, Stirling*
Ms Ailsa Brown	*Health Economist, Greater Glasgow Health Board*
Dr Neil Campbell	*CRC Fellow, Department of General Practice, University of Aberdeen*
Ms Francesca Chappell	*Information Officer, SIGN*
Dr John Gillies	*General Practitioner, Selkirk*
Dr Belinda Green	*Consultant Cardiologist, Ninewells Hospital, Dundee*
Mr Angus Gunn	*Patient representative, Edinburgh*
Ms Patricia Isoud	*Cardiac Rehabilitation Sister, Western Infirmary, Glasgow*
Dr Grace Lindsay	*Lecturer, Nursing and Midwifery Studies, University of Glasgow*
Dr Paul MacIntyre	*Consultant Physician and Cardiologist, Royal Alexandra Hospital, Paisley*
Dr Karen Smith	*Clinical Research Fellow (cardiac nursing), Ninewells Hospital, Dundee*
Ms Nicola Stuckey	*Clinical Psychologist, Astley Ainslie Hospital, Edinburgh*
Ms Morag Thow	*Lecturer, Department of Physiotherapy, Glasgow Caledonian University*
Dr Iain Todd	*Consultant in Cardiovascular Rehabilitation, Astley Ainslie Hospital, Edinburgh*
Ms Joanne Topalian	*Programme Manager, SIGN*

Dr Chris Baker, Medical Director, Dumfries & Galloway NHS Trust, provided advice on implementation and audit.

The membership of the guideline development group was confirmed following consultation with the member organisations of SIGN. Declarations of interests were made by all members of the guideline development group. Further details are available from the SIGN Executive.

8.2 SYSTEMATIC LITERATURE REVIEW

The evidence base for this guideline was synthesised in accordance with SIGN methodology. A number of systematic literature searches were carried out (full details of the search strategies used and the coverage of the Internet search are available from the SIGN Executive). Papers were only included if they adhered to recognisable methodological principles, including adequate sample size, a clearly identified hypothesis and measure of outcome, and accurate reporting of results.

An Internet search was carried out to identify existing guidelines and reviews on cardiac rehabilitation. This search used a range of general and specialised search engines, specific medical sites such as the National Guideline Clearinghouse (www.guideline.gov), and the following

databases: Medline, Healthstar, Embase, PsychINFO, Cinahl, and the Cochrane Library. A search for economic literature was also performed in Medline, Healthstar, Embase, the Cochrane Library, and NEED. The search for systematic reviews and meta-analyses covered the period January 1991 to May 2000. The Cochrane review *Exercise-based Rehabilitation for Coronary Heart Disease,*[93] an AHCPR publication *Cardiac Rehabilitation: Clinical Guideline No.17*,[146] *Effective Health Care: Cardiac Rehabilitation,*[147] and systematic reviews by Oldridge *et al* (1988)[135] and Goble and Worcester (1999)[91] provided much of the evidence for this guideline.

Additional searches were performed covering the period January 1995 to September 2000 to bring the literature up to date for randomised controlled trials and the evidence base was further updated during the course of development of the guideline.

8.3 CONSULTATION AND PEER REVIEW

8.3.1 NATIONAL MEETING

A national open meeting is the main consultative phase of SIGN guideline development, at which the guideline development group presents their draft recommendations for comment. The national open meeting for this guideline was held in March 2001 and was attended by representatives of all the key specialties relevant to the guideline. The draft guideline was also available on the SIGN web site for a limited period at this stage to allow those unable to attend the meeting to contribute to the development of the guideline.

8.3.2 SPECIALIST REVIEW

The guideline was reviewed in draft form by a panel of independent expert referees, who were asked to comment primarily on the comprehensiveness and accuracy of interpretation of the evidence base supporting the recommendations in the guideline. SIGN is grateful to all of these experts for their contribution to this guideline.

Professor Annie Anderson	*Faculty of Epidemiology & Public Health, University of Dundee*
Mrs Mandy Andrew	*Cardiovascular Facilitator, Perth & Kinross LHCC and Tayside Primary Care Trust*
Dr Jenny Bell	*Director, BACR Phase 4 Education Project*
Dr Hugh Bethell	*General Practitioner, Alton*
Mrs Lesley Brooks	*Cardiac Specialist Nurse, Perth Royal Infirmary*
Professor Sir Charles George	*Medical Director, British Heart Foundation, London*
Dr John Irving	*Consultant Cardiologist, St Johns Hospital, Livingston*
Professor Marie Johnston	*Professor of Health Psychology, St Andrews University*
Dr Kate Jolly	*Department of Public Health & Epidemiology, University of Birmingham*
Professor Bob Lewin	*British Heart Foundation Rehabilitation Research Unit, University of York*
Professor Richard Mayou	*Department of Psychiatry, University of Oxford*
Dr Andrew McLeod	*Consultant Cardiologist, Poole Hospital NHS Trust*
Dr Allan Merry	*General Practitioner, Ardrossan*
Dr Jill Pell	*Consultant in Public Health Medicine, Greater Glasgow Health Board*
Dr Ann Taylor	*Physiotherapy Division, King's College London*
Dr Rod Taylor	*Senior Lecturer in Public Health, University of Birmingham*
Mrs Joan Thain	*Health Visitor, Westburn Centre, Aberdeen*
Professor David Thompson	*Department of Health Studies, University of York*
Professor Erkki Vartiainen	*National Public Health Institute, Finland*
Dr Alex Watson	*General Practitioner, Dundee*

8.3.3 SIGN EDITORIAL GROUP

The guideline was then reviewed by an Editorial Group comprising relevant specialty representatives on SIGN Council, to ensure that the peer reviewers' comments had been addressed adequately and that any risk of bias in the guideline development process as a whole had been minimised. The Editorial Group for this guideline was as follows:

Dr David Alexander	*British Medical Association, Scottish General Practice Committee*
Dr Jim Beattie	*Royal College of General Practitioners*
Dr Doreen Campbell	*CRAG Secretariat, Scottish Executive Department of Health*
Mrs Patricia Dawson	*Royal College of Nursing*
Professor Gordon Lowe	*Chairman of SIGN, Co-Editor*
Ms Juliet Miller	*Director of SIGN, Co-Editor*
Miss Tracy Nairn	*National Paramedical Advisory Committee*
Dr Sara Twaddle	*Health Economics Adviser to SIGN*
Dr Bernice West	*National Nursing, Midwifery & Health Visiting Advisory Committee*

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Abbreviations

ACE	Angiotensin converting enzyme
AHCPR	Agency for Health Care Policy and Research
BACR	British Association for Cardiac Rehabilitation
BMI	Body mass index
BP	Blood pressure
CABG	Coronary artery bypass graft
CHD	Coronary heart disease
CRAG	Clinical Research and Audit Group
CSBS	Clinical Standards Board for Scotland
ECG	Electrocardiogram
GP	General practitioner
HADS	Hospital Anxiety and Depression Scale
ICD	Implantable cardioverter defibrillator
METS	Metabolic equivalents
MI	Myocardial infarction
NHS	National Health Service
NIH	National Institutes for Health
NSF	National Service Framework
QALY	Quality adjusted life year
QLMI	Quality of life after myocardial infarction
RCT	Randomised controlled trial
S/NVQ	Scottish/National Vocational Qualification
SIGN	Scottish Intercollegiate Guidelines Network
SNAP	Scottish Needs Assessment Programme
UK	United Kingdom
US	United States

Update to printed guideline

19 Oct 2004

Section 6.2 Heart Manual Office email changed from

heart.manual@genie.co.uk

to

heart.manual@lpct.scot.nhs.uk

A	**Comprehensive cardiac rehabilitation** is recommended: ▪ Following **myocardial infarction** ▪ Following **coronary revascularisation** ▪ For patients with **stable angina** or **chronic heart failure** with limiting symptoms or after a new event
B	**Women** and **older patients** should be included in comprehensive cardiac rehabilitation programmes

PSYCHOLOGICAL AND EDUCATIONAL INTERVENTIONS

A	Comprehensive cardiac rehabilitation should include both **psychological and educational interventions** and should be delivered using established principles of adult education and behavioural change
B	**Target** psychological and behavioural interventions at the needs of individual patients with coronary heart disease
B	Identify and address **health beliefs** and **cardiac misconceptions** with CHD patients
A	Use the **Heart Manual** to facilitate comprehensive cardiac rehabilitation
B	Screen patients for **anxiety and depression** using a validated assessment tool, such as the Hospital Anxiety and Depression (HAD) scale
☑	Screening should take place at discharge, 6-12 weeks post MI or following a decision on surgical intervention, and repeated at three month intervals if appropriate
A	**Patients in whom anxiety or depression is diagnosed should be treated appropriately**
☑	Caution should be exercised in selecting an antidepressant without significant cardiac side effects
B	Patients with **moderate to severe psychological difficulties** should be treated by staff with specialist training in techniques such as **cognitive behavioural therapy**

PHASE 1

The inpatient stage or after a 'step change' in the patient's cardiac condition (MI, onset of angina, any emergency hospital admission for CHD, cardiac surgery or angioplasty, or first diagnosis of heart failure).

Includes medical evaluation, reassurance and education, correction of cardiac misconceptions, risk factor assessment, mobilisation and discharge planning.

PHASE 2

The early post discharge period, a time when many patients feel isolated and insecure. Psychological distress and poor social support are powerful predictors of outcome following MI, independent of the degree of physical impairment.

Support can be provided by home visiting, telephone contact, and by supervised use of the Heart Manual or an equivalent cognitive behavioural programme.

PHASE 3

Structured exercise training together with continuing educational and psychological support and advice on risk factors. All components can be undertaken safely and effectively in the community.

A menu-based approach recognises the need to tailor services to the individual and is likely to include specific education to reduce cardiac misconceptions, encourage smoking cessation and weight management; vocational rehabilitation to assist return to work or retirement; and referral to a psychologist, cardiologist, or exercise physiologist if appropriate.

Most patients will benefit from and should be encouraged to undertake at least low to moderate intensity exercise. However, patients with clinically unstable cardiac disease, complicating illness, or serious psychotic illness should be excluded from exercise training.

PHASE 4

Long term maintenance of physical activity and lifestyle change.

EXERCISE TRAINING

A	**Exercise training** is a core element of cardiac rehabilitation and should be offered **at least twice a week for a minimum of eight weeks**
B	**Aerobic, low to moderate intensity exercise** is recommended for most patients undergoing exercise training and can be undertaken **safely and effectively in the home or community**
D	**Clinical risk stratification** is sufficient for low to moderate risk patients undergoing low to moderate intensity exercise **Exercise testing** and **echocardiography** are recommended for high risk patients and/or high intensity exercise (and to assess residual ischaemia and ventricular function where appropriate)
D	**Functional capacity** should be evaluated before and on completion of exercise training using a valid and reliable measure (e.g. the shuttle walking test)
D	The ratio of patients to trained staff during exercise classes should be no more than **10:1** Staff with **basic life support training** and the ability to use a defibrillator are required for **group exercise** of **low to moderate risk** patients Immediate access to on-site staff with **advanced life support training** is required for **high risk patients** or classes offering **high intensity training**
D	**Monitor exercise intensity** by perceived exertion using the Borg scale or by using a pulse monitor
C	Low to moderate risk cardiac patients can undertake **resistance training**

LONG TERM FOLLOW UP

A	**Structured care and follow up** in primary care should be provided for patients with coronary heart disease
C	Encourage people with stable coronary disease to continue **regular moderate intensity aerobic exercise**
☑	Fitness instructors running maintenance exercise programmes should hold an S/NVQ Level 3 Instructor qualification