EVIDENCE-BASED
BEST PRACTICE
GUIDELINE

CARDIAC
REHABILITATION

AUGUST 2002
Best Practice Evidence-based
Guideline

CARDIAC REHABILITATION

AUGUST 2002
STATEMENT OF INTENT

Clinical guidelines are produced to help health professionals and consumers make decisions about health care in specific clinical circumstances. Research has shown that if properly developed, communicated and implemented, guidelines can improve care. While guidelines represent a statement of best practice based on the latest available evidence (at the time of publishing), they are not intended to replace the health professional’s judgment in each individual case.
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PURPOSE

This guideline applies primarily to patients with coronary heart disease, and specifically those following an acute coronary syndrome (acute myocardial infarction/unstable angina) and following coronary bypass surgery and angioplasty.

The purpose of the guideline is to provide a summary of the most up to date New Zealand and overseas evidence and make recommendations based on the evidence, that will lead to best practice cardiac rehabilitation in New Zealand. The guideline is aimed at all health professionals working in cardiac rehabilitation, primary care providers and health information services. Further resources are being developed for patients and their families. It is hoped that the information in these guidelines will be used to inform patients with coronary heart disease and their advisers about the benefits of comprehensive cardiac rehabilitation, and that this will ultimately lead to improved health outcomes for patients.
Cardiovascular disease in New Zealand

Cardiovascular disease is the leading cause of death in New Zealand, accounting for 40% of all deaths annually [1]. Coronary heart disease is the largest contributor to this mortality, accounting for about 1 in 4 of all deaths [1]. Since 1970, the age standardised death rate from coronary heart disease has halved due to primary prevention and improved disease management [1]. With an aging population however, the burden of disease will remain high. Demand for hospital medical admissions including those for coronary heart disease, continues to increase and the average length of hospital stay has been progressively reduced during the past 10 – 20 years.

Cardiac rehabilitation programmes of different kinds have been promoted in parts of New Zealand during the past 20 – 30 years. A growing body of evidence now allows clearer recommendations to be made to improve the quality of life and long term outcomes for patients with coronary heart disease and to better standardise practice to reduce the present large regional variations. This guideline should be considered alongside several others from amongst a range of cardiovascular guidelines recently published or currently in development. Of particular relevance are those which relate to specific risk factor interventions and pharmacotherapy in more detail.

Definition of cardiac rehabilitation

Cardiac rehabilitation is the coordinated sum of interventions required to ensure the best physical, psychological and social conditions so that patients with chronic or post-acute cardiovascular disease may, by their own efforts, preserve or resume optimal functioning in society and, through improved health behaviours, slow or reverse progression of disease. [2]

Traditionally cardiac rehabilitation services have included:
- Medical evaluation and risk stratification
- Exercise
- Education
- Psychological and social support.

This has usually been conducted in a coordinated fashion by a multidisciplinary team, providing a basis for long term secondary prevention and helping patients to achieve as active and satisfying a life as possible.

This cardiac rehabilitation guideline applies primarily to patients with coronary heart disease, specifically those following an acute coronary syndrome (acute myocardial infarction/unstable angina), and following coronary artery bypass surgery and angioplasty. Most aspects will also be applicable to patients with chronic stable angina and also following surgery for valvular heart disease.

Patient groups with specific rehabilitation needs eg, the elderly, young adults, women, Māori, Pacific or other ethnic groups and those with co-morbidities such as diabetes, congestive heart failure and obesity are considered within the guideline. A brief section is dedicated to drug treatment for secondary prevention. A full guideline that includes all medical and surgical secondary prevention interventions is beyond the scope of this document.
There are three recognised phases of cardiac rehabilitation defined below:

**PHASES OF CARDIAC REHABILITATION**

**Phase I - Inpatient rehabilitation**

Phase I rehabilitation in hospital includes early mobilisation and education helping the patient, spouse, partner, whānau and family begin to develop an understanding of heart disease. It assists towards self-care, physical and psychological recovery, provides some information on how risk factors can be modified and seeks to increase a patient’s sense of control [3]. The scope of Phase I rehabilitation has changed in the last decade due to decreasing length of hospital stay and new acute interventions.

**Phase II - Outpatient rehabilitation**

Most cardiac rehabilitation is based on Phase II rehabilitation consisting of a supervised programme of six to twelve weeks duration, beginning as soon as possible after referral or discharge from hospital. The length of the programme depends on the specific needs of the patient, and spouse/partner and varies considerably nationally and internationally. It usually involves an exercise component (home activity and/or supervised exercise sessions), education sessions, including understanding of the disease process, treatment, risk factors, nutrition and guidelines for resumption of physical, sexual and daily living activities, including work and psychosocial support. This can either be conducted within group settings or with an individual or family. Whilst it is considered best practice for programmes to be run by a multidisciplinary team, it is recognised that they can be run by any trained health professional caring for cardiac patients, as no sophisticated equipment or facilities are required.

**Phase III - Long-term maintenance**

This relates to long-term maintenance of the skills and behaviour change learned within Phase I and II. In New Zealand, this phase is primarily the domain of independent community ‘cardiac clubs’ which act as support groups. The National Heart Foundation of New Zealand has an affiliation with 40 cardiac clubs throughout New Zealand and has a heart health information service for patients and professionals.

**CURRENT DATA ON CARDIAC REHABILITATION IN NEW ZEALAND**

There are 41 centres in New Zealand offering Phase I and II cardiac rehabilitation. There is variation in facilities, equipment, format of the service, duration of the programmes and the number of sessions offered. The range in the length of programme duration is two to twelve weeks [4]. The quality of current service provision is difficult to assess. Programme performance indicators (eg, participation rate, drop-out rate) are kept by some rehabilitation centres, but patient outcome measures, (eg, quality of life, re-hospitalisation rate, mortality) are kept by very few.

**Rehabilitation uptake**

An audit of the Auckland Hospital’s Phase II cardiac rehabilitation programme was conducted in 1999 [5]. It found that 56% of the eligible patients did not attend the programme. Of those attending one or more sessions, more than half did not complete the six week programme.

Factors associated with non-attendance include distance from programme venue and lack of transport [5], female gender [6-8], older age [8-10], lower socio-economic status and social deprivation [6, 11, 12]. Deficiencies in the referral process have also frequently been reported.
Facility audit August 2000

A facility audit of cardiac rehabilitation centres in New Zealand (n=33, 80% response rate) [13] showed:

- 100% offer education, risk factor modification, medication advice and psychosocial intervention
- 73% vocational support/counselling
- 79% personalised exercise programme
- 64% supervised exercise in hospital
- 48% supervised exercise in the community
- 85% spouse counselling/support
- 76% offered a patient support group
- 15% programmes had formal input from Māori
- 0% programmes had formal input from Pacific peoples
- 48% of the programmes had a mechanism in place for communication with GPs
- 27% had the ability to follow-up those who declined/did not attend.

At the present time there are no cardiac rehabilitation programmes provided by Māori or Pacific healthcare providers in New Zealand. The potential to improve both the access and the service provision to these groups and reduce disparities in health outcomes is seen as a priority.

Programme variability

An audit of the nutritional component of all formal Phase II cardiac rehabilitation programmes was undertaken in 1999 [5]. Thirty programmes eligible for study returned completed audit forms (response rate 83%). The total time spent on nutrition education ranged from 15 minutes to 9 hours (median 1.1 hours) contributing 2.1%-60% of programme contact time (median 10%). All aspects of the nutrition education component were in accord with existing nutrition recommendations. However this report highlighted the under-representation of ethnic minority, lack of responsiveness to Treaty of Waitangi issues and the lack of resources to cater for non-English, or English as second language, participants.

Patients’ views and preferences

There was limited research on patients’ views and preferences at the time of writing these guidelines. At present, very few programmes conduct patient satisfaction questionnaires. A focus group of people who had attended Middlemore Hospital Phase II cardiac rehabilitation programme in Auckland was conducted by the National Heart Foundation of New Zealand in 2000 [14]. Of the 17 participants, only two had received information about Phase III cardiac rehabilitation. No member of the focus group knew what a cardiac club was or where to locate one. All stated they would have liked to visit a cardiac club prior to leaving the Phase II programme. Anecdotal evidence suggests referral from Phase II programmes to cardiac clubs is poor throughout New Zealand.

Cost-utilisation data/funding

Cost-utilisation data is very limited. There is no available data on outcomes and costs such as re-hospitalisation rates, GP visits and other health professional services, medical/surgical treatment costs and laboratory costs in New Zealand for patients attending compared with not attending programmes.

The cost of providing a cardiac rehabilitation programme varies with the duration and frequency of sessions, uptake and throughput of participants, staff mix, monitoring technologies utilised and the cost of the facility. Currently in New Zealand cardiac rehabilitation is purchased through cardiac education and management purchase units. The extent of funding is $80.45 per purchase unit, with a total national spending of $1.34 million with wide disparities existing nationally (Figure 1).
A review of the cost effectiveness literature suggests that investment in cardiac rehabilitation is warranted not only in terms of reduced mortality and improved quality of life, but also cost savings to the healthcare system [16, 17]. This evidence however, is derived from studies conducted in the US, Sweden and the UK. A cost analysis of 16 programmes in England and Wales [18] showed the average cost per patient to be £371. This figure was biased by the high cost of three programmes. The median cost was £233. Using data extrapolated from studies in other countries may be misleading. There is a need to collate New Zealand data in relation to cost effectiveness.

GUIDELINE DEVELOPMENT TEAM

In response to the wide geographic variation in cardiac rehabilitation service provision in New Zealand, the Ministry of Health allocated funding to the New Zealand Guidelines Group for the development of cardiac rehabilitation guidelines. Previously the National Heart Foundation of New Zealand had published Minimum Standards and Policy Statements for Cardiac Rehabilitation [19]. The National Heart Foundation of New Zealand and the New Zealand Guidelines Group reached a joint agreement to develop evidence-based cardiac rehabilitation guidelines for New Zealand. The Cardiac Rehabilitation Guidelines Team was established in August 2000. The working brief for the guidelines was threefold. They were to be explicitly evidence-based, be conducted in accordance with the principles of the Treaty of Waitangi and the Code of Health and Disability Services Consumers’ Rights and reflect diverse cultural, consumer and health professional perspectives.

TARGET USERS

The target users of the guideline are all health professionals working in cardiac rehabilitation in New Zealand, both in hospitals and the community. Companion consumer documents will also be produced.
GUIDELINE DEVELOPMENT

Due to the vast quantity of cardiovascular literature and the availability of recently developed international cardiac rehabilitation guidelines listed below, a pragmatic approach was taken by the guideline team. The methodology of the following guidelines was appraised according to the AGREE critical appraisal instrument [20]:

- Cardiac Rehabilitation. Guidelines and audit standards. (United Kingdom) [21]
- Canadian guidelines for cardiac rehabilitation and cardiovascular disease prevention (1999) [22]
- American College of Sports Medicine guidelines for exercise testing and prescription (2000) [23]
- 1997 New South Wales Policy Standards for Cardiac Rehabilitation [24].

The Victorian and US Agency for Health Care Policy and Research guidelines were assessed as being explicitly evidence-based and of high quality. These two guidelines were then used as the basis for the New Zealand Cardiac Rehabilitation guideline and a literature search from January 1995 until December 2000 was conducted.

Clinical questions addressed by the guideline

A series of questions were developed for the literature search:

1. For people with established coronary artery disease, do comprehensive, multifactorial rehabilitation programmes compared with usual care, achieve benefits in terms of all-cause and total mortality, hospitalisation rates, quality of life and health care costs over a 5 year period?
2. What evidence is there for individual components of cardiac rehabilitation programmes; exercise, nutrition education, psychosocial education and interventions, risk factor education, drug and lifestyle interventions, in terms of benefits/harms and costs?
3. For specific population groups with coronary artery disease (the elderly, young, Māori, Pacific peoples, other ethnic groups, rural/urban, those with congestive heart failure or other co-morbidities) what is the evidence for programme effectiveness (in terms of participation, consumer acceptability and ability to achieve lifestyle changes) for one mode of delivery compared to another?
4. Are there specific prognostic factors that will predict the likelihood of a cardiac event during cardiac rehabilitation?

Two independent literature searches were conducted from January 1995 to December 2000, to find publications not included in the previous guidelines. Databases used were Cochrane CD (including Cochrane Clinical Trials Register), Medline, Embase, CINAHL, PsycLIT and Psychinfo. Reference lists of identified studies were also searched. Attempts were made to locate all relevant literature and conference abstracts. For therapy questions, evidence of effectiveness was sought preferentially from systematic reviews, meta-analyses or randomised controlled trials. Where no new evidence was available, large cohort studies or case-control studies were also included. For questions regarding prognosis, large cohort studies and systematic reviews of cohort studies were considered the preferred study design. Where evidence for some of the questions was lacking, other study designs eg, quasi-experimental were also evaluated.

Approximately 4000 abstracts were retrieved. These were then evaluated to determine whether the full articles would be retrieved according to whether the individual articles fulfilled the original PECOT criteria (specifically the patient population, intervention and outcome). Non-English language publications were also retrieved as some of these had both original and translated text. Following this evaluation, around 400 abstracts were collated according to chapter headings. Literature acquisition and tracking was then coordinated by the Cochrane Menstrual Disorders and Subfertility Group (Auckland).

Evidence tables for major studies were completed to critically appraise study quality, validity, and applicability. The evidence was ranked according to the Scottish Intercollegiate Guidelines Network (SIGN) grading system for recommendations in evidence-based guidelines [25]. More information about this grading system can be found at www.sign.ac.nz. Approximately 10% of all the studies were independently graded by other members of the guideline committee to check for discrepancies in the assignment of grading levels. There was a high degree of concordance.
### ADAPTED SIGN GRADING SYSTEM

#### LEVELS OF EVIDENCE

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
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<tbody>
<tr>
<td>1++</td>
<td>High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias.</td>
</tr>
<tr>
<td>1+</td>
<td>Well conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias.</td>
</tr>
<tr>
<td>1-</td>
<td>Well conducted meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias.</td>
</tr>
<tr>
<td>2++</td>
<td>High quality systematic reviews of case-control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal.</td>
</tr>
<tr>
<td>2+</td>
<td>Well conducted case-control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal.</td>
</tr>
<tr>
<td>2-</td>
<td>Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal.</td>
</tr>
<tr>
<td>3</td>
<td>Non-analytic studies, e.g., case reports, case series.</td>
</tr>
<tr>
<td>4</td>
<td>Expert opinion.</td>
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</table>

Following assessment of the level of evidence for individual papers, recommendations were given a grade from A to D as below. This grading system departs from the Scottish Intercollegiate Guidelines Network (SIGN) system which was derived primarily for treatment guidelines and revises ranking according to therapy or prognosis. Questions relating to prognosis were considered a feature of this guideline to determine how to tailor cardiac rehabilitation services according to individual patient needs. For further details on the SIGN system see [www.sign.ac.uk](http://www.sign.ac.uk).

#### GRADES OF RECOMMENDATION

<table>
<thead>
<tr>
<th>Grade</th>
<th>Therapy Requirement</th>
<th>Prognosis Requirement</th>
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<tbody>
<tr>
<td>A</td>
<td>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.</td>
<td>At least one meta-analysis, systematic review, or large high quality cohort study rated as 2++ and directly applicable to the target population, OR A body of evidence consisting principally of studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results.</td>
</tr>
<tr>
<td>B</td>
<td>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+.</td>
<td>A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results.</td>
</tr>
<tr>
<td>C</td>
<td>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++.</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Evidence levels 3 or 4, OR for therapy: extrapolated evidence from studies rated as 2+, or expert opinion.</td>
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Studies graded 1- or 2- were considered similar to level 3 or 4 evidence because of methodological flaws.
Sections were written by separate author/s and edited by Professor Norman Sharpe and Dr Diana North.

Special consideration was given to:

- Appropriateness and acceptability for Māori
- Appropriateness and acceptability for Pacific peoples
- Other socio-cultural/socio-economic factors in New Zealand.

The chapters and recommendations were evaluated by the whole committee and disagreements resolved by consensus.

EXTERNAL PEER REVIEW

The document was sent to the following groups and individuals for peer review (* indicates that a response was received).

- Dr Peter Leslie, Chair, Council of Medical Colleges of New Zealand*
- Australian & New Zealand College of Anaesthetists
- Chair, Royal Australian and New Zealand College of Radiologists
- Royal Australasian College of Surgeons*
- Royal Australian & New Zealand College of Psychiatrists
- Royal Australasian College of Physicians
- Royal Australian & New Zealand College of Ophthalmologists
- Royal Australian & New Zealand College of Obstetrics & Gynaecology
- Australasian College of Emergency Medicine
- Royal Australian & New Zealand College of Ophthalmologists
- Dr Ross Freebairn, Chair, Joint Faculty of Intensive Care Medicine
- David Thompson, University of Health Studies, York, UK*
- Dr Marion Worcester, The Heart Research Centre, The Royal Melbourne Hospital
- Cardiac Society of New Zealand*
- Cardiac Rehabilitation Nurses of New Zealand*
- NZ Society of Physiotherapists*
- Royal New Zealand College of General Practitioners*
- Women’s Health Action*
- National Heart Foundation of New Zealand*
- Te Hotu Manawa Māori
- Te Ora Māori Doctors Association
- Nga Ngāru Hauora O Aotearoa Inc
- Stroke Foundation of New Zealand*
- Ministry of Health*
- Dr Alan Goble, The Heart Research Centre, The Royal Melbourne Hospital*
- Sports Medicine New Zealand
- Pacifika
- NZ College of Nurses*
- New Zealand Nurses Organisation
- Nursing Council of New Zealand*
- Federation of Women’s Health Councils
- Dale Bramley
- Harry McNaughton*
- Prof Jim Mann
- Dr Patrick Manning
- Dr Richard Milne
- Dr Jonathon Baskett*
- Prof Harvey White
- Dr Peter Jansen*. 
Comments were considered by a subgroup of the guideline development team and the NZGG and adjustments incorporated.

The focus of the guideline is limited to comprehensive cardiac rehabilitation. It does not seek to review the evidence associated with cardiac heart disease or secondary prevention medications.

PROCEDURE FOR UPDATING THIS DOCUMENT

It is intended that this guideline will be reviewed in three years following evaluation of patient and facility audits, further qualitative research and if new evidence becomes available.

A more detailed guideline on medications for the prevention of secondary cardiovascular disease is planned for publication in 2003.

ENDORSEMENTS

The guideline has received endorsement and support from:

FUNDING

The guideline was developed under the auspices of the New Zealand Guidelines Group and the National Heart Foundation of New Zealand. Funding for the project was received from the Ministry of Health and the National Heart Foundation of New Zealand.

GUIDELINE DEVELOPMENT TEAM

The following people were responsible for the development of this guideline:

Chairman
Prof Norman Sharpe - Cardiologist, Auckland Hospital; Head, School of Medicine, University of Auckland; Chair New Zealand Guidelines Group.

Co-Drivers
Dr Sue Wells - Public Health Medicine Registrar; General Practitioner.
Fiona Doolan-Noble - National Cardiac Rehabilitation Co-ordinator, National Heart Foundation of New Zealand, Auckland; President, Cardiac Rehabilitation Association of New Zealand.

Members
The Guideline development team is a diverse group representing consumers, Māori and Pacific peoples, and health professionals including cardiologists, cardiac rehabilitation nurse specialists, Māori Mobile Disease State nurses, general practitioners, exercise physiologists, a dietitian, an education nurse specialist, a public health medicine specialist and two public health medicine registrars.

• Chris Baldi - Lecturer in exercise physiology and cardiac rehabilitation, Department of Sports and Exercise Science, University of Auckland.

• Stephen Burden - Exercise Physiologist, Centre for Sports and Exercise Science, Waikato Polytechnic.

• Tim Corbett - MBS, Dip Ph, BPhED.
• Dr Rob Doughty - Senior Lecturer in Medicine, Department of Medicine, University of Auckland.
• Stewart Eadie - Education Nurse Specialist, Unitec.
• Euan Grigor - Co-founder, Deputy-Chairman Heart Foundation Cardiac Care & Rehabilitation Committee; Consumer representative, Rakaia.
• Dr Ngaire Kerse - General Practitioner; Department of General Practice, University of Auckland; Representative of the Royal New Zealand College of General Practitioners.
• Helen McGrinder - Cardiac Rehabilitation Nurse Specialist, Greenlane Hospital.
• Henare Mason - Board Member Te Hotu Manawa Māori; Rheumatic Fever Trust, Middlemore Hospital.
• Dahlia Naepi - Registered Nurse, Pasifi k HealthCare, Pasifi k Peoples representative.
• Dr Diana North - Medical Director, National Heart Foundation of New Zealand.
• Dr Tania Riddell - Public Health Medicine Registrar, National Heart Foundation of New Zealand.
• David Roberts - National Dietitian, National Heart Foundation of New Zealand.
• Henare Mason - Board Member Te Hotu Manawa Māori; Rheumatic Fever Trust, Middlemore Hospital.
• Riki Robinson - Registered Nurse; Māori Mobile Disease State Nurse; Māori representative.
• Iutita Rusk - Manager, Pasific Islands Heartbeat, National Heart Foundation of New Zealand; Pasific Peoples representative.
• Dr Ralph Stewart - Cardiologist, Greenlane Hospital, Auckland.
• Tangi Vautier - Registered Nurse; Māori Mobile Disease State Nurse; Māori representative.

In August 2001, Deidre Nehua, CEO Te Hotu Manawa Whanui, joined the guideline committee to be the elected representative of Te Hotu Manawa Whanui. Henare Mason had retired from the Board of Te Hotu Manawa Whanui but agreed to stay on the committee to support the guideline development.

The guideline development team would like to acknowledge the help and support it has received from Laura Lambie, Gabrielle Collison, Rachel Gilchrist from the Ministry of Health, and Rob Cook and Catherine Marshall from the New Zealand Guidelines Group. Virginia Hand, Department of Medicine, University of Auckland, assisted with co-ordination of this manuscript.

Competing Interests
Professor Norman Sharpe has received funding or acted as consultant for the New Zealand or international offices of the following companies:
• Aventis
• Roche
• Merck Sharp & Dohme
• Astra Zeneca
• Wyeth Ayerst
• Eli Lilly.

Dr Diana North has acted as a consultant for Roche.

Dr Rob Doughty has received research support from the following companies:
• Merck Sharp and Dohme (NZ) Ltd
• Roche Pharmaceuticals (NZ)
• Wyeth
• Eli Lilly.

Dr Ralph Stewart has received research support from:
• Phamacia
• Bristol Myers Squibb
• Merck Sharp & Dohme.

The other members of the guideline development team did not report any competing interests.
• Comprehensive cardiac rehabilitation programmes have been shown to reduce mortality from coronary heart disease, re-infarction rates and hospital admissions and improve quality of life for the patient and their family.

• The main goals of cardiac rehabilitation are:
  - To prevent further cardiovascular events by empowering patients to initiate and maintain lifestyle changes
  - To improve quality of life through the identification and treatment of psychological distress
  - To facilitate the patient’s return to a full and active life by enabling the development of their own resources.

• Prior to hospital discharge, all eligible patients should be referred to attend a comprehensive cardiac rehabilitation programme.

• The main components of a comprehensive cardiac rehabilitation programme are:
  - Empowering patients to make lifelong changes
  - Exercise programmes
  - Nutrition management
  - Weight management
  - Smoking cessation
  - Managing psychosocial aspects of life
  - Pharmacotherapy
  - Ongoing personal follow-up and support.

• Cardiac rehabilitation provides the opportunity to coach and encourage positive lifestyle behaviours and increases compliance with medication use.

• For personal behaviour change, several key elements need to be present:
  - A belief that change is possible
  - Motivation to make the change
  - A support network and personal capacity to enact and sustain change.

• Physical activity improves functional capacity, risk factors and significantly reduces cardiovascular disease and total mortality. The benefits of regular, moderate physical activity are likely to outweigh any small increased risk of sudden death associated with vigorous exercise.

• A cardioprotective dietary pattern reduces cardiovascular and total mortality and is recommended. Modification of dietary fat should not be considered in isolation from a whole diet approach.

• All patients with coronary heart disease should be strongly encouraged to stop smoking and to avoid second-hand smoke.

• Up to 1 in 4 patients will experience a disabling level of anxiety or depression following a myocardial infarction. Psychosocial interventions are recommended.

• Pharmacotherapy with aspirin, a beta blocker, an ACE inhibitor and a statin can provide substantial benefits and these medications should be considered in all patients.

• Cardiac rehabilitation should be viewed as a continuum from initial admission through to long-term follow-up. This requires integration between primary and secondary care.

• Audit, evaluation and patient feedback are integral aspects of quality improvement.

• Specific groups may require special consideration. Patients requiring extra support or varied options may include women, the elderly, the socioeconomically disadvantaged and those living in rural areas. People with diabetes are at particularly high risk and warrant priority.

• Ensuring Māori and Pacific peoples access to cardiac rehabilitation programmes is important and will help reduce disparities in cardiovascular disease outcomes. Existing programmes may need reorientation to increase responsiveness to Māori and Pacific peoples needs.
RECOMMENDATIONS

**PHYSICAL ACTIVITY**

**B** Exercise advice should be individualised and consider clinical characteristics, lifestyle, attitudes, culture and environment.

**B** For sedentary people, at least 30 minutes of moderate intensity activity on most days of the week is recommended.

**D** Physical activity for people with coronary heart disease should begin at low intensity and gradually increase over several weeks.

**B** Short periods of physical activity are beneficial.

**C** In people with coronary heart disease, vigorous exercise is generally not encouraged.

**B** Where possible, people with coronary heart disease should be referred to a comprehensive cardiac rehabilitation programme for exercise training.

**NUTRITION MANAGEMENT**

**A** In all patients with cardiovascular disease, the adoption of a cardioprotective dietary pattern is recommended. This pattern includes large servings of fruit, vegetables and whole grains, low fat dairy products, small servings of unsalted nuts and seeds regularly and fish or legumes frequently in place of fatty meat and full fat dairy products. Small lean meat servings can be part of this dietary pattern.

**A** Intensive dietary advice, compliance checks and long term follow up, preferably from a dietitian, are recommended to facilitate the adoption and maintenance of this dietary pattern.

**C** A small amount of alcohol may provide health benefits. The protective effect of alcohol is seen at doses as low as one standard drink every second day.

**A** There is currently insufficient evidence to recommend nutrition supplements of antioxidant vitamins, minerals or trace elements for the treatment or prevention of cardiovascular disease.

**A** Fish and fish oil supplements may reduce the risk of sudden cardiac death, however it remains to be determined whether fish oil supplements are more beneficial than eating fish.

**WEIGHT MANAGEMENT**

**A** For overweight and obese patients with coronary heart disease, the combination of a reduced-energy diet and increased physical activity is recommended.

**A** The initial goal of therapy should be to reduce the patient's weight by 10%.

**A** An energy deficit is most readily achieved through choice of foods low in total fat content, particularly saturated fat. Further reductions in total energy intake can be achieved by reducing carbohydrate intake, especially highly sweetened foods or drinks such as sugar, confectionery, cakes, biscuits, soft drinks and chocolate.

**D** Popular high protein weight loss diets are not recommended for long term weight loss because they restrict consumption of healthy foods and do not provide the variety of foods needed to meet nutritional needs.

**KEY**

A Well designed meta-analysis (MA) of RCT, or a body or evidence which are consistently applicable

B Very well designed observational studies or extrapolated evidence from RCTs or MAs

C Lower quality observational studies or extrapolated evidence from B

D Non analytical studies or expert opinion

- see page 10 for details
### SMOKING

| A | All patients with cardiovascular disease should be advised to quit smoking. They should be supported to stop smoking as a priority measure. |
| A | For smokers with coronary heart disease, medical advice, individual and group counselling, nicotine replacement therapy and some antidepressant medications improve success in quitting and are recommended. |
| D | The spouses, partners, whānau and family of patients with coronary heart disease should be strongly encouraged to stop smoking to avoid the risk of second-hand smoke to the patient. |

### PSYCHOSOCIAL ASPECTS

| B | Psychosocial interventions (patient education, counselling and cognitive behavioural techniques) should be included in comprehensive cardiac rehabilitation programmes. |
| C | An assessment of the social support available to the patient is recommended for all patients with coronary heart disease. |
| D | Simple questions regarding the patient’s illness perception, coping skills and external support followed by a validated questionnaire such as the HADS questionnaire are recommended. |
| C | The involvement of spouses, partners, whānau and family should be encouraged in all phases of comprehensive cardiac rehabilitation. |
| B | All patients with coronary heart disease who demonstrate a high level of anxiety or depression should be referred to a trained practitioner for assessment and treatment of their anxiety and depression. |
| B | Comprehensive cardiac rehabilitation programmes should include vocational guidance to facilitate an appropriate and realistic return to work. |
| D | For those who see work as a potential barrier to participation in an outpatient based programme, options such as home based cardiac rehabilitation should be considered. |
| D | Comprehensive cardiac rehabilitation programmes should include discussion of sexual activity in an open, frank and sensitive manner. |

### PHARMACOTHERAPY

| A | In all patients with coronary heart disease pharmacotherapy with aspirin, a beta-blocker, an ACE inhibitor and a statin should be considered unless contraindicated, regardless of initial levels. |

### CASE MANAGEMENT

| A | Comprehensive cardiac rehabilitation should embrace a case management approach. |
| D | Hospital based cardiac rehabilitation must be comprehensive and should be individualised to meet the needs of each patient. |
PATIENT IDENTIFICATION

D Comprehensive cardiac rehabilitation should be considered in all patients after myocardial infarction, coronary artery bypass surgery and angioplasty.

D All patients with coronary heart disease should receive a personal written invitation to attend a cardiac rehabilitation programme.

D A cardiac rehabilitation co-ordinator should have overall responsibility for liaison with patients, their health practitioners and other members of the team. The coordinator should implement strategies to minimise missed referrals.

PROGRAMME FORMAT

D All patients following a coronary event should receive a recommendation and referral for rehabilitation from a clinician.

D Prior to discharge, all eligible patients should receive a written discharge plan.

D Prior to commencing Phase II cardiac rehabilitation, all patients should be assessed and a programme developed that meets their individual needs and sets realistic goals.

D The programme co-ordinator should communicate in writing to the patient’s general practitioner and specialist advising details of enrolment, non-attendance or discharge from the programme.

D All patients should receive written information regarding their nearest cardiac club.

INFORMATION NEEDS

B The educational component of a comprehensive cardiac rehabilitation programme should be individually tailored to the specific circumstances, readiness to change, cultural background and socio-economic circumstances of the patient.

B Varied methods of providing patients with information during their hospital stay need to be considered to optimise patient learning and recovery.

SETTINGS FOR CARDIAC REHABILITATION

D Hospital based cardiac rehabilitation must be comprehensive and should be individualised to meet the needs of each patient.

B Cardiac rehabilitation programmes should be offered within the primary care setting for which workforce development is required.

D Home based cardiac rehabilitation is recommended for patients who are either unable to attend or unwilling to use a hospital based service.

THE MULTIDISCIPLINARY TEAM

D A range of knowledge and skills are recommended for a comprehensive cardiac rehabilitation service. The disciplines of medicine, cardiology, dietetics, nursing, exercise physiology, occupational therapy, physiotherapy, psychology and social work all contribute to ensuring a comprehensive service. The model chosen locally will vary but all disciplines included need to be committed to a coordinated and collaborative approach.

KEY - see page 10 for details
A Well designed meta-analysis (MA) of RCT, or a body or evidence which are consistently applicable
B Very well designed observational studies or extrapolated evidence from RCTs or MAs
C Lower quality observational studies or extrapolated evidence from B
D Non analytical studies or expert opinion
### SPECIFIC POPULATIONS

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>D</strong></td>
<td>Women’s needs should be addressed in comprehensive cardiac rehabilitation programmes.</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>All patients should be referred to comprehensive cardiac rehabilitation irrespective of age.</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Disadvantaged patients may need extra support to attend and complete programmes.</td>
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<tr>
<td><strong>D</strong></td>
<td>Rural patients need options for rehabilitation at home or within a primary care setting.</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Patients with diabetes warrant priority for rehabilitation.</td>
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<tr>
<td><strong>D</strong></td>
<td>Spouse, partner, whānau and family should be offered access to an appropriate support group and be involved in all stages of the rehabilitation process.</td>
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</table>

### MĀORI PERSPECTIVES

<p>| | |</p>
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<thead>
<tr>
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<tbody>
<tr>
<td><strong>D</strong></td>
<td>The development of Māori provider cardiac rehabilitation programmes is recommended.</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Mainstream cardiac rehabilitation programmes must be reoriented to meet the needs of Māori.</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>It is necessary that Māori have input into the policy and decision making processes of cardiac rehabilitation services.</td>
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</table>

### PACIFIC PERSPECTIVES

<p>| | |</p>
<table>
<thead>
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<tbody>
<tr>
<td><strong>D</strong></td>
<td>Current cardiac rehabilitation programmes should be redefined to meet the needs of Pacific peoples.</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Cardiac rehabilitation services serving Pacific people should consider the importance of the Pacific family unit, spiritual needs and socio-economic status.</td>
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</table>

### AUDIT, PROGRAMME EVALUATION AND PATIENT SATISFACTION

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<tbody>
<tr>
<td><strong>D</strong></td>
<td>Audit of programme performance indicators is necessary to monitor service provision and quality of care. Audit should take place every six months.</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>The collection and audit of ethnicity data is recommended to monitor services for equitable access and delivery of programmes.</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>All comprehensive cardiac rehabilitation programmes should monitor and evaluate data relevant to their locality, the population served and the stakeholders of the service.</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>All comprehensive cardiac rehabilitation programmes should ascertain the views of the consumers to assist the development of a quality service.</td>
</tr>
</tbody>
</table>
## CARDIAC REHABILITATION GOALS

<table>
<thead>
<tr>
<th>GOALS</th>
<th>INTERVENTION</th>
</tr>
</thead>
</table>
| **Psychosocial management:**       | Assess level of social support needed.  
|                                    | Monitor symptoms of depression and anxiety.  
|                                    | Advise on return to vocational activity, driving and return to sexual activity.  
|                                    | Refer to home or hospital based comprehensive cardiac rehabilitation programme. |
| **Smoking goal:**                  | Assess tobacco use. Strongly encourage patient and family to stop smoking and avoid smoke. Facilitate counselling, pharmacotherapy and cessation programmes as appropriate. |
| **Physical activity goal:**        | Assess exercise risk, preferably with exercise test to guide prescription. A gradual increase to periods of physical activity of at least 30 minutes most days of the week and an increase in daily lifestyle activities is advised.  
|                                    | Vigorous exercise is not routinely recommended.  
|                                    | The benefits of regular moderate physical activity overall, considerably outweigh any risk of sudden death. |
| **Nutrition management goal:**     | This dietary pattern includes:  
|                                    | • Large servings of fruit, vegetables and whole grains  
|                                    | • Low fat dairy products  
|                                    | • Small servings of unsalted nuts and seeds regularly  
|                                    | • Fish or legumes frequently in place of fatty meat and full fat dairy products  
|                                    | • Small lean meat servings. |
| **Weight management goal:**        | For overweight or obese patients, an individually planned nutritionally balanced diet may be considered. The initial goal of weight loss should be to reduce the patient's weight by 10%. Encourage exercise and nutrition goals. |
| **Lipid lowering medication goals:** | Ensure cardioprotective dietary change. Promote exercise and weight management. Assess fasting lipid profile. Start drug therapy (statin generally most appropriate; consider adding fibrate if low HDL or high TGL). |
| **BP control goal:**               | Ensure lifestyle measures. Add BP medication individualised to patient characteristics. |
| **Antiplatelet agents**            | Continue aspirin indefinitely. If aspirin contraindicated, consider warfarin. |
| **Beta blockers**                  | Continue betablockers indefinitely unless contraindicated. |
| **ACE inhibitors**                 | Continue ACE inhibitor indefinitely in high-risk, post MI patients (anterior MI, previous MI, LV dysfunction or CHF).  
|                                    | Consider chronic therapy in other patients. |

These guidelines have been endorsed by:
4.1 EMPOWERING BEHAVIOUR CHANGE

**Key points**

Cardiac rehabilitation provides the opportunity to coach and encourage positive lifestyle behaviours and increases compliance with medication use.

For personal behaviour change, several key elements need to be present:

- A belief that change is possible.
- Motivation to make the change.
- A support network and personal capacity to enact and sustain change.

The cardiac rehabilitation programme provides the opportunity to coach and encourage the person to more positive lifestyle behaviours and sustained healthy habits. Enabling a person in cardiac rehabilitation to change what will be ingrained lifestyle behaviours may be a difficult yet rewarding experience. Many of the lifestyle behaviours will have been developed over years and will be reinforced by the social and community settings in which the person lives.

Empowering behaviour change is a difficult and dynamic process. The cardiac patient will enter with high feelings of anxiety and nervousness. Each person will enter into the programme with a different package of feelings, support, motivation and goals. Therefore, it is difficult and counterproductive to prescribe a single methodology for working with cardiac patients. However, there are a range of tools and processes which personnel can utilise which will make the task easier and enable patient behaviour change.

The essential practice dilemma for cardiac rehabilitation professionals is how to assure a patient centered empowering approach in a programme that may not allow for a great deal of one to one time. The patient may be highly reticent to change, or nervous and fearful of a repeat cardiac event. Furthermore, patients are often being asked to make a large number of lifestyle changes and fear of recurrence is often not a sufficient motivator to make sustained change.

**Behaviour change models**

A series of socio-cognitive models have been utilised in behaviour change research in areas such as smoking, physical activity, nutrition and weight loss. These models have been formulated in attempts to explain how the behaviours are developed through societal conditioning, personal and psychological attributes and decision making processes. They have also been utilised in intervention approaches with varying degrees of success.
**Health belief model**

The health belief model [26] states that a person is likely to adopt a behaviour if they perceive a threat to their personal health. They also need to have a conviction that adopting the behaviour will lead to the prevention or control of the threat. Whether a person perceives a threat to their health or not, will depend upon whether they believe they are susceptible to the disease and, how much impact the disease will have on their life.

According to the health belief model, in a cardiac rehabilitation programme, an individual would make a change to their behaviour, (eg, becoming active) if the behaviour (being sedentary) is perceived as a threat to heart health. They must also believe that by making these changes, (eg, becoming active) they will reduce their risk of heart disease.

**Self efficacy theory**

Self efficacy is a person’s judgment of their ability to devise and execute strategies of action to successfully perform a desired behaviour [27]. Individuals tend to undertake activities if they feel the activities are within their capabilities. Conversely, they avoid situations that they perceive they cannot handle. A belief in self efficacy is learned in various ways including personal experiences and the example provided by others. Perceived self efficacy can determine whether an individual patient attempts a given task, the degree of persistence when the individual encounters difficulties and, ultimate success.

Self efficacy theory distinguishes between the expectation of outcome – an individual’s estimate that a given behaviour will lead to certain outcomes and, the expectation of self efficacy – the conviction that a person can successfully execute the required behaviour to produce the outcomes. The self efficacy theory places a greater emphasis on a person’s strength of belief that they can perform the behaviour in a variety of circumstances.

**Self efficacy is made up of four factors**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance accomplishments</td>
<td>A patient’s level of success with performing the behaviour</td>
</tr>
<tr>
<td>Vicarious experiences</td>
<td>Patients judging the likelihood of success by comparing with others’ efforts</td>
</tr>
<tr>
<td>Verbal persuasion</td>
<td>Convincing patients to raise confidence and expectation of success</td>
</tr>
<tr>
<td>Physiological states</td>
<td>Physical feelings of anxiety and tension associated with the fear of not performing well</td>
</tr>
</tbody>
</table>

Self efficacy theory has great potential in cardiac rehabilitation programmes for empowering behaviour change. To encourage successful initiation and maintenance of sustained behaviour change with patients, their self efficacy must be increased. More specifically, their personal belief that they can make lifestyle change in nutrition, exercise, stress management and smoking can be influenced by programme elements that build self efficacy. These include elements such as the counselling methodology of the professional, the social setting of the programme, role modelling from other patients and staff, building resilience and strategies to barriers and building confidence to face life outside the safety of the programme through simulation and practice.

**Programme approaches to increasing self efficacy**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance accomplishments</td>
<td>Create small regular milestones that participants can reach</td>
</tr>
<tr>
<td></td>
<td>Reward for changes that lead to desired behaviour, eg, watching less TV which provides the potential for being more active</td>
</tr>
<tr>
<td>Vicarious experiences</td>
<td>Buddy new Phase II participants with more experienced ones</td>
</tr>
<tr>
<td></td>
<td>Group participants of similar ability together</td>
</tr>
<tr>
<td></td>
<td>Use role models of previous participants. Tell the story of how these participants were able to change behaviours to make behaviour change real and possible</td>
</tr>
<tr>
<td>Verbal persuasion</td>
<td>Use patient centred, empathetic negotiation. Focus negotiation on what patient can do today and on what they have achieved so far</td>
</tr>
<tr>
<td>Physiological states</td>
<td>Include relaxation techniques to reduce anxiety</td>
</tr>
</tbody>
</table>

Focus patients on the positive feelings of energy, feelings of self esteem, the social contact and performance improvements that come from the Phase II activities.
Theory of planned behaviour

The individual’s intent to adopt the behaviour is determined by their attitude about performing the behaviour, the influence of social factors and the perceived behavioural control that the individual has over the behaviour in different settings.

The Theory of Planned Behaviour [28] can be utilised by cardiac rehabilitation professionals to provide a framework to empower behaviour change by:

- Identifying a patient’s attitude towards the behaviour
- Determining the influence of their immediate and local social conditions
- Examining their ability to perform the behaviour in a range of situations.

Transtheoretical model – stages of behaviour change

This model attempts to illustrate the dynamic process of change that a person may go through to alter their behaviour [29]. It has been applied to addictive behaviours such as smoking, as well as nutrition and exercise [30]. It has become a commonly applied model in health professions to enable interventions to be designed and matched to the stage of change the person is in. In the cardiac rehabilitation context, the model provides a guide to enable the health professional to adjust their approach to a more patient centred one. Further, it enables the health professional to begin in the appropriate stage, saving time for both the patient and professional.

The process of movement through the stages is dynamic. A person can easily slip out of a stage and regress. They may move quickly through one stage only to become stalled at another. It should also be noted that just because a person is attending a cardiac rehabilitation programme this does not make them ready to change their lifestyle. Although they have been referred to the programme they may be far from ready to initiate behaviour change. Importantly then, cardiac rehabilitation programmes and the approaches of health professionals need to match the capacities, capabilities and stage of the individual. The practice guidelines following will outline a process to achieve this.

Summary of behaviour change approaches

What these models and theories suggest is that a person is more likely to be able to change their health behaviour if:

- The benefit of the behaviour change will outweigh the costs (personal, social, economic etc.)
- The benefits will be greater than the health risk of the behaviour
- The person believes they have the capacity to be able to make the change
- The intended behaviour reinforces how they view themselves or how they would like to view themselves
- The interpersonal and social support mechanisms are available from spouses, partners, whānau, families, colleagues and friends to enable and reinforce the change.

Furthermore, the person will be more successful in their behaviour change if a patient centred approach is taken.
**Patient centred approaches for cardiac rehabilitation**

- The intervention process should be matched to the patients’ specific circumstances, readiness to change and process of change.
- Empathetic and empowering coaching from health professionals will also facilitate the process of making and sustaining change. This will build the person’s belief that they can cope with the change process and, that they can adhere to the changes once they enter into the outside world.
- Proactive practice of coping strategies by identifying potential barriers and practicing responding to these barriers will aid adherence to change.
- At any stage of the process, relapse strategies specific to the person and the situation they have encountered in their relapse need to be developed in conjunction with the person to enable them to ‘get back on track’ as quickly as possible.

While this appears to be a daunting list of variables to include for every person in a cardiac rehabilitation programme, current average numbers are low enabling individualisation of the intervention to be achieved. Further, a more successful behaviour change intervention will reduce relapse. Very few of the patients seen by cardiac rehabilitation professionals will be ready to make change, or have the ability to make change by themselves. Taking a patient centred approach will save time and improve success for the patient.

**Evidence-based practice strategies**

**Brief intervention approaches**

Recently, brief interventions, an empowerment patient centered approach, has been utilised in a variety of addiction contexts by health professionals with good success. At present, the brief intervention approach is being used as an early intervention process for encouraging behaviour change in smoking, physical activity and mental health promotion [31].

The process uses elements from key behaviour change approaches while using the stages of change model as a framework. It focuses upon developing rapport and trust between the health professional and the patient. The aim is to allow the patient to investigate, at their own pace, the rationale and reasons for their behaviours and to develop their own strategies and change processes. Health advice and direction from the health professional gives way to listening, coaching, negotiation and working with the patient.

In the area of brief interventions, New Zealand based research is disparate particularly the efficacy of brief intervention approaches with Māori and Pacific peoples. However, there is growing evidence of the effectiveness of brief intervention approaches to elicit behaviour change in a patient centered theme. Most of the evidence is generated from addiction research in alcohol, smoking and other drugs. However, the approach has been used in coronary heart disease prevention strategies for smoking cessation, nutrition and physical activity [32].

The evidence collected in three controlled trials has been summarised [32] and provides a useful guide to cardiac rehabilitation personnel, of strategies available to empower behaviour change.

A menu of strategies has been evaluated amongst heavy drinkers in a health promotion study in a general hospital setting. Nurses receiving brief intervention training used a range of strategies including:

- Asking participants to describe a typical day
- Weighing the pros and cons of behaviours
- Exploring concerns the participant has about specific behaviours or outcomes
- Information exchange
- Decision making strategies.

This menu approach was found to be more effective than receiving no brief intervention. There was also an indication in the findings that this approach was more effective than a skills based approach among patients who were less ready to change. Among those ready to change, a skills based or the menu method was equally effective.
The process of making change

The intent of behaviour change approaches are summarised into two thematic areas [32]. Exploring a patient’s personal value of change (importance) and assessing and empowering the patient’s confidence in mastering the skills necessary to achieve the change (confidence). A brief patient centered consultation approach is advocated and an overview of the process is provided as shown.

The range of strategies are delivered in a framework that emphasises information exchange to ensure the key issues are understood by both practitioner and patient and also that each other’s viewpoint is heard and understood. Between the patient and the cardiac rehabilitation professional, the aim is to reduce resistance to change through empowerment and facilitation.

Typical behaviour change barriers

Cardiac rehabilitation patients will face a number of high, real and perceived barriers to behaviour change. These barriers need to be overcome through empowering the patient to develop strategies specific to their context and by working with the patient to modify perceptions of the barriers.

Typical barriers centre around personal, situational and social elements

- The patient may not be clear about the goals of the rehabilitation programme from their perspective, ie, the functional physiological goals are made clear but how this impacts upon the patient’s life today and tomorrow is unclear
- The goals may well be functional around physiological well being but how do they relate and integrate into the patients total life picture? How do they enable him to function as a Father or her to function as a Grandmother, to care for others, to reach family and financial goals?
- Has the patient actually made these life goals? Long term motivation to generate health behaviour change does not come from health scares such as cardiac events but may be motivated by socially conditioned goals such as parenting, grand parenting, family, career or educational goals. The rehabilitation programme then becomes a programme to allow fulfillment of life objectives – a powerful motivator.

Common barriers are also developed around inaccurate beliefs about cardiac events and rehabilitation

- Personal attitudinal and psychological factors also impact upon perceived and actual barriers. Mood disorders such as depression and anxiety will lead to a patient perceiving what are actually small barriers, as insurmountable. Related to this is the level of behaviour change burnout that is possible in people who have entered into chronic recycling behaviour change. This is seen in rebound weight loss dieters, people with diabetes, and people who repeatedly drop out of exercise programmes. Eventually they grow tired of making change and move to a more fatalistic, “this is my lot”, type of attitude.
• Some patients may enter with another form of fatalistic attitude in that family history or environmental conditions predetermine their cardiac fate. The man whose father died of a cardiac event resolves that he is likely to go the same way. Often these patients will feel that no matter what they do they will not be able to change their cardiac health status. This type of attitude is difficult to counter directly.

• Social support barriers become evident in patients enacting lifestyle change. No one to walk with, dark unsafe streets to walk on, friends who smoke, eat fatty foods or who are sedentary, make sustainable behaviour change difficult for cardiac rehabilitation patients.

• Programme factors have a large influence on patient’s adherence to change. A lack of role modelling, aspiration as well as inspiration, particularly from people who have been in the same situation will reduce patient change success. Role modelling is empowering, it shows patients a pathway that someone just like them has travelled. In addition, strong leadership is required to enable patients to at first be led, then to lead themselves in their own process of change. A lack of rapport, trust and empathy are common elements that lead to intimidation, relapse and low self esteem amongst behaviour change dropouts.

Strategies for a patient centered approach
Adopting a patient centered consulting style involves heightened sensitivity to social and environmental pressures on individual patients, enabling the health professional to enter the social world through the eyes of the individual. The behaviour change process then becomes specific to the personal and social context of the patient. Although it may appear to be time intensive, the aim is to conduct brief interviews of five to eight minutes. Further, utilising a negotiation style enables more effective use of time and resources in the remainder of the Phase II programme.

Achieving a patient centered approach involves:
• Negotiation
• Reflective listening
• Simple open ended questions
• Aiming to mobilise patients
• Avoiding confrontation
• Strengthening self efficacy
• Clarifying and summarising
• Working at the patient’s pace and direction
• Respecting the autonomy of patients
• A level of empathy which relates to the level of success
• Listening and encouraging with verbal and non verbal prompts
• Believing low motivation is not a lack of will power but the lack of a pathway.

Taking this approach will counter extrinsic motivation, the danger of which is that once the person has left the constrained and directed environment of the Phase II programme, they revert to pre-existing behaviours. If the person is not empowered to enact their own change, if the setting in which they reside is not altered and, if the person is not given the tools to be resilient to the external environment, then it is highly likely that the person will revert. Indeed, those people who maintain an exercise programme appear to have a different set of psychological skills than those who drop out [30]. The need then is to build confidence, self efficacy and resilience in an empowerment approach, then enable the person to make and keep change on their own volition. Then, when faced with the outside world, they have the capacity to cope.

While in the programme, the patient centered approach advocated will help to combat drop out and allow increased practice of behaviours specific to the person. It will also allow more specific tailoring of the Phase II intervention to the patient. Knowledge alone does not work; education alone does not work; knowledge and education may work, knowledge and education with empowerment is best.

A range of practical strategies is now presented that could be utilised by a cardiac rehabilitation professional. They have been placed in what appear to be the logical strategic change points in a typical rehabilitation programme.
### Applying a patient centred approach in cardiac rehabilitation

<table>
<thead>
<tr>
<th>Stage of programme</th>
<th>End of Phase I</th>
<th>Beginning of Phase II</th>
<th>Early Phase II</th>
<th>Mid Phase II / Ongoing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose</strong></td>
<td>Initial contact made by Phase II co-ordinator to begin building trust and rapport and to identify importance, confidence and readiness</td>
<td>Initiate information exchange</td>
<td>Begin negotiation Continue building trust and rapport, confidence and importance</td>
<td>Continue negotiation Refine change process through feedback, information exchange and negotiation</td>
</tr>
<tr>
<td><strong>Tool</strong></td>
<td>Typical Day</td>
<td>Agenda setting Open ended questions</td>
<td>Agenda setting Open ended questions</td>
<td>Past successes Open ended questions</td>
</tr>
<tr>
<td><strong>Typical behaviour</strong></td>
<td>Nervous Defensive Reticent Keen Willing</td>
<td>Nervous Defensive Reticent Resentment Keen Willing</td>
<td>Confidence Over-confidence Resistance Fear Ambivalence</td>
<td>Disgruntled Resentment Positive Energetic Confident Proud</td>
</tr>
<tr>
<td><strong>Example</strong></td>
<td>Can you take me through a typical day in your life What would you like to talk about today? We could talk about (smoking, eating, drinking, exercise) all of which affect your recovery, but what do you think, perhaps you are more concerned about something else?</td>
<td>What happens to some people is…, what do you make of this?</td>
<td>“When have you been successful at making a change in the past? Who helped you, what did you do that helped?”</td>
<td></td>
</tr>
<tr>
<td><strong>How not to</strong></td>
<td>No eye contact. Physical barriers Refer to notes regularly Give health advice</td>
<td>Let’s start with deciding what you are going to do about giving up smoking.</td>
<td>“You haven’t been very successful in the past have you? Let’s see if we can fix that shall we?”</td>
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</table>

<table>
<thead>
<tr>
<th>Stage of programme</th>
<th>Anytime / Ongoing</th>
<th>Anytime / Ongoing</th>
<th>Mid to Late Phase II</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose</strong></td>
<td>Dealing with resistance Enhance trust and rapport Enhance information exchange Refining change process</td>
<td>Develop relapse strategies Minimise disruption to change process Build self efficacy for dealing with barriers</td>
<td>Scenario practice Build resilience and capacity Build self efficacy for varying situations to be encountered after Phase II</td>
</tr>
<tr>
<td><strong>Tool</strong></td>
<td>Emphasise personal choice Reassess Come alongside</td>
<td>Foresight Open ended questions</td>
<td>Foresight Open ended questions</td>
</tr>
<tr>
<td><strong>Typical behaviour</strong></td>
<td>Resistance Feeling of failure (both patient and practitioner)</td>
<td>Resistance Feeling of failure (both patient and practitioner) Relief Fatalistic</td>
<td>Confusion Apprehensive Pushed Ready Confident Over confident Courageous Successful Proud</td>
</tr>
<tr>
<td><strong>Example</strong></td>
<td>“Every time I try to diet I end up eating the fried foods the kids get.” “you don’t want to try something that’s not going to work, can you see a way around this?”</td>
<td>“What barriers have you faced before?” What was your normal reaction? “In this situation (relapse) what happened.” “What could you do to prevent or meet that challenge when it comes next?”</td>
<td>“What aspects about the challenge are in your control? Out of your control?” “How confident do you feel about dealing with the challenges?” “What practical things can you do to help yourself?”</td>
</tr>
<tr>
<td><strong>How not to</strong></td>
<td>“Next time, why don’t you……”</td>
<td></td>
<td>“You are going to face a lot of obstacles when you leave the programme, lets connect you with a support group to help you.”</td>
</tr>
</tbody>
</table>
**Maximising patient change through group support**

The group support mechanism can be utilised to maximise behaviour change. Inter and intra group support can be established to provide role modelling and a feeling of normality for the cardiac patient. For the rehabilitation professional, using group support enables the experiences and resources of the programme individuals to be utilised, while also providing time to focus on individual patients.

Using the processes outlined in the previous sections on behaviour change and brief interventions, the following guides have been developed.

- Gather participants in groups of a similar stage of change
- To aid group cohesion, utilise group dynamic/team building processes to build trust and rapport amongst members
- Build intra group support by having groups perform programme activities together
- Establish buddy systems inside groups
- Establish mentor systems between groups
- Encourage group leadership by participants. Revolve leader and style
- Build inter group support by including ‘participant teachers’ from action and maintenance stages, tell their story of change to prepare stage participants
- Use accelerated learning approaches to presenting education components (peer teaching, project based learning, colour, music, movement). Use these approaches to remove/reduce didactic teaching
- Encourage patient determined learning programmes. Patient chooses topic and learning style addressed to their current needs, anxieties, aspirations
- Involve participants in programme design
- Encourage groups to develop behaviour change strategies and processes for each other.

Encouraging group cohesion in cardiac rehabilitation programmes will allow participants to support each other through difficult change. It will minimise drop out as each person is responsible for another and is in turn supported by others. Importantly, it will also allow for sustained support after the phase has finished. This support will help to counter relapse from behaviour change as the participant will leave with a social network that will encourage and support the person efforts.
4.2 PHYSICAL ACTIVITY

**Key points**

Physical activity has a small effect on serum lipids, blood pressure, obesity and smoking cessation, but significantly reduces cardiovascular and total mortality.

Physical activity improves functional capacity of patients with cardiac disease and lessens symptoms of angina and shortness of breath.

Vigorous physical exercise is associated with an increase in risk of myocardial infarction and sudden death.

Regular moderate physical activity is associated with lower, long term cardiovascular risk.

**RECOMMENDATIONS**

- **B** Exercise advice should be individualised and consider clinical characteristics, lifestyle, attitudes, culture and environment.
- **B** For sedentary people, at least 30 minutes of moderate intensity activity on most days of the week is recommended.
- **D** Physical activity for people with coronary heart disease should begin at low intensity and gradually increase over several weeks.
- **B** Short periods of physical activity are beneficial.
- **C** In people with coronary heart disease, vigorous exercise is generally not encouraged.
- **B** Where possible, people with coronary heart disease should be referred to a comprehensive cardiac rehabilitation programme for exercise training.

This section reviews evidence that regular exercise reduces long-term morbidity and mortality from cardiovascular disease and that exercise based cardiac rehabilitation improves both functional capacity and prognosis after myocardial infarction. The cardiovascular risks of vigorous exercise and steps to reduce this risk are addressed. The more limited body of evidence for benefits of exercise in patients with cardiovascular disease other than after myocardial infarction is briefly reviewed. Guidelines for pre-exercise risk assessment and exercise prescription for patients with coronary artery disease are provided.

**Effects of exercise on cardiovascular morbidity and mortality**

Evidence that regular exercise reduces mortality from cardiovascular disease comes from large epidemiological studies which have assessed the relationship between usual levels of exercise and mortality, during long-term follow-up and from randomised clinical trials of exercise as a component of cardiac rehabilitation.

**Epidemiological studies of exercise and mortality**

In many epidemiological studies, regular exercise is associated with lower mortality from both cardiovascular disease and all causes [33-37]. In large epidemiological studies mortality is lower in physically fit compared to sedentary individuals. In the Nurses’ Health Study which followed the regular waking of >17,000 nurses over eight years, there was a stepwise graded reduction in risk of coronary artery disease and stroke [33]. The risk of coronary artery disease was less than half in the most active compared to the most sedentary individuals (>20 vs. <2 MET.hours/week respectively). In addition, cardiovascular risk was reduced by approximately 40% in individuals who increased activity by the equivalent of walking briskly for ½ hour/day during the study [33]. Similar findings have been reported in many other large epidemiological studies. Many epidemiological studies suggest a graded relation between the level of physical activity and the size of the reduction in mortality from cardiovascular disease [33-35].

Currently there is no clear consensus on the health benefits of vigorous and prolonged exercise compared to more moderate physical activity. It has been suggested exercise energy expenditure of greater than 2000 kcal/week (~8360kJ/week) provides no additional health benefit [36]. Other studies suggest the potential benefits of exercise continue to increase up to levels of greater than 5000 kcal/week (20,900kJ/week) [38].
Most studies suggest physical activity needs to be maintained long-term for cardiovascular benefits to continue and increasing physical activity is associated with a decrease in cardiovascular mortality [33, 36, 39]. More limited evidence suggests frequent short episodes of activity have similar benefits to exercise in longer periods [40, 41]. Most evidence is for aerobic exercise, but recent observational studies suggests resistance training also has favourable effects on cardiovascular risk [42].

Associations between exercise levels and/or fitness and reduced cardiovascular mortality have been reported for men and women, for middle aged and older populations, in many different countries and in ethnically and socially diverse populations. Based on evidence from these epidemiological studies, the US Surgeon General [43] has advised significant health benefits can be obtained by including a moderate amount of physical activity, such as brisk walking for 30 minutes, on most days of the week. There are additional health benefits with greater amounts of physical activity.

**Exercise based cardiac rehabilitation**

**Randomised trials of cardiac rehabilitation which include exercise**

Health benefits of regular exercise are also likely in patients with ischaemic heart disease but because of potential hazards of exercise in this population, evidence from clinical trials of exercise training is needed to reliably assess the balance of benefits and risks. The Cochrane Collaboration [44] have undertaken a systematic review of 34 randomised clinical trials of exercise based cardiac rehabilitation published prior to December 1998. Thirteen were ‘exercise only’ studies (2582 subjects) and 21 compared usual care with comprehensive cardiac rehabilitation which included exercise, dietary, lifestyle and stress advice or management (5101 subjects). In a pooled estimate, total mortality was reduced by 27% (odds ratio 0.73, 95% CI 0.54 to 0.98) for ‘exercise only’ rehabilitation and 13% (Random effects odds ratio 0.87, 95% CI 0.71 to 1.05) for ‘comprehensive cardiac rehabilitation’ compared to usual care. The reduction in mortality due to cardiovascular disease was 31% (odds ratio 0.69, 95% CI 0.51 to 0.94) for the ‘exercise only’ rehabilitation and 26% (odds ratio 0.74, 95% CI 0.57 to 0.96) for comprehensive cardiac rehabilitation. There was no significant effect of either exercise only or comprehensive cardiac rehabilitation on non-fatal myocardial infarction. There was insufficient information to reliably assess the effect of the exercise interventions on rates of coronary artery bypass surgery or coronary angioplasty. Effects on modifiable risk factors including serum lipids, triglycerides, blood pressure and smoking were small or not statistically significant.

Taken together these studies suggest exercise based cardiac rehabilitation results in a clinically important 20-30% reduction in cardiac death. There is no evidence from these studies that comprehensive rehabilitation reduces mortality more than ‘exercise only’ rehabilitation.

**Limitations of evidence from clinical trials of exercise rehabilitation**

Although evidence for the benefits of exercise as part of cardiac rehabilitation is strong, many individual clinical trials of exercise based rehabilitation have important methodological limitations. In a significant proportion of studies, the method of randomisation was not clearly reported. In approximately one third of trials, loss to follow-up was more than 20%. Most individual studies were too small to detect statistically significant differences in outcome. Failure to publish negative studies in which there was no trend for benefit could exaggerate the estimated benefits of exercise rehabilitation in a pooled analysis. There is heterogeneity between studies in the method used to screen participants, the timing and duration of the exercise programme and the types of exercise recommended. Evidence on the optimal timing of cardiac rehabilitation, the duration of the exercise programme or whether certain types of exercise programme are most beneficial is limited.

Randomised studies of cardiac rehabilitation were generally conducted in middle aged men following myocardial infarction at a time when prolonged rest and avoidance of physical activity was frequently recommended. There is little information on the effects of cardiac rehabilitation on mortality in the elderly, in women, post cardiac surgery, post coronary angioplasty, or in patients with cardiac failure, a history of inducible angina, arrhythmia or heart valve disease. In addition, because most studies were undertaken in the 1970’s and 1980’s, the relative and absolute benefits of exercise based rehabilitation on mortality in patients who received thrombolysis, statins, angiotensin converting enzyme inhibitors and higher intervention rates with angioplasty and coronary artery bypass surgery is uncertain. The mean follow-up time in the studies included in the Cochrane Systematic Review was 2.4 years and evidence for benefit beyond that time is limited. Thus, although the randomised trials suggest a clinically important benefit of exercise based rehabilitation, there is uncertainty about the generalisability of these studies and the magnitude of benefit in patients who receive currently recommended investigations and treatments.

**Effects of exercise on cardiovascular risk factors and progression of atherosclerosis**

The reasons that regular exercise decreases cardiovascular mortality are uncertain. Small observational studies have demonstrated lower rates of progression of coronary atherosclerosis on serial coronary angiography in persons who have higher levels of regular physical activity [45, 46]. Many small studies suggest exercise has favourable effects on atherogenic and thrombotic risk factors [3]. Risk factor changes with exercise include small reductions in obesity and

**KEY** - see page 10 for details

A Well designed meta-analysis (MA) of RCT, or a body or evidence which are consistently applicable
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D Non analytical studies or expert opinion
abdominal fat, improvements in plasma HDL, plasma triglycerides, blood pressure, glucose insulin dynamics and a more favourable coagulation profile [3]. Although the effects of exercise on individual risk factors is small, the combination of small favourable effects on multiple risk factors may have a moderate impact on overall risk. In large observational studies about one third of the reduction in cardiovascular risk associated with exercise is accounted for by changes in identified cardiovascular risk factors.

Other mechanisms are likely to explain much of the beneficial effects of exercise on cardiovascular risk. Regular exercise increases endothelial nitric oxide synthase activity and this may reduce progression of atherosclerosis by improving endothelial function [47, 48]. Regular exercise may reduce the risk of sudden death by raising the threshold for ventricular fibrillation and/or by increasing the ability to tolerate myocardial infarction by other unknown mechanisms.

**Exercise training and functional capacity after myocardial infarction and revascularisation**

At least 35 randomised clinical trials have assessed the effects of exercise training on measures of exercise tolerance in patients with cardiac disease [3]. The majority of studies report statistically significant improvements in exercise capacity for the intervention compared to control subjects. In most studies exercise training sessions were three or more times per week. The duration of training ranged from <5 weeks to one year. Some studies suggest higher intensity training improves exercise tolerance more than lower intensity training, but there is no evidence this benefit is maintained long term. The benefits of exercise training may be greatest for individuals who have been inactive due to illness. Improvements in fitness and exercise capacity are primarily due to peripheral adaptations in skeletal muscles.

At least four randomised clinical trials have assessed circuit weight training in addition to aerobic exercise as part of exercise based cardiac rehabilitation. In all studies, resistance training significantly improved weight carrying tolerance and muscular strength. In two of three studies resistance training improved aerobic exercise tolerance. Resistance training results in lower peak heart rate, rate-pressure product, and oxygen consumption than symptom limited aerobic exercise, and is less likely to cause arrhythmias, angina or ischaemic ST segment depression. Although available studies are small and generally include individuals at low risk, there is no evidence for greater hazard for resistance compared to aerobic exercise training. Resistance training should be in addition to and not replace aerobic exercise. Exercise training has been shown to reduce angina and dyspnoea during exercise by lowering heart rate and systolic blood pressure at given levels of physical activity. This together with improved fitness means patients are able to undertake routine activities with less angina, fatigue and shortness of breath.

**Exercise habits**

Cardiac rehabilitation increases post rehabilitation exercise levels but long term change is unlikely unless rehabilitation is extended long term. Six randomised trials have shown that exercise training improves subsequent exercise behaviour [3]. Changes were maintained for up to one year or longer. However, four randomised trials showed no long term change in exercise behaviour. It is suggested that Phase III cardiac rehabilitation programmes may improve long term exercise participation. However, no randomised trials have been conducted and more research is needed in this area [3]. In the general population those less likely to participate in health promotion programmes have lower incomes, poorer socialisation behaviours and may be physically disabled [49]. Important aspects of successful interventions to achieving lasting change in exercise behaviour include personal instruction, continued support and moderate exercise intensity [50]. Behavioural techniques, brief physician advice, varied use of educational principles [51] and high levels of exercise self efficacy also predict success in maintaining regular exercise [52]. There are few studies addressing these issues in cardiac rehabilitation patients. Adherence may be worse for high compared to lower intensity cardiac rehabilitation exercise programmes [53].

**Risks of exercise**

Vigorous exercise may trigger myocardial infarction [54] or sudden death [55, 56] but regular exercise protects against this. Case crossover studies suggest the risk of myocardial infarction is on average six times higher during and for one hour after vigorous exercise. This relative increase in risk is much greater in sedentary individuals and less for those who exercise regularly. The risk of an acute cardiac event increases by up to 100-fold during vigorous exercise in individuals with underlying coronary artery disease [55, 57-60]. Similar studies also suggest the risk of sudden death is also higher during vigorous exercise especially for the normally sedentary. However, clinical trials of exercise based cardiac rehabilitation suggest an overall benefit from regular exercise in low to moderate risk patients after myocardial infarction, implying the increase in risk during and after vigorous exercise is likely to be balanced by a lower, long-term cardiovascular risk with regular moderate exercise.

In addition, surveys of supervised cardiac rehabilitation show the risk of both sudden death and myocardial infarction during the exercise programme is very low, being 1 in 784,000 and 1 in 294,000 exercise hours respectively [61].

Cardiovascular risk is higher in persons with impaired left ventricular function, severe coronary artery disease with inducible myocardial ischaemia, recent myocardial infarction and in individuals with significant ventricular arrhythmia. Vigorous
exercise is not recommended in these individuals although reliable evidence on the balance of risks and benefits is limited. The risks of exercise may be reduced by assessing risk prior to exercise training, by recommending low to moderate intensity activity, and for individuals at moderate or higher risk, by exercising initially in a formal cardiac rehabilitation programme.

Pre-exercise risk stratification
An estimation of an individual’s potential risk related to exercise will help to determine whether exercise training is appropriate, whether it should be medically supervised and what type of exercise should be performed. This includes clinical evaluation and review of relevant cardiac investigations. Exercise stress-testing prior to exercise participation may be useful for risk assessment and to guide exercise prescription. Stress-testing is also recommended for participants who are likely to experience myocardial ischaemia or are at high risk of malignant ventricular arrhythmias. However, there is no evidence that exercise testing is needed for low risk patients before low to moderate intensity exercise training undertaken in a supervised programme.

Cardiovascular risk can be estimated clinically as described in Table 1. Advice from a cardiologist or physician may be appropriate for individuals with several risk factors. The exercise specialist should be aware of clinical information relevant to cardiovascular risk so that exercise can be monitored appropriately and exercise prescriptions modified.

Medical supervision and cardiac rehabilitation facilities
Exercise prescription in a supervised setting for six to twelve weeks will safely and effectively allow patients to increase their functional capacity by determining appropriate training intensity, duration and frequency. Participation in a structured cardiac exercise programme has been consistently associated with greater improvements in functional capacity and exercise behaviour. However, randomised, controlled trials to determine whether facility-based exercise programmes are more effective than self-prescription have not been carried out.

If a properly staffed exercise facility is unavailable, careful instruction on how to conservatively limit exercise intensity can assist individuals in ‘self-prescribing’ exercise which is not too vigorous and thus minimise the risk of an acute cardiac event. For individuals who are not on beta-blockers, the use of a heart-rate monitor which alarms when heart rate exceeds or fails to reach desired levels, aids in monitoring exercise. Teaching participants to take their pulse rate and use the Borg scale of perceived exertion are alternative methods to monitoring heart rate. While this exercise self-prescription is cost-effective, drawbacks are that individuals may not maximise the benefits of exercise with gradual and appropriate increases in exercise intensity and duration. It is safest to have emergency medical equipment and personnel on site during the early stages of their exercise programme when individuals are most uncustomed to regular exercise activity. Electrocardiographic monitoring is widely used in the US, but this increases costs, with limited evidence for improved outcomes.

The risk of sudden cardiac event decreases with decreasing exercise intensity [62] and is highest in individuals who exercise above their prescribed intensity limitations [63]. Monitored exercise programmes staffed by trained exercise specialists can assure appropriate exercise intensities are adhered to.

For participants at moderate risk (Table 1), a 2 – 3 month medically supervised exercise programme is recommended and a longer period of supervision may be advised. Other patients are also likely to benefit from exercise training in a supervised cardiac rehabilitation programme. The goals are to improve physical and emotional well being, establish safe exercise parameters and educate the patient to monitor their own activity within a suitable intensity and duration range. Periodic check-ups after the Phase II programme will allow patient prescriptions to progress where necessary without constant medical monitoring.

Facilities and exercise specialists should be supplied with medical records and physician recommendations to ensure exercise prescriptions are appropriate. Rehabilitation facilities should be equipped with a defibrillator and updated emergency drugs. Staff should be trained in exercise prescription for cardiac populations and certified in CPR and first aid. There should be a plan to ensure cardiovascular emergencies are handled effectively. This should include easily visible phone numbers for emergency services and regularly rehearsed emergency procedures. Cardiac events are effectively treated without physician supervision in gymnasium settings when these safeguards are in place [60].

Progress notes and symptom reporting should be documented for each session to ensure consistency in prescription and awareness of individual patient needs. In addition to cardiovascular disease, other medical problems such as obesity, diabetes, neuromuscular disorders and orthopaedic limitations should be considered. Cardiac rehabilitation staff should be trained in exercise prescription for special populations and have appropriate knowledge of pathophysiology.

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B Very well designed observational studies or extrapolated evidence from RCTs or MAs
C Lower quality observational studies or extrapolated evidence from B
D Non analytical studies or expert opinion
Exercise in specific cardiac conditions

Most studies of exercise based rehabilitation have been in subjects with a history of myocardial infarction. Exercise training is likely to be beneficial after coronary artery bypass surgery, coronary angioplasty, unstable angina and in patients with heart failure, but evidence for benefit is more limited. There is no reliable evidence on the effects of exercise training on morbidity and mortality in these patients.

i. Angioplasty and stenting

Although regular exercise is likely to reduce long term risk, no studies reliably assess whether exercise training influences outcomes following PTCA. There is also limited information on the safety of exercise early after coronary angioplasty and stenting. It takes several days for the femoral puncture site to heal and ~1 – 3 weeks for endothelium to cover the stent. However there is no evidence for increased risk from moderate exercise during this time.

ii. Coronary artery bypass grafting and other cardiac surgery

Cardiac rehabilitation with exercise may more rapidly improve functional capacity following coronary artery bypass surgery, particularly in patients with physical deconditioning. Exercise is normally limited during the early weeks until there is adequate healing of the sternotomy and surgical incisions, but low level activities, eg, walking, can usually begin 48 hours following surgery with gradual progression. In the long term, regular exercise is likely to reduce cardiovascular risk.

iii. Arrhythmias

The effects of exercise training in persons with arrhythmias is uncertain. The presence of exercise induced high grade ventricular ectopy is usually a contraindication to vigorous exercise. For persons with benign arrhythmias, exercise training is not contraindicated.

iv. Pacemakers

The presence of a pacemaker should not restrict physical activity. For many patients with pacemakers heart rate is not a reliable guide to exercise intensity. Other indicators such as perceived exertion need to be used to guide appropriate levels of exercise. Electrocardiographic changes of myocardial ischaemia during treadmill exercise cannot be interpreted with a paced rhythm.

Older people

Older people are much less likely to be referred for cardiac rehabilitation than younger groups. Older women in particular have low rates of entry into rehabilitation [64]. However both male and female older persons with established coronary disease, can improve exercise capacity with training comparable to younger groups. In one observational study, persons older than 75 years participating in rehabilitation, had a greater increase in their exercise capacity than younger participants [65]. Muscle strength and functional status improved in nursing home bound older people with congestive heart failure as a result of resistance training [66] showing that the most frail may benefit from exercise intervention. A short term improvement in exercise tolerance, cardiovascular symptoms and functional status after a three month period has been reported in a small randomised study of exercise training in the elderly [67]. In addition several observational studies document improvements in exercise tolerance for older people after cardiac rehabilitation without significant adverse events [53]. These studies suggest efforts should be made to enable older people to be referred for rehabilitation.

Exercise prescription

The aim of exercise prescription is to provide individual advice on the level and type of exercise needed to improve functional capacity and increase caloric expenditure without compromising safety or detracting from enjoyment. There is no evidence-based standard for exercise prescription in cardiac populations and it is not clear that one type of exercise training improves outcomes more than another. Guidelines for exercise prescription given below are largely based on recommendations of expert committees of the American College of Sports Medicine and Centre for Disease Control [68].

An individual approach is needed because of the wide range of age, fitness level, disease severity, risk factor profile and medications. There are five major components to consider when prescribing exercise, frequency, duration, type of exercise, intensity, warm-up and cool-down. The intensity and duration of exercise sessions should start at a low level and gradually increase.

i. Frequency

Most exercise prescriptions are modified from a 3 session per week model. Nonetheless, several factors may affect the optimal frequency of the exercise prescription. A patient for whom an improved health status is the only consideration, will benefit from three-to-five half-hour sessions, as described above [69]. Patients with low (< 5 Metabolic Equivalents (METS))
functional capacity are encouraged to take part in several, brief (<10 minutes) exercise sessions each day, whereas patients with higher functional capacities will benefit from fewer, longer sessions. Increases in caloric expenditure and maintenance or improvement of aerobic fitness require higher training volumes. For these individuals, three to five sessions per week are recommended. Finally, patients at the beginning of an exercise programme may have different requirements than those who have trained for longer. Thus, a patient’s programme may start out with several short sessions each day and gradually increase into three-to-five, 30 – 45 minute sessions per week as functional capacity improves.

ii. Duration

Much like frequency, duration is affected by many factors. However, as frequency can be adapted from a baseline of 3 sessions per week, duration can be adapted from a baseline value of 30 minutes per session. It is not unusual for training sessions to be shorter than 30 minutes at the beginning of a training programme and longer than 30 minutes after several months of training. Furthermore, significant health benefit has been attributed to regular exercise sessions of this length [69].

It is preferable for each session to be one continuous session, however, accumulating a target duration with several short bouts of exercise separated by brief rest periods is encouraged at early stages of training, or in those individuals with low functional capacities (< 5 METS). If a goal of training is to increase caloric expenditure, longer training sessions (up to 60 minutes) may be prescribed. However, a general rule for training sessions is that they should be completed in one hour with the inclusion of warm-up and cool-down sessions. There does not appear to be any evidence to suggest benefit from longer sessions and risk of cardiovascular and orthopaedic injuries increases with duration of exercise [62].

iii. Type of exercise

To achieve the best aerobic training effect, prolonged continuous low to moderate intensity exercise (40 – 75% VO2max), using large muscle groups is indicated [68]. Typical activities include walking, running, cycling and swimming. Activities such as weightlifting, most sports and heavy manual labour are usually too sporadic or of unnecessarily high intensity to qualify as good aerobic training modalities. Activities such as gardening and golf fall somewhere in the middle of these extremes and are often substituted as training modes, albeit not ideal ones.

iv. Exercise intensity

The most difficult part of exercise prescription in a cardiac population is intensity; not only due to determining which intensity is appropriate, but also in measuring the intensity of a given activity. Extrapolation from several large retrospective and prospective cohort studies (enrolling those without cardiac disease) and applying it to those with cardiac disease in the context of cardiac rehabilitation, suggests that low-to-moderate intensity exercise is beneficial and increased benefit may be achieved with more intense exercise [33, 40].

There is a direct dose-response-relationship between fitness level and/or activity level and cardiovascular benefit. Whatever intensity of exercise is indicated, the use of ‘low, moderate, or vigorous’ activity may be confusing to patients in unsupervised exercise programmes. It is important to carefully describe these intensities. Thus, METS (metabolic equivalents), heart rate, rating of perceived exertion (RPE) or some other indicator of exercise intensity should be thoroughly explained and incorporated into exercise programmes. Once this is done, the practitioner should ensure that exercise prescriptions meet whatever goals are established for a given programme. Approximate MET equivalents for common ‘low to moderate intensity’ activities are given in Table 2.

v. Warm-up and cool-down

A period of warm-up which includes stretching and flexibility exercises decreases the likelihood of musculo-skeletal injuries. In addition, a short period of warm-up exercise reduces ischaemia during subsequent exercise [70]. Five to ten minutes of lower intensity exercise (cool-down), such as walking at the end of an exercise session, may reduce hypotension immediately after vigorous exercise.
**Resistance exercise**

Resistance training can improve muscular strength in cardiac patients who do not have contraindications for beginning an exercise programme. Resistance training is safe in these patients when appropriate training and supervision are provided. Resistance training should be added to, but not substituted for aerobic training, because resistance training fails to reach prescribed targets for aerobic benefit [71]. Patients should be instructed on proper lifting and breathing techniques, as some types of resistance training may induce inappropriate hemodynamic responses [72, 73]. Randomised and non-randomised controlled trials have shown that low resistance, high repetition resistance training improves strength in patients with cardiovascular disease [74, 75] without inappropriate increases in heart rate or blood pressure [71, 76, 77].

When resistance training incorporates low weight with high repetitions and with brief rest between sets, the heart rate [71, 74] and blood pressure [71, 77] and rate pressure product [77] responses to resistance training are less than during similar intensity aerobic exercise. Resistance training elicits moderate increases in diastolic blood pressure, but this is unlikely to have a significant adverse effect on myocardial perfusion [78, 79].

**Table 1: Risk stratification before exercise training**

<table>
<thead>
<tr>
<th>Low risk</th>
<th>&gt; Four weeks after myocardial infarction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No or mild dyspnea on exertion (NYHA class 1 or 2)</td>
</tr>
<tr>
<td></td>
<td>No ischaemia or angina at or below 6 METS of exercise</td>
</tr>
<tr>
<td></td>
<td>Appropriate increase in systolic blood pressure</td>
</tr>
<tr>
<td></td>
<td>No ventricular ectopy</td>
</tr>
<tr>
<td></td>
<td>Patient can recognise symptoms of ischaemia and self monitor exercise intensity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Moderate risk</th>
<th>&lt; Four weeks after myocardial infarction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Two or more previous myocardial infarctions</td>
</tr>
<tr>
<td></td>
<td>Dyspnea during usual physical activity (NYHA class 3 or 4 symptoms)</td>
</tr>
<tr>
<td></td>
<td>Exercise capacity &lt; 6 METS</td>
</tr>
<tr>
<td></td>
<td>Fall in systolic blood pressure during exercise</td>
</tr>
<tr>
<td></td>
<td>Ischaemic ST depression &gt;3mm or angina during exercise</td>
</tr>
<tr>
<td></td>
<td>A medical problem which the physician believes is life threatening</td>
</tr>
<tr>
<td></td>
<td>Previous episode of primary cardiac arrest</td>
</tr>
<tr>
<td></td>
<td>Ventricular tachycardia or complex ventricular ectopy at a workload &lt;6 METS</td>
</tr>
<tr>
<td></td>
<td>Known three vessel or left main stem disease</td>
</tr>
<tr>
<td></td>
<td>Low ejection fraction (&lt;30%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>High risk: restriction of activity recommended</th>
<th>Unstable ischaemia (increasing angina, angina at rest or with minimal exertion)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Decompensated heart failure</td>
</tr>
<tr>
<td></td>
<td>Uncontrolled arrhythmias</td>
</tr>
<tr>
<td></td>
<td>Presence of other cardiac conditions which may be aggravated by exercise (eg, severe aortic stenosis, hypertrophic cardiomyopathy)</td>
</tr>
</tbody>
</table>
Table 2: Exercise Intensity

One METS equals oxygen consumption at rest which is about 3.5 millilitres per kilogram of body weight per minute. An individual exercising as 2 METS is consuming oxygen at twice the resting rate.

<table>
<thead>
<tr>
<th>Activity</th>
<th>METS (Min)</th>
<th>METS (Max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycling 5mph</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>10mph</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>13mph</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Dancing Ballroom</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Aerobic</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Skipping &lt;80/min</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>120-140/min</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Swimming Breast stroke</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Freestyle</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Tennis 1 mph</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2 mph</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3 mph</td>
<td>3</td>
<td>3.5</td>
</tr>
<tr>
<td>3.5 mph</td>
<td>3.4</td>
<td>4</td>
</tr>
<tr>
<td>4 mph</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity</th>
<th>METS (Min)</th>
<th>METS (Max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bed making</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Carrying heavy groceries</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Cleaning windows</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Cooking (standing)</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Dressing</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Driving a car</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Eating</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>General housework</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Grocery shopping</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Loading/unloading washing machine</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Lying awake</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Mowing by hand</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Painting / decorating</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Sexual intercourse</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Showering</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Vacuuming</td>
<td>3</td>
<td>3.5</td>
</tr>
<tr>
<td>Walking up stairs</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Washing car</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Washing dishes</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Watching television</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

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4.3 NUTRITION MANAGEMENT

**Key points**

In patients with cardiovascular disease, a cardioprotective dietary pattern reduces cardiovascular and total mortality. Modification of dietary fat should not be considered in isolation from a whole diet approach.

A cardioprotective dietary pattern reduces LDL cholesterol but also improves the lipid profile, lowers blood pressure, improves glycaemic control and reduces thrombotic clotting.

Dietary therapy is an integral component of cardiac rehabilitation and is additive to drug therapy.

**RECOMMENDATIONS**

| A | In all patients with cardiovascular disease, the adoption of a cardioprotective dietary pattern is recommended. This pattern includes large servings of fruit, vegetables and whole grains, low fat dairy products, small servings of unsalted nuts and seeds regularly and fish or legumes frequently in place of fatty meat and full fat dairy products. Small lean meat servings can be part of this dietary pattern. |
| A | Intensive dietary advice, compliance checks and long term follow up, preferably from a dietitian, are recommended to facilitate the adoption and maintenance of this dietary pattern. |
| C | A small amount of alcohol may provide health benefits. The protective effect of alcohol is seen at doses as low as one standard drink every second day. |
| A | There is currently insufficient evidence to recommend nutrition supplements of antioxidant vitamins, minerals or trace elements for the treatment or prevention of cardiovascular disease. |
| A | Fish and fish oil supplements may reduce the risk of sudden cardiac death, however it remains to be determined whether fish oil supplements are more beneficial than eating fish. |

**Nutrition counselling for the cardiac patient**

**Nutritional assessment**

A comprehensive nutrition assessment will profile eating habits and alert the healthcare professional to less appropriate food choices and changes in body weight. This information can then be used to educate and reinforce changes. Nutrition assessment for individuals with CVD should ideally include (adapted from [81]):

- Evaluation of food and nutrient intake
- Evaluation of physical activity levels and exercise tolerance
- Identification of diet-related diseases or conditions that contribute to CVD
- Evaluation of smoking habits
- Evaluation of current medication use
- Measurement of height
- Measurement of body weight and waist circumference (Appendix 1)
- Measurement of blood pressure
- Measurement of blood lipid levels.

Recent evidence supports recommendations for a modified dietary pattern for the management of CVD rather than a reduction of dietary fat, in isolation, especially saturated fat (SFA), and dietary cholesterol [82]. It is not surprising that many of the nutrition assessment tools that exist today focus on saturated fat [83-88]. While these can be useful educational and monitoring tools, their screening application is limited by their narrow focus which does not consider the wider dietary pattern.

No instruments specifically identify New Zealand eating habits or food availability, or have been validated in a New Zealand cardiac patient population.
A nutrition knowledge questionnaire designed to test cardiac patients’ practical knowledge of a lipid-lowering diet may be the most applicable in New Zealand [85]. The questionnaire was found to be a reliable and valid measure of nutrition knowledge for patients who had undergone coronary artery bypass graft (CABG) surgery or percutaneous transluminal coronary angioplasty (PTCA). Questionnaire items relate to fat, cholesterol and fibre content of foods and food labeling information. This questionnaire could be useful in assessing practical nutrition knowledge and act as a basis for nutrition counselling during cardiac rehabilitation. Other tools include interviews, questionnaires, food records or the use of computerised nutrition software. Often these will require the specific expertise of a qualified dietitian or registered nutritionist to analyse and interpret results.

Reinforcing dietary adherence during pharmacological management

Some studies suggest pharmacological management should begin as soon as possible after the cardiac event and increasingly, patients are started on drug therapy while in hospital as part of acute management [89-91]. An interim statement from the Cardiovascular Guideline Group states that people at very high absolute risk (>20% over five years) may be considered for lipid lowering therapy with statins begun concurrently with intensive dietary treatment [92].

Intensive dietary treatment involving dietary assessment, individualised advice and regular follow-up should be offered to all patients at high and very high absolute risk. This treatment is best given by a dietitian. Other health professionals can assess the patients for weight reduction and give general dietary advice without formal dietary assessment. When dietary and pharmacological interventions are introduced at the same time, diet may be perceived as less important. This is despite evidence that a cardioprotective dietary pattern has a beneficial effect on risk factors as well as mortality [93]. Failure to adopt a cardioprotective diet may result in the need to use higher doses or combinations of medications.

Several randomised controlled trials have shown more patients are able to achieve therapeutic lipid targets on a combination of lifestyle and medical interventions than medical interventions alone [94-101] (see Evidence Table 1). Hunninghake [100] [14] reported an extra 5% lowering of LDL cholesterol when lovastatin therapy was combined with dietary treatment. This additional LDL cholesterol lowering equates to doubling the dose of the statin, due to the log-dose characteristics of statin usage. Other studies revealed a much greater LDL reduction when dietary treatment plus plant stanols were combined with statin therapy [94, 99, 102].

Nutrition education

The aim of nutrition education in cardiac rehabilitation is to facilitate the adoption of more healthy food-related behaviours. Almost all nutrition programmes in Phase II cardiac rehabilitation in New Zealand are knowledge-based, with only one programme reporting behaviour change based objectives [4]. Knowledge-based programmes may be effective in increasing the nutrition knowledge of patients but they may have little impact on dietary pattern [103-105]. Effective nutrition education programmes are behaviourally focused and evidence-based [104].

There are a number of behaviour change models proposed in nutrition counselling which may enhance the adoption of more healthful food-related behaviours. The ‘stages of change model’ is promoted by the Heart Foundation for the management of patients with dyslipidaemia [106]. This model suggests that change is cyclical, individuals who intentionally change behaviours do so through a series of stages. These stages have been termed: 1 pre-contemplation; 2 contemplation; 3 preparation; 4 action; 5 maintenance and 6 relapse. This approach is patient centred. It acknowledges that change is difficult and relapse is common and normal. To assist the individual, a nutrition educator needs to identify what stage of change the individual is currently at and then apply appropriate motivational techniques to promote lifestyle changes [107-109]). This nutrition advice then needs to be followed up and reinforced by all healthcare professionals.

Repeated exposure to nutrition messages is important because changing food-related behaviours is complex. People need detailed information to make appropriate food choices, particularly when they are ready to change. Kris-Etherton [110] suggests that group education sessions should be supplemented by counselling of individual patients and their partners.

The stages of change model is supported by few, well controlled trials and its value in cardiac rehabilitation and group education remains undetermined [111-114]. However, this model may be useful for several reasons: it can serve as a theoretical framework for designing effective interventions; it can be used to evaluate the effectiveness of an educational intervention and it can help facilitate realistic expectations among patients and support persons [109].

Many educational adjuncts have been applied in teaching patients how to adopt a healthy dietary pattern including tasting food samples, shopping tours, videotape information, recipes, cooking demonstrations, meal planning, budgeting, nutrition knowledge quizzes and lectures (see Evidence Table 2) [105, 114-118].

At present, Phase II cardiac rehabilitation programmes in this country use lectures, individual consultations, group discussions, demonstrations, practical tasks, video presentations and supermarket tours [4]. There is no single effective method for teaching cardiac patients. The techniques chosen must address the individual needs of participants in terms of their nutrition needs,

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ethnicity, financial situation, literacy and life-style. If this style of learning is to be achieved adequate time is needed for nutrition education across all phases of rehabilitation.

**The cardioprotective dietary pattern - moving beyond fat reduction**

There is now strong evidence that manipulation of dietary fats should not be considered in isolation from a whole diet approach [119]. Together, cardioprotective dietary changes can improve risk factors beyond blood cholesterol, including blood triglycerides, blood pressure, body weight, waist measurement, blood glucose and insulin levels, type 2 diabetes, and clotting factors. These effects may be equivalent to or greater than those of drugs that change just one or two risk factors.

A cardioprotective dietary pattern is illustrated in Appendix 2.

Taking a comprehensive approach to dietary patterns during Phase II cardiac rehabilitation is an important development from previous guidelines, where nutrition advice was given separately for the management of blood cholesterol, blood pressure and body weight reduction [120, 121]. Specific dietary recommendations for an individual patient’s risk factor profile can still be offered on a one-to-one basis, but this is more likely to occur once the patient has returned to the community and there is more time to address individual patient needs. (For comprehensive food and nutrient recommendations refer [93, 122].

Several randomised controlled trials have compared different dietary patterns in secondary prevention with a traditional lipid-lowering diet (see Evidence Table 3) [123-125]. These nutrition interventions all reduced dietary fat and SFA, providing a low animal to plant food ratio with high intakes of fruits and vegetables and, except for the Lifestyle Heart Trial, a source of unsaturated fats. Significant differences in mortality and/or angiographic disease progression between intervention and control groups were shown within 12 months, particularly when the intervention was begun very soon after myocardial infarction [125, 126]. Several trials have also shown significantly reduced all-cause mortality despite being of relatively short duration [123, 127].

It is worth noting that nutrition counselling in most trials was offered by a dietitian, follow up was for long periods of time and there were regular compliance assessments through diet history, 24-hour recall, food frequency questionnaires or 3 – 7 day food records.

**Addressing barriers to adopting a cardioprotective dietary pattern**

Improvements in food intake and food preparation by patients participating in cardiac rehabilitation have been reported. Compliance with nutrition therapy has been shown in follow up to six years in a small sample of patients [128]. This survey reported that although nutrient targets were not fully achieved, healthier changes observed at 12 months were maintained long term. Significant reductions were recorded for total energy, percent energy from fat and protein, dietary cholesterol and improvements in dietary fibre and the PUFA: SFA ratio.

Factors associated with poor dietary compliance following cardiac rehabilitation include: lower levels of education and lower socio-economic status [128-130]. Reid et al, reported that poor compliers did not understand their illness as well as good compliers and the majority felt that they had not been adequately informed about their illness and rehabilitation [130]. In a cross-sectional survey of 362 older males following cardiac rehabilitation, the most significant perceived barrier to adopting the nutrition advice was eating in social situations [131]. Other key barriers include food prices and overabundance of food. These findings are corroborated by earlier surveys in mixed gender populations attending cardiac rehabilitation [129, 132]. Within one group, over 40% stated that eating in social situations, an overabundance of food and the taste of food would be barriers to following nutrition advice [132]. Efforts should be made to ensure these identified barriers are addressed during nutrition counselling sessions.

**Implications for nutrition services during cardiac rehabilitation**

Current nutrition services for cardiac patients do not meet the level of nutrition intervention outlined above. A national postal survey of Phase II cardiac rehabilitation programmes in New Zealand reported that the majority of Phase II cardiac rehabilitation programmes spend less than 15% of total participant contact time on nutrition education [4]. The median number of nutrition sessions per cardiac rehabilitation programme is one, with a median length of 60 minutes. This equates to approximately 10% of the total programme contact time.

Potentially there are many cardiac patients re-entering the community with little or no nutrition education. Bell [133] reported that only a minority of cardiac patients will see a dietitian before discharge from the hospital. Parks [5] reported that 56% of patients eligible for cardiac rehabilitation did not attend. More recently, an audit of clinical notes of 326 cardiac patients in primary care indicated that only 50% had received dietary advice, approximately one third had a dietitian review either through referral or as part of the integrated service provided by hospital-based clinics [89].

For the cardiac patient to fully realise the benefits of nutrition intervention will require many changes to the delivery of nutrition services both within the hospital and the primary healthcare setting. Increased funding for nutrition in cardiac education,
training of other health professionals in nutrition and improved access to dietitians during all phases of rehabilitation and secondary prevention are required.

**Answers to commonly asked questions**

During cardiac rehabilitation, patients, their spouse, partner, whānau and family members often have many questions on specific food and nutrient issues. This section attempts to answer some of the more common questions that are raised. For a more comprehensive review of these and other food and nutrient issues an evidence-based summary has been previously published by the National Heart Foundation of New Zealand [122].

**Are there any dietary supplements patients should take for the treatment of heart disease?**

One-half of the New Zealand adult population regularly consumes a vitamin and/or mineral supplement [134]. Despite these high rates of consumption there is little evidence from recent randomised controlled trials to support their use in the treatment of people with CVD and in some cases these supplements may be harmful [135-137].

Supplemental vitamin E may reduce the susceptibility of LDL cholesterol to oxidation [138, 139]. However, the relationship between the prevention of LDL cholesterol oxidation and clinical efficacy is not clear. In two large-scale randomised controlled trials, vitamin E supplements had no clear beneficial effect on subsequent CVD events or mortality rates (see Evidence Table 4) [135, 136]. Vitamin E supplements are not recommended for the prevention or treatment of CVD.

Supplemental beta-carotene, 20 mg/d, taken singly or combined with vitamin E, may increase CHD mortality [137 (1+)].

Fish or fish oil supplements may reduce the risk of sudden cardiac death [127, 135]. However it remains to be determined if fish oil supplements are more beneficial than eating fish. Poor regulation of the dietary supplements industry in New Zealand means the quality and consistency of supplements may vary. Rancid or old fish oils from supplements can lead to gastric upset.

Increasing the intake of omega 3 polyunsaturated fats (PUFA) through food sources is less expensive than direct supplementation and more likely to be maintained by patients long term [127 (1+)]. The omega 3 PUFA occur in all fish and shellfish but are especially rich in oily fish, for example, tuna, kahawai, trevally, kingfish, warehou, dory, salmon, sardines and eel. Squid, mussels and oysters also have a medium to high oil content [140].

**Should patients start drinking alcohol?**

The relationship between alcohol consumption and the risk of death from all causes is described by a J-shaped curve. Heavy drinkers have the highest risk of death, from injuries and a number of medical conditions associated with a high alcohol intake. However, light to moderate drinkers have a lower mortality than those who abstain. This is largely due to the lower rate of CHD among light to moderate drinkers. The observed benefit for light to moderate drinkers is of the order of 40% to 64% reduction in risk, for both fatal and non-fatal coronary disease [141-143].

Possible mechanisms to explain the protective effect of alcohol include increased HDL cholesterol and reduction in risk of thrombosis through effects on platelet aggregation and reduction in circulating fibrinogen levels [144, 145]. Benefit for individuals will vary according to their underlying absolute cardiovascular risk. The group most likely to benefit is older people who have a high absolute risk of a cardiovascular event and a low risk of injury, cirrhosis and other adverse effects of alcohol. A substantial portion of the benefit appears to come from alcohol itself, rather than other components of each type of drink. There are other constituents in red wine (eg antioxidant flavonoids) which might have positive health effects but these have not yet been proven beneficial [146].

From a public policy point of view, it is important to acknowledge that an increase in the mean alcohol consumption is likely to lead to an increase in the proportion of heavy drinkers. The INTERSALT Study, which reviewed 52 populations worldwide, found mean alcohol consumption and prevalence of heavy drinking to be highly correlated [147]. It has been suggested that an increase in mean consumption of 15 g (approximately one drink) per week would be expected to lead to a 10% increase in prevalence in heavy drinkers [148]. Therefore, appropriate advice to the public in general is to promote light to moderate alcohol consumption and avoid heavy drinking.

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**KEY** - see page 10 for details

A Well designed meta-analysis (MA) of RCT, or a body or evidence which are consistently applicable
B Very well designed observational studies or extrapolated evidence from RCTs or MAs
C Lower quality observational studies or extrapolated evidence from B
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Definitions of standard servings of alcohol
1 standard drink is equal to 10 g of alcohol. This equates to:
• 1 (300 ml) glass of ordinary strength beer
• 1 (60 ml) glass of fortified wine (e.g., sherry, martini, port)
• 1 (30 ml) pub measure of spirits (e.g., whisky, gin, vodka)
• 1 (100 ml) glass of table wine.

What is homocysteine?
Homocysteine is a normal amino acid in the blood but at higher concentrations (greater than 14 µmol/l) it has been associated with a higher risk of coronary heart disease and stroke [149-154].

Due to its role in amino acid metabolism, folate along with vitamins B12 and B6, have been implicated in the reduction of homocysteine. The exact amount of folate required to lower blood homocysteine levels has yet to be determined. However, 0.5-5.0 mg folic acid daily with the addition of vitamin B12 (mean 0.5 mg) has been shown to be effective [155].

Dietary patterns demonstrating significant reductions in homocysteine are rich in fruits, vegetables, folic-acid fortified grains and cereals (≥ 100 µg/serving), low-fat dairy products and are reduced in saturated and total fat [156-162].

Reductions in blood homocysteine are greater in people with higher pre-treatment concentrations and with lower pre-treatment blood folate concentrations. The inference that a higher, daily, folate intake might reduce cardiovascular disease mortality requires more careful scrutiny by appropriate, controlled clinical trials. It is still unclear whether normalising homocysteine levels actually reduces cardiovascular disease risk. Based on published data, the only potential adverse effect associated with excessive intake of folic acid relates to abnormalities in neurological function, specifically the precipitation or exacerbation of neuropathy in vitamin B12 deficient individuals. Excessive intake of folic acid may obscure or ‘mask’ and potentially delay the diagnosis of vitamin B12 deficiency, which may increase the risk of neurological damage. The data suggestive of this adverse effect were from more than 100 case reports in which vitamin B12 deficient patients who received a dose of greater than or equal to 5 mg per day folic acid supplements experienced progression of neurological disorders [163].

What role does garlic have in nutrition therapy?
The active component of garlic is allicin, which is released by mechanical disruption of garlic cloves. There is a wide variation of allicin concentration in cloves and in industrial preparations (up to 20-fold in commercially available preparations) which complicates the comparison of studies [164]. There are a number of biologically plausible mechanisms for benefit from garlic with respect to cardio-protection. Investigation of the effects on haemostasis and lipids has produced contradictory results [165-168].

A number of studies on the lipid-lowering effects of garlic have methodological flaws. When combined in meta-analysis, there appears to be a positive effect of garlic supplements, but these results have probably overstated the effects of garlic (see Evidence Table 8) [167, 168]. Importantly, no studies have been designed to determine whether garlic alters clinically important outcomes such as rates of myocardial infarction or mortality. Further well-designed, large studies, examining garlic’s effect on clinical parameters are awaited. Side effects from garlic ingestion appear minimal at the doses used in the trials, but there have been reports of excessive bleeding in people taking large quantities. At this stage, the evidence is not strong enough to recommend taking garlic powder for cardio-protection, though it appears to cause little harm when taken as part of a varied diet.
4.4 WEIGHT MANAGEMENT

**Key points**

- About one sixth of the adult population in New Zealand are obese (BMI>30).
- Obesity is associated with a two to three fold increase in coronary heart disease.
- Modest weight reduction will improve blood lipids, blood pressure and blood glucose control.

**RECOMMENDATIONS**

| A | For overweight and obese patients with coronary heart disease, the combination of a reduced-energy diet and increased physical activity is recommended. |
| D | Popular high protein weight loss diets are not recommended for long term weight loss because they restrict consumption of healthy foods and do not provide the variety of foods needed to meet nutritional needs. |
| A | The initial goal of therapy should be to reduce the patient’s weight by 10%. |

**What is the best diet?**

Obesity is a major health problem in New Zealand; 15% of males and 19% of females are obese. There are substantial differences in body mass index among different ethnic groups. Amongst women, 48% of Pacific, 28% of Māori and 17% of European and others are obese. Obesity is less common in men in all ethnic groups with 27% of Pacific, 27% of Māori and 13% of European and others being classified as obese. Adult New Zealanders have increased in average weight by approximately a gram each day between 1989 and 1997 [134]. Coronary populations display a higher prevalence of obesity than is observed in non-coronary populations [169, 170]. For a similar body composition and body fat distribution, cardiac patients have a higher risk metabolic profile than healthier populations. They are more likely to be insulin resistant with higher values for total and LDL cholesterol, triglycerides, insulin and have lower HDL cholesterol [171-173].

The cardiovascular benefits from modest weight reduction include an improved blood lipid profile (lower triglycerides, raised HDL cholesterol, and usually an improved total and LDL cholesterol), lower blood pressure and reduced blood glucose and HbA1c in some patients with type 2 diabetes [174].

New Zealanders have reduced their total fat intake from 37.5% to 34.9% of total energy between 1989 and 1997. Since there is evidence that 22% of New Zealand adults are reported to be trying to reduce their consumption of high fat foods [134], many are presumably ‘dieting’. For the cardiac patient wanting to lose body weight, the issues surrounding effective weight loss strategies may appear confusing due to the aggressive marketing of popular or ‘fad’ diets. Of the 50 best-selling diet books in the United States, 58% were published in 1999 and 2000 and 88% have been published since 1997 [175]. Many of these diets have support from a health professional or endorsement by a celebrity that confounds the assessment of their safety, efficacy, and durability.

The American Heart Association (AHA) has reviewed four popular high-protein weight loss diets concluding that they are not to be recommended for long term weight loss because they restrict healthful foods and do not provide the variety of foods needed to meet nutrition needs. Individuals who follow these diets are therefore at risk for compromised vitamin and mineral intake, as well as potential cardiac, renal, bone, and liver abnormalities [176].

Evidence-based guidelines from the National Heart, Lung and Blood Institute recommend a reduced-energy diet and increased physical activity for therapeutic weight loss [174]. Besides weight loss, such programmes decrease abdominal fat and increase cardio-respiratory fitness [174]. A diet low in energy is most readily achieved through choosing foods low in total fat content, particularly saturated fat. Further reductions in total energy intake can be achieved by reducing carbohydrate intake, especially highly sweetened foods or drinks such as sugar, confectionery, cakes, biscuits, soft drinks and chocolate. Recently

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a meta-analysis from [177] reported that a low-fat diet, high in protein and fibre-rich carbohydrates, mainly from different vegetables, fruits, and whole grains, is highly satiating for fewer kilojoules than fatty foods (see Evidence Table 6).

4.5 SMOKING

**Key points**

Smokers with coronary heart disease reduce the risk of a recurrent myocardial infarction (MI) by half if they stop smoking.

Nicotine replacement therapy increases quit rates by 1.5 – 2 fold compared to placebo, regardless of setting.

Second-hand smoke is a significant risk factor for non-smokers and should be avoided.

**RECOMMENDATIONS**

<table>
<thead>
<tr>
<th></th>
<th>All patients with cardiovascular disease should be advised to quit smoking. They should be supported to stop smoking as a priority measure.</th>
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<tbody>
<tr>
<td>A</td>
<td>For smokers with coronary heart disease, medical advice, individual and group counselling, nicotine replacement therapy and some antidepressant medications improve success in quitting and are recommended.</td>
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<tr>
<td>D</td>
<td>The spouses, partners, whānau and family of patients with coronary heart disease should be strongly encouraged to stop smoking to avoid the risk of second-hand smoke to the patient.</td>
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**Benefits of smoking cessation**

- People with heart disease reduce the risk of a recurrent myocardial infarct or death by half if they stop smoking
- It is beneficial to stop smoking at any age. The earlier smoking is stopped, the greater the health gain
- Smoking cessation has major and immediate health benefits for smokers of all ages
- Within one day of quitting, the chance of a heart attack decreases
- Within two days of quitting, smell and taste are enhanced
- The excess risk of heart disease is reduced by half after one year’s abstinence. The risk of a major coronary event reduces to the level of a never smoker within five years
- The average weight gain of 3kg and the adverse temporary psychological effects of quitting are far outweighed by the overall health benefits.

There is good evidence for the effectiveness of:

- Brief advice from health professionals
- All forms of nicotine replacement therapy (NRT) for people smoking more than 10 – 15 cigarettes per day
- Self help materials alone; adding follow-up telephone calls improves effectiveness
- Organised group programmes, are better than self help materials but no better than intensive health professional advice.

**Nicotine replacement therapy (NRT)**

NRT increases quit rates at 12 months approximately 1.5 – 2 fold compared to placebo, regardless of setting.

It is more dangerous for patients with heart disease to continue smoking than to use NRT. Given the seriousness of their medical condition, cardiac patients who cannot quit should be among the first to be considered for NRT. In patients with ischaemic heart disease, NRT should be started at a lower dose. The dose may be increased if withdrawal symptoms occur. Follow closely. Use cautiously after discussion with a specialist in people in the immediate post myocardial infarction period (4 weeks), those with serious arrhythmias or those with severe or worsening angina.

Contraindications to NRT may include hypersensitivity to nicotine, recent myocardial infarction, unstable or progressive angina, Prinzmetal’s variant angina, and severe cardiac arrhythmias.
**Antidepressant drugs (bupropion and nortriptyline)**

These are second line pharmacotherapy. Bupropion is a suitable treatment (if required) for people with cardiovascular disease. Patients with cardiovascular disease should be given nortriptyline only under close supervision because of the tendency of the medicine to produce sinus tachycardia and to prolong the conduction time.

**Second-hand smoke**

About two thirds of the smoke in a cigarette is not inhaled by the smoker but is released into the air. That smoke mixes with smoke exhaled by the smoker and the combination is called second hand smoke. All patients with a history of cardiovascular disease and their family should stop smoking and avoid second hand smoke.

Effective approaches for smoking cessation are detailed in the National Health Committee’s Smoking Cessation Guidelines 2002 (see also Appendix for a summary of the guideline) [178].
4.6 MANAGING PSYCHOSOCIAL ISSUES

Key points
Up to one in four patients will experience a disabling level of anxiety or depression following a myocardial infarction.

A patient’s illness perception may determine the degree of anxiety and depression experienced and may delay or substantially reduce social and leisure activities.

Depression is associated with a five-fold increase in mortality at six months and a three-fold increase in one year cardiac mortality.

Major depression following a coronary event runs a long term course with the majority of those affected remaining depressed at one year.

Most patients will return to work or primary activity following myocardial infarction. The return to work is associated with an improvement in emotional well being.

Marital status, emotional and social support and social networks are likely to have a protective effect and reduce risk of future fatal and non-fatal coronary heart disease and total mortality.

RECOMMENDATIONS

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<td>B</td>
<td>Psychosocial interventions (patient education, counselling and cognitive behavioural techniques) should be included in comprehensive cardiac rehabilitation programmes.</td>
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<tr>
<td>C</td>
<td>An assessment of the social support available to the patient is recommended for all patients with coronary heart disease.</td>
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<tr>
<td>D</td>
<td>Simple questions regarding the patient’s illness perception, coping skills and external support followed by a validated questionnaire such as the HADS questionnaire are recommended.</td>
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<tr>
<td>C</td>
<td>The involvement of spouses, partners, whānau and family should be encouraged in all phases of comprehensive cardiac rehabilitation.</td>
</tr>
<tr>
<td>B</td>
<td>All patients with coronary heart disease who demonstrate a high level of anxiety or depression should be referred to a trained practitioner for assessment and treatment of their anxiety and depression.</td>
</tr>
<tr>
<td>B</td>
<td>Comprehensive cardiac rehabilitation programmes should include vocational guidance to facilitate an appropriate and realistic return to work.</td>
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<tr>
<td>D</td>
<td>For those who see work as a potential barrier to participation in an outpatient based programme, options such as home based cardiac rehabilitation should be considered.</td>
</tr>
<tr>
<td>D</td>
<td>Comprehensive cardiac rehabilitation programmes should include discussion of sexual activity in an open, frank and sensitive manner.</td>
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A cardiac event or procedure is a major stressor in most people’s lives. Individuals often face an initial period of turmoil and confusion as they adjust to the fact that their health has changed and work out how their illness will impact on their daily life and future plans. Cardiac rehabilitation can help facilitate a smoother transition through this period. The main goals being:

1. To prevent further cardiovascular events by empowering patients to initiate and maintain lifestyle changes
2. To improve quality of life through the identification and treatment of psychological distress
3. To facilitate the patient’s return to a full and active life by enabling the development of their own resources.
Overview of recovery after a coronary event or procedure

For patients having just experienced a heart attack or undergone coronary artery surgery, the event is traumatic and the process of recovery is complex. With the trend to shorter hospital stays there is less time for people to internalise, assimilate and adjust to the meaning of their illness or procedure. The period after discharge is a particularly vulnerable time of grief; ‘home-coming depression’ or ‘cardiac blues’ is so common it is regarded as a normal part of the recovery process [179]. Up to one in four patients will experience a disabling level of depressive symptoms or anxiety. Recent research assessed 38 survivors of a recent myocardial infarction. Subjects experienced a flux of emotions including anxiety, depression, ambiguity, uncertainty, fear of recurrence, deterioration in health, boredom and inertia, with a struggle to integrate changes in lifestyle [180].

The majority of patients do make effective adjustments and cope with these feelings slowly resolving over the weeks post event. The effects of a myocardial infarction on patients’ lives may have positive aspects with patients reporting feeling closer to their immediate family, adoption of healthy lifestyle changes, greater appreciation of health and life, changes in personal priorities, having a second chance, greater knowledge about health and improved empathy.

Over 50% of patients have been reported to return to both sexual activity and outdoor activities by three weeks following myocardial infarction and returned to work (if previously employed) and to their previous maximum level of activity by seven weeks [181].

Recent work has been developed around the concepts of illness perception and its relationship to future psychosocial and physical functioning [182]. Illness perception is based upon five main domains:

1. **Identity** - the label given to the illness and the symptoms attributed it
2. **Cause** - personal ideas about the illness
3. **Time line** - how long the patient believes it will last
4. **Consequences** - of the illness
5. **Cure or control** - how the patient recovers or controls the illness.

A patient’s belief about the severity, cause, controllability and the perceived consequences of their illness, may determine:

- The degree of anxiety and depression experienced
- Non-adherence to recommended treatment regimens
- Delayed return to, or substantially reduced social and leisure activities
- Delayed return to previous sexual functioning
- Early retirement or unemployment [182, 183].

In New Zealand, Petrie et al, [182] conducted a study of 143 first time myocardial infarction patients aged less than 65 years. They found that return to work within six months was significantly predicted by the perception that the illness would last a short time and have less grave consequences for the patient. Conversely, patients’ belief that their heart disease would have serious consequences was significantly related to later disability in work around the house, recreational activities and social interaction. Of those who were previously in full time employment, 79% returned to work within three months (median six weeks). Although both length of stay in hospital and peak creatine kinase (CK) levels were significantly correlated, they were found to be largely unrelated to the patient’s perceptions of their illness or psychological distress. It has been estimated that between 40-50% of people that do not make it back to work, do so because of psychological reasons and not physical factors. Clinical indices of infarction size and disease severity are less likely to predict work-related outcomes [184 (2+)]. Resumption of work is largely dependent upon psychological recovery and acceptance that work itself is not dangerous [2].

Early exploration and identification of patient’s illness perceptions offers the opportunity of minimising or avoiding later difficulties. Patients with a strong belief that their condition is controllable are more likely to attend cardiac rehabilitation [10].

Psychosocial factors and prognosis

Psychosocial factors affecting people with coronary heart disease have been investigated for their association with mortality, readmission to hospital, recovery to previous functional level, quality of life and return to work. The major prognostic factors include; anxiety, hostility or depressive states, socio-economic status, social support, connectedness, family and spousal relationships, gender issues and internal resources such as perceived control, self-efficacy and coping skills. These issues influence patients’ quality of life and recovery, and affect health-related behaviours such as smoking, diet and alcohol consumption or physical activity. It has been hypothesised that psychosocial factors may in themselves cause direct acute or

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B Very well designed observational studies or extrapolated evidence from RCTs or MAs
C Lower quality observational studies or extrapolated evidence from B
D Non analytical studies or expert opinion
chronic pathophysiological changes via neuro-endocrine pathways leading to vasoconstriction, raised blood pressure and heart rate, reduced endothelial functioning, and increased platelet activation [185 (2-)].

In general, the literature has explored psychosocial exposures in white, caucasian people (mainly men) with little reference to the effect of factors such as socio-economic status, socio-cultural values and spirituality, or the experience of marginalised or minority groups. There is an urgent need for research on psychosocial issues related to Māori and Pacific people with coronary heart disease.

**Anxiety and depression**

An estimated 15-30% of post-myocardial infarction patients and 14-18% of post CABG patients experience moderate to severe levels of anxiety and depression [179, 186, 187]. The incidence of a major depressive disorder is lower varying between 7-15% [188] with no difference in incidence between men and women [188, 189]. (An overall estimated prevalence of depression in the New Zealand population is 8.5% [190]). Major depression after coronary events runs a long term course with the majority of patients remaining depressed when followed up at six months and at one year [191]. The elderly are as vulnerable to depression as younger patients but often present with somatic symptoms eg, insomnia, fatigue, headache, memory impairment and vague chest pain and bodily discomfort, thereby going largely unrecognised by health professionals [192].

**The association of anxiety and depression with mortality and morbidity**

Prospective cohort studies have observed that clinical depression and anxiety states in patients with or without existing coronary artery disease may be an independent risk factor for future cardiac events and mortality [183, 184, 186, 191, 193-204].

Depression and anxiety levels in hospital has predicted the overall number of primary care visits [198 (2+)], rehospitalisation or recurrent cardiac event [195, 204] and is associated with a five fold increase in mortality at six months and over three fold increase in one year cardiac mortality (OR 3.36; 95% CI .68-6.7), even when adjusted for factors associated with higher risk (eg, previous myocardial infarction or impaired left ventricular function) [196 (2+)]. High baseline depression scores have also been shown to be associated with long term coronary and all-cause mortality [201 (2++)]. The association between depression and sudden cardiac death was non-statistically significant after adjusting for the confounding effect of cardiac fatigue and dyspnoea [199 (1++)].

Mayou et al, found that high baseline distress immediately following myocardial infarction was associated with significantly longer hospital stay, younger age and a history of psychological and social difficulties but not with cardiac history and status [198 (2+)]. Allison et al, also found that high psychological distress was relatively independent of medical history and co-morbidities except for those who had had a previous cardiac event or continued smoking [195 (2++)]. Baseline distress was strongly predictive of poor symptomatic, psychological and social outcomes at 3 and 12 months [197, 198].

Other studies concur that depression following post-myocardial infarction, PTCA or CABG is linked to:

- Failure to return to work [183, 184]
- Failure to return to normal everyday, social and leisure activities [186, 202, 203]
- More reports of angina [183, 198, 203]
- Poorer compliance with medical treatments
- Poor compliance with healthy life choices [186 (2+)] especially smoking cessation [191, 200].

**Socio-economic status/social class**

Research internationally has highlighted the importance of social, cultural and economic factors as determinants of health and the association between widening income disparities or relative deprivation and increased risk of cardiovascular disease. Kawachi et al, identified social class gradients for both coronary heart disease and stroke mortality in 1975-77 in New Zealand, with the lowest social classes experiencing the highest mortality. When the study was repeated for the period 1985-87, although age-standardised mortality from CHD had declined, the social class gradient had actually increased [205]. Those of lower socioeconomic status are at increased risk of premature mortality and morbidity from coronary heart disease [206], have a higher burden of physiological and lifestyle cardiovascular risk factors, (eg, smoking, obesity and diabetes) and also psychosocial factors such as depression and anxiety [197, 207].

Following myocardial infarction, lower socio-economic scale, individuals experience higher levels of stress [208] and are at risk of poorer adjustment across multiple areas of functioning in the 12 months following discharge, including a higher risk of depression [197]. The effect of social class on functional recovery is independent of age, ethnicity, medical history, severity of infarction and other psychosocial features such as life stress, social isolation and depression [209 (1++)]. Therefore,
attention should not be focused solely on biomedical variables, but should include indices of socio-economic scale, which can be readily and easily obtained.

Barefoot found that high levels of social support and improvement were strongest with those with low income and high levels of depression at baseline [210 (2+)].

**Social support, connectedness, and spousal/family relationships**

Most prospective cohort studies investigating the role of marital status, emotional and social support and social networks have documented a protective effect on fatal and non-fatal CHD and all-cause mortality. Social resources have been seen as what an individual draws on in order to cope. An association between depression and degree of social support has been reported. High levels of support appear to buffer the impact of depression on mortality in the first year post-myocardial infarction [196, 210] and conversely, lack of social support and depression independently increased the 10 year risk of a fatal coronary event [201 (2++)]. However, there are positive and negative aspects within every significant social relationship which may be equally important in predicting psychosocial adjustment. It should not be assumed that all patient–spouse/partner behaviour is, of necessity, supportive or constructive [21].

A myocardial infarction not only affects the patient, but rocks the social and emotional foundation of a patient’s family, particularly their spouse or partner. Studies suggest that family members may be as or more distressed than patients during acute hospitalisation and post-discharge [2, 211]. Some studies have shown that younger wives experience more stress than older wives particularly if they have children under the age of 16. Distressed wives may use disengagement as a coping strategy (avoidance, wishful thinking, self-criticism and withdrawal) and may report significantly less intimacy within the relationship [212]. Many conflicting feelings have been reported including anxiety, guilt, resentment and anger and underlying these may be the fear of another event and possible death of the patient [2]. Spouses/partners also may feel ill-informed. It has been argued that spouse/partner support is integral to compliance by the patient to regimens and life adjustments after infarction [213]. As the majority of spouses/partners are women and have a major role in the patient’s subsequent diet, increased knowledge could have an impact on the health of these patients (and perhaps on other family members at risk).

Marital relationships often become strained during convalescence and different coping strategies may influence adjustment. Patient anxiety has been associated with venting of emotions, the use of either alcohol or drugs and with mental disengagement from their wives [213]. It has also been suggested that male myocardial infarction patients who hide their concerns and worries from their wives have poorer adjustment over time [214]. Spousal support appears to enhance emotional and cognitive readjustment, self-esteem, mastery and coping with physical restrictions. Some spouses/partners may become overprotective which may result in limitation of the patient’s activities and reduced self-efficacy [2, 215].

A review of the literature reported that there may be marked differences between patients and spouses/partners in their perceptions of the severity of the event, expectations of outcome, the likelihood of patient compliance and the level of patient progress [2]. There may also be considerable disagreement regarding diet, activity levels, resumption of driving, sexual activity or work. What a patient and his/her partner believe about the cause of the disease and control over the disease is a major factor determining their emotional and practical response including adherence to lifestyle change and medical treatment as well as return to work [179, 215-217].

**Sexuality**

Research investigating the impact of acute myocardial infarction on sexual activity is reported to be relatively sparse. There is even less data available post-CABG or PTCA. The psychological impact of acute myocardial infarction, as well as the physiological effects of the illness and medications, can have a major effect on patients’ ability to resume sexual activity. Patient or spouse/partner anxiety and fear of another heart attack or sudden death during intercourse often lead to reduced sexual activity or sexual function. In fact, Froelicher et al., 1994, report that for many years sexual activity was discouraged because of the belief that the energy expenditure was too great for the heart [181]. However studies conducted since the early 70’s generally agree that oxygen requirements during sexual activity are moderate [218]. Heart rate levels during intercourse are similar to those found in everyday life [219] and sexual activity for those with coronary heart disease is associated with low risk of cardiac complication [218]. Coital death is extremely rare, encompassing only 0.6% of sudden death cases [220]. Of those people who were sexually active prior to the infarction, 5-34% fail to resume sexual activity [181, 221]. For those who resume sexual activity, 50% resume sexual activity within one month, the large majority by 3-6 months [181, 221]. However many who return to sexual activity report a reduction in frequency and/or satisfaction.

The incidence of sexual dysfunction after a myocardial infarction has been estimated at 50-75% of all patients, with much of the sexual dysfunction predating the coronary event [222]. Other contributing variables are age, education, diabetes and depression [221]. A New Zealand study by Petrie et al, found that a strong illness perception (not linked to the size of infarct) was significantly related to greater sexual dysfunction at both three and six months post myocardial infarction [223].
Receiving sexual counselling is an important issue for many patients both acutely and in the post-discharge setting. However, sexuality is frequently not addressed by health professionals [224-227]. A number of common questions and suggested answers are listed in Appendix 4.

Sexual dysfunction is frequently seen in cardiac patients and can often relate to cardiovascular drugs as listed below.

**Table 3: The potential impact of medications on sexual functioning**

<table>
<thead>
<tr>
<th>Medication</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrochlorothiazide</td>
<td>Decreased libido, impotence, inhibition of vaginal lubrication</td>
</tr>
<tr>
<td>Spironolactone</td>
<td>Decreased libido, gynaecomastia, impotence, hirsutism</td>
</tr>
<tr>
<td></td>
<td>Menstrual irregularities</td>
</tr>
<tr>
<td>Methyldopa</td>
<td>Decreased libido, ejaculatory difficulty, gynaecomastia impotence, lactation</td>
</tr>
<tr>
<td>Clonidine</td>
<td>Decreased libido, gynaecomastia, impotence, inorgasmia, retrograde ejaculation</td>
</tr>
<tr>
<td>Reserpine</td>
<td>Decreased libido, ejaculatory difficulty, impotence</td>
</tr>
<tr>
<td>Guanethidine</td>
<td>Decreased libido, ejaculatory difficulty, impotence</td>
</tr>
<tr>
<td>Prazosin</td>
<td>Impotence, priapism</td>
</tr>
<tr>
<td>Propranolol</td>
<td>Decreased libido, impotence</td>
</tr>
<tr>
<td>Metoprolol</td>
<td>Impotence, peyronie’s disease</td>
</tr>
<tr>
<td>Labetalol</td>
<td>Delayed ejaculatory, delayed tumescence, impotence, priapism</td>
</tr>
<tr>
<td>Atenolol, pindolol &amp; nadolol</td>
<td>Impotence</td>
</tr>
<tr>
<td>Digitalis</td>
<td>Gynaecomastia, impotence</td>
</tr>
<tr>
<td>Hydralazine</td>
<td>Priapism</td>
</tr>
<tr>
<td>Disopyramide, mexilitine, flecanide, propafenone, amiodarone &amp; sotalol</td>
<td>Impotence (rare)</td>
</tr>
<tr>
<td>Captopril, enalapril, ramipril &amp; lisinopril</td>
<td>Impotence (rare)</td>
</tr>
<tr>
<td>Losartan, valsartan</td>
<td>Impotence (rare)</td>
</tr>
<tr>
<td>Clofibrate &amp; gemifibrozil</td>
<td>Impotence, decreased libido</td>
</tr>
<tr>
<td>Phenoxybenzamine and phentolamine</td>
<td>Ejaculation inhibition</td>
</tr>
</tbody>
</table>

(Adapted from *Sex and the Heart* [228]).

**Treatment options for erectile dysfunction**

Erectile dysfunction is defined as the inability to achieve and/or sustain erection sufficiently to permit satisfactory sexual intercourse. Patients with heart disease, diabetes, high LDL (low density lipoprotein) levels and smokers, are at higher risk of developing erectile dysfunction associated with atherosclerotic stenosis of major penile arteries [228-230]. Treatment options include the use of oral pharmacotherapy, vacuum constriction devices, penile self-injection with alprostadil, papaverine or phentolamine, intra-urethral alprostadil suppository (not available in NZ), penile prosthesis and vascular surgery.

**Sildenafil (Viagra) in men with cardiovascular disease**

Sildenafil citrate (Viagra) is the first orally active medication proven to be effective for erectile dysfunction. However concern has arisen that sildenafil citrate may be associated with adverse cardiovascular outcomes in high-risk patients; in particular patients with ischaemic heart disease and hypertension [230]. In normal healthy men, cardiovascular side effects are reportedly minor and associated with vasodilatation (headache, flushing, and small decreases in systolic and diastolic blood pressures) [231].
Recent guidelines from the American College of Cardiology/American Heart Association [231] have provided the following recommendations:

i. Sildenafil (Viagra) use is contraindicated for patients receiving any form of nitrate therapy

This in combination is associated with significant increased risk of potentially life-threatening hypotension. Furthermore, although definitive evidence is lacking, it is possible that a precipitous reduction in blood pressure with nitrate use may occur over the initial 24 hours after a dose of Sildenafil (Viagra).

ii. Cardiovascular effects of Sildenafil (Viagra) may be potentially hazardous for the following patients (use dependent on individual clinical assessment)

- Patients with active coronary ischaemia, (eg, positive exercise test for ischaemia)
- Patients with congestive heart failure and borderline low blood pressure and borderline low volume status
- Patients on a complicated, multidrug, antihypertensive programme
- Patients taking drugs that can prolong the half-life of Sildenafil (Viagra). These are drugs that are metabolised by or that inhibit Cytochrome P450 3A4, eg, erythromycin, ketoconazole, norfl oxacin, cimetidine, theophylline, digoxin, diltiazem and other calcium antagonists statins, prozac, imipramine etc. (see Appendix 5 for full list).

**Internal resources**

Much of the psychosocial literature has attempted to explore a patient’s perceived available internal and external resources. Internal resources may be seen as demonstrated by self-efficacy and coping skills, whereas external resources may be defined as the perceived availability of social support and connectedness to others. Both internal and external resources influence a person’s view of illness, self-rated health, self-care and perceived control. It is thought that the stronger the perceived control or self-efficacy, the more likely a person feels able to strive towards health and well-being and integrate lifestyle changes/health behaviours. Those with higher sense of control at baseline compared to lower sense of control, were less likely to be anxious, depressed or hostile and had better psychosocial adjustment [232 (2+)]. According to cognitive behavioural theory [233] the likelihood someone will change their health-related behaviour is related to three cognitions:

1. The perception that health is threatened
2. The expectancy that behavioural change will reduce the threat, and
3. The expectancy that one is competent to change behaviour (self-efficacy).

Meland et al, found that self efficacy of increased physical exercise was the only variable significantly related to exercise change. Furthermore, age and self efficacy were significant predictors of success in smoking cessation and educational level related negatively although not statistically significantly with total risk change [216 (1+)]. Self efficacy estimates have been shown to be better predictors of return to work, physical functional status and use of pain medication, than age or medical status [215].

The contribution of spirituality and religious beliefs, ethnicity and cultural values to quality of life and other health outcomes for patient with coronary artery disease have been poorly investigated in the literature. One researcher investigating urban, low-income African-Americans and Caribbean-Americans found low levels of depression and anxiety. This was attributed to strongly held religious beliefs and attitudes which were positive factors in their psychosocial adjustment [222]. In a study of 151 American patients following their first CABG, prayer was reported as the single most commonly used self care, followed by exercise, lifestyle-diet and pursuing the services of an individual counsellor [234]. A qualitative study conducted in Sydney, Australia found that human connectedness, finding and harnessing the ‘will’ to live and having faith in the primacy of a higher power, gave people hope to carry on [235].

**Gender issues**

In general, women recover from cardiac events relatively poorly compared to men. Low social class, low educational attainment, the double loads of work and family, chronic emotional distress, low self-esteem, and lack of social support/social isolation have been associated with increased risk of recurrent events for women following myocardial infarction or CABG [189 (2-)]. It has been reported that mortality and morbidity after myocardial infarction are greater for women than men [2, 236, 237]. However, after adjusting for age, clinical status and other risk factors, the results are conflicting [189 (2-)].

The majority of studies comparing psychosocial well being in men and women after a non-fatal myocardial infarction suggest that women do not cope as well physically and psychosocially as men [189 (2-)]. After discharge women are more likely to report lower quality of life, worse physical and mental health than men, score higher on psychosomatic symptoms and more likely to report spending time in bed due to ill-health and to be working less than before their myocardial infarction [189, 236, 238, 239].
It has been suggested that women have less access to major diagnostic and therapeutic procedures such as thrombolytic therapy, PTCA and CABG. In New Zealand in 1996, nearly three times more men with coronary heart disease were treated as day patients, compared to women which was thought to reflect a greater number of men receiving specialised investigation procedures such as coronary angiography [240]. It has been suggested that women having CABG surgery have substantially higher in-hospital mortality rates than men [189 (1-)]. However it is not clear from the review whether this excess mortality results from the older age of women, other risk factors or sub-optimal care. Long-term survival rates are reported to be similar after CABG in men and women [189 (1-)].

Women attending cardiac rehabilitation are more likely to report significantly greater dysfunction on total, psychosocial, home management, and emotional behaviour. Women also have significantly greater incidence of widowhood, migraine/ chronic headache, and arthritis than men and lower functional capacity (measured in METS) [241]. In comparison to men, women may tend to describe ischaemic pain/discomfort in epigastric terms rather than classical cardiac symptoms [237]. Furthermore, studies of cardiac rehabilitation report a poorer uptake, poorer adherence and significantly higher drop out rates for women than men [189 (1-)].

**Identification of those with significant psychosocial distress**

A major challenge in health care, particularly in times of scarce resources, is determining those patients for whom a specific intervention, in this case referral and treatment by psychological services, would be most advantageous. Referral for all patients would be neither appropriate nor feasible.

**Detection of psychological distress post-cardiac event or procedure**

The following is a guide to how a health professional might screen or assess patients in order to detect those with, or at risk of, significant psychosocial distress. It is not possible to determine mental status by observation alone [179]. Some simple questions regarding illness perception, understanding of the event, procedure and disease and coping skills may identify patients at risk of significant psychosocial distress. These questions may help characterise those patients who are at risk for poor subjective and objective outcome after a myocardial infarction or coronary procedure [217, 242, 243].

Suggested questions are:

- What do you think causes heart attacks? (Knowledge)
- Why do you think the heart attack happened to you? or Why do you think your coronary arteries blocked up? (Illness perception)
- What have the doctors told you? AND Do you go along with that? (Illness perception)
- Do you understand it? What do you understand by it? (Knowledge, misconceptions, ‘cardiac myths’)
- How have you coped in the past with a major life event? (Previous coping skills)
- What and who will help you cope with this? (Internal and external resources—social support)
- How do you see the future? What difficulties do you see in recovering from this? (Sense of control/efficacy, barriers to recovery, eg, financial, social).

In addition to this, other factors have been identified that may place a patient more at risk of significant psychosocial distress [242]:

- Unexpected or first time illness
- Changes to diagnosis/treatment
- Complications or cancellations
- Prolonged stay/repeated admissions
- Person under 50 years of age
- Lack of partner or family support
- Other negative health and illness beliefs
- Other recent life stressors eg, change of job, redundancy, moving house, marriage, divorce, death, financial difficulties.
It is important to note that there is a risk of oversimplifying the assessment process, as the skill of the individual asking the questions will largely determine the quality of the response. This is further supported by findings that nurses even in specialised areas such as hospice training were only able to elicit fifty percent of patients’ concerns [244]. Therefore it is advisable to also screen and measure psychological distress using a well-validated questionnaire. There are several instruments available including:

- Hospital Anxiety and Depression Scale (HADS) [245]
- Anxiety and Depression Scale [246]
- Hopkins Symptom Checklist (HSCL-25) [247]
- State-Trait Anxiety Scale [248]
- COPE questionnaire [249]
- Global Mood Scale (GMS) [250].

The commonest questionnaire used in cardiac rehabilitation in New Zealand is the HADS scale [245] which is well-validated, short, well-accepted by patients and easy to score (see Appendix 3).

There does not appear to be any evidence that any one of these instruments is better than the others (except some are more cumbersome and time-consuming). There is considerable overlap with other case-finding instruments of depression for use in primary care such as the Centre for Epidemiologic Studies Depression Scale (CES-D), Beck Depression Inventory (BDI—both long and short forms), the Hamilton Major Depressive Disorder Rating scale, the Symptom-Driven Diagnostic System for Primary Care (SDDS-PC), the Medical Outcomes Study-Depression measure (MOS-D), and the Quick Diagnostic Interview Schedule. A study of the latter instruments found that these tools had sensitivities of 89 to 96% and specificities of 51-72% [251]. This same study found that the validity of two questions for depression had similar test characteristics (sensitivity 96% and specificity 57%). The two questions were:

1. During the past month, have you often been bothered by feeling down, depressed or hopeless?
2. During the past month, have you often been bothered by little interest or pleasure in doing things?

The information gained from the assessment questions and the HADS questionnaire can be utilised to tailor an individual care plan (Table 4). It is recommended that those who demonstrate a high level of distress (HADS score 11-21) be referred to a clinical psychologist, psychiatrist or a counsellor trained at a Masters level for further assessment and treatment. Those with a score indicative of possible borderline depression or anxiety (HADS score 8-10) and additional risk factors gained from the personalised assessment should alert the cardiac rehabilitation team that these clients are at greater risk of adjustment difficulties and possibly at risk of developing a major depressive disorder. Group-based lecture-style psycho-educational sessions may or may not be suitable for these individuals and their families at this stage or there may be a need to follow-up after each session with individual/family concerns.

In the weeks and months post-event and particularly at discharge from a Phase II programme, a repeat screening of the HADs questionnaire or the 2-question instrument may help to identify those who continue to experience psychosocial distress who need on-going support, referral and treatment. Readers requiring further advice on best practice and treatment of depressive disorders are encouraged to obtain the 1996 guidelines for the treatment and management of depression by primary healthcare professionals [139] These guidelines are available to download from the New Zealand Guideline Group website; www.nzgg.org.nz.

Questionnaires which assess quality of life, reported in the literature to be both valid and reliable eg, General Health Questionnaire, Medical Outcomes Survey-short form 36 (SF-36), Sickness Impact Profile Study, Nottingham Health Profile, Seattle Angina Questionnaire (SAQ) and Quality of life index-cardiac version III tend to be used more for research and the evaluation of cardiac rehabilitation programmes rather than in clinical practice [192, 197, 200, 203, 210, 238, 239, 241, 252-257].
Table 4: Individual care plan

<table>
<thead>
<tr>
<th>Assessment</th>
<th>HADS score</th>
<th>Probable significant depression or anxiety</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess illness perception, coping skills and factors present that may place</td>
<td>11 – 21</td>
<td>Probable significant depression or anxiety</td>
<td>Referral to appropriate person; Tailor cardiac rehabilitation programme accordingly, check on progress</td>
</tr>
<tr>
<td>a patient more at risk of significant psychosocial distress:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Unexpected or first time illness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Changes to diagnosis/treatment</td>
<td></td>
<td></td>
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<tr>
<td>• Complications or cancellations</td>
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<tr>
<td>• Prolonged stay/repeated admissions</td>
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<tr>
<td>• Person under 50 years of age</td>
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<td></td>
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<tr>
<td>• Lack of spouse, partner, whānau or family support</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Other negative health and illness beliefs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Other recent life stressors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Other negative health and illness beliefs</td>
<td>8 – 10</td>
<td>Possible or borderline depression</td>
<td>Tailor cardiac rehabilitation programme accordingly, may need referral to appropriate person check on progress</td>
</tr>
<tr>
<td>• Lack of spouse, partner, whānau or family support</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Other recent life stressors</td>
<td>0 – 7</td>
<td>No depression or anxiety state, but may be 'at risk' as determined by assessment</td>
<td>Usual cardiac rehabilitation programme, check on progress</td>
</tr>
<tr>
<td>• Other negative health and illness beliefs</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Evidence for psychosocial interventions within cardiac rehabilitation

In general, cardiac rehabilitation programmes are often an agglomeration of many interventions, making it difficult to evaluate the individual effects of each component. Furthermore, there is a paucity of single-component intervention trials in the literature. There have been five systematic reviews (including 3 three meta-analyses) [258-262] that have evaluated the effect of psychosocial and educational interventions. These reviews have investigated studies where psychosocial and/or educational interventions were offered to a group of patients in addition to treatments offered to patients in a usual care control group. In some studies different types or intensity of interventions were trialled, (eg, exercise training plus relaxation therapy compared with exercise training only). The studies included in the three meta-analyses were either randomised controlled trials or of quasi-experimental design (usually pre-post test with a control group) [258, 259, 262]. In these studies, it is assumed that pharmacological treatment consistent with clinical practice is part of the usual care of patients with coronary artery disease and the effects are in addition to the benefits gained from medications. There is a wide diversity in psychosocial programmes including underlying rationales, treatment techniques, adherence to educational principles (see Table 5), length of treatment, profession of programme providers, participation of partners and target of treatment (individual patient, patient group, or both). There is often a lack of operational definition of psychological or educational interventions. Many studies have compared an intervention with usual care but did not define the latter. Also, most studies have been conducted with male caucasian participants, who speak English as a first language, and we assume moderate-high literacy skills. Studies often do not document socio-economic status, previous employment, or educational attainment and many programmes were limited by patients’ inability to attend a rehabilitation programme (usually geographic access). These factors all limit the generalisability of the findings. Some meta-analyses [258, 262] have attempted to investigate the effects of either educational or psychological interventions but have included some programmes that have combined education and psychological interventions in their analyses. Furthermore, it needs to be highlighted that even a minimal exercise programme with an educational component may provide psychological benefit via the social support that being with others in a rehabilitation programme provides.

Dusseldorp et al, [259 (1+)] have conducted the most recent meta-analysis of 37 studies of psychoeducational (health education and stress management) and programmes for coronary heart disease patients. Health education was defined as instructional activities organised in a systematic way; stress management included a mix of psychotherapeutic interventions or relaxation therapy or supportive treatment. Their results suggest that these programmes may result in a 34% reduction in cardiac mortality; a 29% reduction in recurrence of myocardial infarction; and statistically significant effects on blood pressure, cholesterol, body weight, smoking behaviour, physical exercise and eating habits. The programme interventions did not show any effect with regard to coronary bypass surgery, anxiety or depression. Also those programmes that were successful in modifying shorter term outcomes (systolic blood pressure, smoking, physical exercise, emotional distress) were more effective in reducing future cardiac events than programmes without success on proximal outcomes. Randomisation, type of evaluation, setting and length of programme, profession of programme provider, individual or group treatment, participation of partners and patient characteristics (mean age, type of cardiac event, percentage of women) were not found to influence treatment success.
There is accumulated evidence of the large impact of cardiac events on psychological functioning and of the roles of anxiety and depression in both the onset and progression of CAD, though the majority of patients cope with their cardiac event in a functional way. These patients do not require intensive or extended stress management programmes. Such programmes are however, needed by the minority of patients who do not cope with their cardiac event [259 (1+)].

Linden et al, [258 (1-)] evaluated 23 randomised controlled trials of psychosocial intervention compared with usual care with a total of 3180 patients with documented coronary artery disease (mainly post-myocardial infarction). Diverse psychosocial treatments were offered but mainly had a cognitive-behavioural orientation. The results showed that psychosocial interventions may be associated with benefits to patients with coronary artery disease over and above those achieved by medication and exercise. Statistically significant reductions occurred in levels of psychological stress, systolic blood pressure, heart rate and cholesterol level. A 46% reduction in non-fatal cardiac events was observed during the first two years of follow-up (O.R. = 1.84; C.I. 1.12 to 2.99) and a 39% reduction for longer follow-up (O.R. = 1.64; C.I. 1.06-2.54). There was a similar observed reduction in mortality (O.R. = 1.70; C.I. 1.09-2.64) during the first two years of follow-up but no associated benefit was observed for longer follow-up.

Mullen et al, [262 (1-)] in a meta-analysis of 28 randomised controlled trials and quasi-experimental trials of psychoeducational programmes observed statistically significant favourable effects on mortality, systolic blood pressure, exercise, and diet but not on smoking or recurrence of myocardial infarction. Length of intervention, length of measurement period, and channel of intervention did not influence outcome but adherence to educational principles (see Table 5) were associated with larger effect sizes.

Table 5: Educational principles associated with improved programme effectiveness

| 1. | Reinforce positive behaviour. Examples: positive verbal comments from health professionals; help patients to establish rewards for themselves; reframe behavioural data given by the patient to indicate progress. |
| 2. | Offer feedback to demonstrate to the patient the degree to which he or she is achieving progress. Examples: self-monitoring charts, teach patients how to monitor relevant physiological parameters for themselves; give information about physiologic assessments at visits. |
| 3. | Individualise the educational programme to provide opportunities for patients to set the pace of their learning and receive answers to personal questions. Examples: programmed instructions; setting patient’s own goals; exit interviews in which instructions can be clarified and patient’s questions answered; follow-up telephone calls to patients at discharge. |
| 4. | Facilitate behaviour by providing the means for patients and families to take action or reduce barriers to action. Examples: unit dose containers; reminder calendars; help with financial arrangements; suggestions for low-cost, culturally appropriate healthful foods; supermarket visit; self-monitoring skills to recognise when to seek professional advice. |
| 5. | Relevance. Assure that the content and educational methods used are relevant to the learner’s interests and circumstances. Examples: group and individual needs assessments. |

(Adapted from a meta-analysis of controlled trials of cardiac patient education [262]).

A review of studies conducted with adult patients diagnosed either with coronary heart disease or cancer found that psychosocial interventions (patient education, counselling and behavioural techniques) were in general helpful for alleviating psychological distress [260]. It was recommended that such interventions be targeted to high risk patients rather than all patients. Additional randomised controlled trials of psychosocial interventions compared with usual care not covered in these reviews have been identified [211, 253, 263, 264].

A randomised controlled trial of 91 post-CABG patients randomly allocated to a behavioural and educational intervention (including goal setting, skills training, feedback, reinforcement, modelling, self-monitoring and the provision of social support) or usual medical and nursing care, found that other than an improved aerobic capacity (VO2 max), there were no statistically significant differences in smoking cessation, dietary behaviour and lipid profile, or quality of life measures [253 (1+)].

A study of 100 patients (50 post-myocardial infarction and 50 CABG) who were randomised to either a 10-week relaxation-based stress management programme or usual care showed statistically significant improvements in mean scores for emotional well-being, functional and social activities with the stress management group compared to the control group after six months [264 (1-)].
A study of 156 patient post acute myocardial infarction which randomly assigned them to receive exercise training plus relaxation therapy or exercise training compared the occurrence of major cardiac events (death, reinfarction and cardiac surgery) and rehospitalisations at 5-year follow-up. When adjusted for previous angina, size and location of infarction and signs of heart failure, the group receiving additional relaxation therapy had a 48% reduction in major cardiac events over the 5-year period (OR 0.52; 0.28-0.99) but no statistically significant difference in readmission to hospital for cardiac reasons (OR 0.72; 0.38-3.6) [263 (1+)].

Finally, Johnston et al, investigated 100 patients and their partners randomly assigned within 72 hours post-myocardial infarction to three groups; inpatient psychoeducational counselling by a nurse counsellor, an extended counselling group receiving the same inpatient counselling but with additional sessions continuing after six weeks post-discharge and a usual care group. At one year follow-up, those who received in-patient counselling had statistically significant improvement in mean scores for heart health knowledge, mood state as assessed by the Hospital Anxiety and Depression Scale (HADS), satisfaction with care, and disability and resumption of normal activities. There was evidence for additional benefit from the extended programme [211 (1-)].

Psychosocial interventions and return to work/vocational adjustment

Most of the studies on return to work include only men or the great majority of participants are men. Difficulties arise when assessing the generalisability of international studies of psychosocial interventions and return to work as social welfare systems differ and self-selected participants involved in cardiac rehabilitation programmes are more likely to be motivated and therefore more likely to return to work. Factory and unskilled workers are significantly less likely to return to work than professional/administrative or clerical/skilled workers [189 (2-)].

The Victorian Cardiac Rehabilitation guidelines indicate that there have been few studies investigating the most effective interventions to assist patients to return or to remain in the workforce [2]. Exercise based programs do not appear to increase return to work, prediction of which relates to levels of anxiety, depression, and other psychosocial variables. However simulated work testing (such as heavy lifting, using a shovel) and a successful exercise stress test following a cardiac rehabilitation programme can both give the patient confidence and confirm fitness [2].

Simulations are best undertaken by an occupational therapist or another trained professional. In some circumstances, it may be desirable for a doctor to be present and for a defibrillator to be available [2].

Return to work

In addition to providing income, work is an important source of self-esteem. The return to work is associated with an improvement in emotional well-being. Vocational guidance as part of a comprehensive cardiac rehabilitation programme will enable a patient to consider when to return to work, or whether a modification of their work is desirable.

Efforts to facilitate a return to work should begin as early as possible, since patients who delay are less likely to resume work [2]. For those who see work as a potential barrier to participation in an outpatient based programme options such as home based cardiac rehabilitation should be considered.

Cardiac rehabilitation staff should facilitate a discussion between employer and patients that allow a phased return to work or time off to attend cardiac rehabilitation programmes.

New Zealand LTSA Standards relating to fitness to drive

It is recommended that health professionals advise patients regarding fitness to drive using Medical Aspects of Fitness to Drive,: A guide for medical practitioners (www.ltsa.govt.nz) [265]. Clear recommendations related to the cessation and resumption of driving are made for patients with a range of cardiovascular and other medical conditions.

Driving and travel

The Medical Aspects of Fitness to Drive, published by the Land Transport Safety Authority describes precautions for those with cardiac disease.

Patients considering air travel should seek advice from their general practitioner or physician to discuss their individual situation and the risks and benefits associated with travel. Advice will take account of the severity of the cardiac event, the progress in recovery, and the travel requirements (such as distance to be travelled, length of journey and the complexity of the itinerary etc.).
Patients with coronary heart disease are at very high risk and have been shown to benefit from a number of pharmacological interventions regardless of risk factor levels.

**RECOMMENDATION**

In all patients with coronary heart disease pharmacotherapy with aspirin, a betablocker, an ACE inhibitor and a statin should be considered unless contraindicated, regardless of initial levels.

Cardiac rehabilitation is related to lifestyle measures aimed at achieving optimal functioning and minimising the likelihood of disease recurrence. There is particular emphasis on exercise, nutritional management and psychosocial aspects as detailed in this guideline. Whilst cardiac rehabilitation is conveniently managed through the phases outlined by a multidisciplinary team, it must ideally be integrated with other secondary prevention measures administered through clinical cardiological follow up and the primary care practitioner. The aim of clinical follow up will be to optimise specific pharmacotherapy based on individual patient clinical assessment and needs, which is not an appropriate aim in the rehabilitation group setting, and also to reinforce lifestyle measures.

The cardiac rehabilitation programme and individual patient clinical care should be highly complementary and very effective in improving patient outcomes. The proximity and relationship between the two will vary in different settings but in all situations, linkage and clear communication are important to optimise overall patient management. Clinical reinforcement of agreed rehabilitation goals and counselling approaches can be a powerful means of improving programme adherence.

Secondary prevention measures in the clinical setting combine non pharmacologic and pharmacologic approaches to modify risk factors and reduce recurrent cardiovascular events. The benefits of pharmacotherapy are potentially substantial and clear recommendations can be made based on compelling randomised controlled trial results. Detailed data and recommendations are beyond the scope of this present guideline and will be covered in a separate secondary prevention clinical practice guideline. Following are tabulated a checklist for clinical purposes and key evidence related to standard pharmacotherapy considerations, specifically the use of antiplatelet agents, beta blockers, ACE inhibitors and lipid lowering agents.

All medications will require consideration of side effects and contraindications.
### Table 6: Considerations in secondary prevention for patients with coronary and other vascular disease

<table>
<thead>
<tr>
<th>Goals</th>
<th>Intervention</th>
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<tbody>
<tr>
<td><strong>Lipid lowering goals:</strong>&lt;br&gt;Total cholesterol &lt; 4 mmol/L&lt;br&gt;LDL cholesterol &lt; 2.5 mmol/L</td>
<td>Ensure cardioprotective dietary change. Promote exercise and weight management. Assess fasting lipid profile. Start drug therapy (statin generally most appropriate; consider adding fibrate if low HDL or high TGL).</td>
</tr>
<tr>
<td><strong>BP control goal:</strong>&lt;br&gt;&lt;120 - 140/80 - 90 or lower if diabetes</td>
<td>Ensure lifestyle measures. Add BP medication individualised to patient characteristics.</td>
</tr>
<tr>
<td>Antiplatelet agents</td>
<td>Continue aspirin indefinitely. If aspirin contraindicated, consider warfarin.</td>
</tr>
<tr>
<td>Beta blockers</td>
<td>Continue betablockers indefinitely unless contraindicated.</td>
</tr>
<tr>
<td>ACE inhibitors</td>
<td>Continue ACE inhibitor indefinitely in high-risk, post MI patients (anterior MI, previous MI, LV dysfunction or CHF). Consider chronic therapy in other patients.</td>
</tr>
</tbody>
</table>

Adapted from American Heart Association Tables.
COMPREHENSIVE CARDIAC REHABILITATION PROGRAMMES

6.1 CASE MANAGEMENT

Key point
The case management model is adaptable to primary and secondary care settings and also to individual needs in relation to programme content and length.

RECOMMENDATION

<p>| | |</p>
<table>
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<tbody>
<tr>
<td>A</td>
<td>Comprehensive cardiac rehabilitation should embrace a case management approach.</td>
</tr>
<tr>
<td>D</td>
<td>Hospital based cardiac rehabilitation must be comprehensive and should be individualised to meet the needs of each patient.</td>
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</table>

Over the last ten years cardiac rehabilitation programmes have evolved from primarily exercise oriented programmes to more comprehensive programmes with broader approaches to secondary prevention.

Exercise based cardiac rehabilitation
Meta-analyses of exercise based cardiac rehabilitation programmes have demonstrated a reduction in total mortality by 20% and cardiac mortality by 25% [267-269]. Trials from the 1970s and 1980s were included at a time when the both acute medical and surgical treatment of coronary artery disease was less advanced and secondary prevention was limited. The subjects in the trials were generally white, male, younger than 65 years, with few risk factors and relatively little comorbidity. Behavioural change interventions were not widely practiced during this era.

Cardiac rehabilitation and secondary prevention
Three studies were identified which looked at long term reduction in cardiac mortality in myocardial infarction patients following comprehensive rehabilitation which included both exercise based cardiac rehabilitation and secondary prevention. Two of the studies were Swedish [270, 271] and one Finnish, [272 (2++)]. In the Swedish study the intervention included a post myocardial infarction clinic, physical training, information on smoking and diet and psychological support to patients and their families. Ten year follow up in the Swedish study showed a reduction in total and cardiac mortality as well as a reduced incidence of non fatal re-infarctions in the intervention group. The Finnish study also found a reduction in coronary mortality and sudden death in the intervention group. The intervention in this study was comprised of optimal medical care, physical activity, anti-smoking and dietary counselling as well as discussions on psychosocial issues. This intervention was most intensive during the first three months. A reduction in total mortality was not demonstrated in this study. It should be noted that non-coronary mortality was higher in the intervention group in this study due to a higher number of cancers.
Multidisciplinary case management – a way forward for cardiac rehabilitation?

A primary aim of cardiac rehabilitation programmes is to demonstrate observable sustainable changes in participants behaviour. Two key studies, the MULTIFIT Study [273] and the SCRIP Study [274 (1+)] have shown the benefit of using a case management model to achieve this aim. The concept of absolute risk assessment for cardiovascular disease demands a co-ordinated approach to patient management, which brings together behavioural modification principles, exercise training and optimal secondary prevention pharmacotherapy. A recent review article [275] suggested a framework around which to base a case management programme for cardiac rehabilitation. The framework included:

- Screening to identify persons with disease
- Risk stratification and triage of those identified
- Assignment of individuals to a case manager
- Institution of intensive risk reduction interventions based on clinical practice guidelines
- Medical supervision of safety, efficacy, and adherence to risk reduction efforts
- Measurement of medical outcomes and patient satisfaction
- Systematic follow up and institution of change in therapies as indicated.

The case management model has the potential to enhance behavioural change and move away from the concept that Phase II cardiac rehabilitation is time-bound. Ashton and Saccucci [276] describe how perceptions of improved health status accrue at different rates depending on ethnicity and gender. The fact that patient outcomes, physical and psychosocial, are not always optimal during the course of a cardiac rehabilitation programme, could be the result of a compromised timeframe rather than the programme per se.

The case management approach is adaptable to both the primary and secondary care settings. It is a systematic approach, ensuring that the content and length of the programme is appropriate and applicable to the individual. It aims to improve the efficacy of cardiac rehabilitation.

6.2 PATIENT IDENTIFICATION

**Key points**

Patients can be referred to a cardiac rehabilitation programme by different health care professionals.

Programme co-ordination and process evaluation including monitoring of attendance and drop out are important aspects of an effective programme.

**RECOMMENDATIONS**

| D | Comprehensive cardiac rehabilitation should be considered in all patients after myocardial infarction, coronary artery bypass surgery and angioplasty. |
| D | All patients with coronary heart disease should receive a personal written invitation to attend a cardiac rehabilitation programme. |
| D | A cardiac rehabilitation co-ordinator should have overall responsibility for liaison with patients, their health practitioners and other members of the team. The coordinator should implement strategies to minimise missed referrals. |

It is necessary to outline the referral process that may be considered for identification of patients who are eligible for cardiac rehabilitation programmes. It is anticipated that patients may be identified from a variety of different sources including hospital wards and the community.

This guideline applies to patients with coronary heart disease, specifically those following an acute coronary syndrome (acute myocardial infarction / unstable angina), with stable angina, and following coronary artery angioplasty +/- stent implantation, coronary artery bypass surgery, or surgery for valvular heart disease.

**KEY** - see page 10 for details

A Well designed meta-analysis (MA) of RCT, or a body or evidence which are consistently applicable
B Very well designed observational studies or extrapolated evidence from RCTs or MAs
C Lower quality observational studies or extrapolated evidence from B
D Non analytical studies or expert opinion
Specific subgroups of patients such as those following heart transplantation, or with implantable defibrillators or permanent pacemakers, and heart children and adults with congenital heart disease may require rehabilitation but these topics are beyond the scope of this guideline. These patients are a relatively small group of patients with heart disease in NZ and have their own distinct rehabilitation needs, some of which are already provided. Some patients with these conditions may benefit from attending cardiac rehabilitation and thus inclusion in a programme should be at the discretion of the cardiac rehabilitation co-ordinator.

**Referral of patients to a cardiac rehabilitation programme**

**Referral process**

Patients should be referred to cardiac rehabilitation programmes from a variety of sources, including any health professional involved in the care of the patient. Referrals may come from coronary care units, cardiology/surgical/medical wards, day wards, older people’s health services, general practitioner, primary care nurse or from patient’s self-referral. Recommendation made by the medical practitioner responsible for patient care to attend cardiac rehabilitation may improve uptake and adherence to the programme [7, 277, 278].

There are few studies of referral patterns to cardiac rehabilitation programmes, although referral rates appear to be variable and in general low [11, 279, 280]. One recent study reported a referral rate of only 8.7% of patients eligible for a university-based cardiac rehabilitation program [279] Women appear less likely to be referred to Phase II rehabilitation than men [7, 64].

The referral process should be adapted to the local health care environment, but should be standardised to allow a systematic approach to referral. The referral process and documentation should be simple, easy to use and widely available.

It is recommended that a standard referral form is used. This form should include demographic and social details, admission and discharge dates, diagnoses, test results (including interventional procedures), relevant cardiac/medical history, medications on discharge and risk factor profile. Discharge information checklist and progress notes may also be included. A record of educational and exercise classes attended at Phase II should be maintained.

**Methods to deal with missed referrals**

The referral process should be the responsibility of one person; usually this will be the cardiac rehabilitation co-ordinator. Strategies should be in place to help prevent missed referrals. These may include:

- Regular communication with referral sources
- Retrospective and prospective audits with feedback to referral sources
- Incorporation of referral into discharge planning processes.

**Invitation to attend the programme**

On discharge from hospital patients should be seen by the cardiac rehabilitation co-ordinator or a designated person to discuss their cardiac event and risk factor management. The patient should then be given a written invitation with a proposed date to attend the programme, an explanation of the programme content and reasons why they should attend [7].

On the hospital discharge letter/planner, should include written instructions for attendance at a designated cardiac rehabilitation programme in their area. This will ensure that the patients’ general practitioner is aware of their patients’ enrollment in the programme. After discharge, patients should be contacted by the cardiac rehabilitation co-ordinator to reinforce the importance of attending the programme and assistance provided to facilitate attendance.

**Participation and monitoring of attendance**

A register should be kept of patients seen and their acceptance to attend the outpatient programme. Patients who decline to attend the programme should be asked for their reasons. It may be possible to address barriers to attendance for individual patients, such as transport.

Patients who express an interest in attending the programme but do not attend, or attend a few sessions then drop out, should be followed up. This will usually be the responsibility of the cardiac rehabilitation co-ordinator. Attempts should be made to find out their reasons for non-attendance and any possible help given to facilitate attendance.

**Entry to the cardiac rehabilitation programme**

Early enrolment in cardiac rehabilitation is advantageous. Patients may experience significant psychological problems in the early part of their recovery. Since exercise is based on light to moderate levels there is no need to wait until a greater level
of fitness is achieved before attending the programme. Patients may benefit socially from meeting other patients, realising that their problems are similar to other people’s.

Before commencement in the cardiac rehabilitation programme the patient should be assessed for cardiac risk factor management. This can be done prior to discharge from hospital and documented on the referral form by the cardiac rehabilitation co-ordinator or designated person or at a clinic visit.

Advantages of a pre-rehabilitation clinic based assessment
- Individual appointment to meet patient–spouse/partner and develop aims of rehabilitation
- Opportunity to individualise the rehabilitation programme
- Identify/ limit barriers to rehabilitation for individual patients.

Disadvantages of a pre-rehabilitation clinic based assessment
Obvious disadvantages include the time and cost required to adequately staff and run such a clinic, possible reduplication of clinical follow up and the need for close linkage with clinical care plan.

Ideally the cardiac rehabilitation programme should be tailored to the individual patient’s needs. A plan should be structured with the patient’s agreement following review of specific risk factors and management plan.

The patient’s spouse/partner (with the patients consent) should be included in the decision making process. Reception of information has been identified as the most significant concern for the spouse/partner of cardiac rehabilitation patients. The spouse/partner may retain more information following an education session and can therefore reinforce patient understanding [281].

6.3 PROGRAMME FORMAT

**Key point**
Cardiac rehabilitation should be viewed as a continuum through Phases I, II and III from initial admission to long term follow up. This requires co-ordination of the programme and integration between primary and secondary care.

<table>
<thead>
<tr>
<th>RECOMMENDATIONS</th>
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<tbody>
<tr>
<td><strong>D</strong> All patients following a coronary event should receive a recommendation and referral for rehabilitation from a clinician.</td>
</tr>
<tr>
<td><strong>D</strong> Prior to discharge, all eligible patients should receive a written discharge plan.</td>
</tr>
<tr>
<td><strong>D</strong> Prior to commencing Phase II cardiac rehabilitation, all patients should be assessed and a programme developed that meets their individual needs and sets realistic goals.</td>
</tr>
<tr>
<td><strong>D</strong> The programme co-ordinator should communicate in writing to the patient’s general practitioner and specialist advising details of enrolment, non-attendance or discharge from the programme.</td>
</tr>
<tr>
<td><strong>D</strong> All patients should receive written information regarding their nearest cardiac club.</td>
</tr>
</tbody>
</table>

Cardiac rehabilitation is a multidisciplinary approach that aims to modify cardiac risk factors through lifestyle change and improve functional capacity, self-confidence, and reduce psychological distress. The desired result is for patients to regain and maintain their best physical, emotional and vocational state [282, 283]. Rehabilitation programmes usually combine education and counselling, risk factor modification and exercise training.

**Phase I. Inpatient rehabilitation**
Patients may have been admitted or transferred to a coronary care unit, a medical or surgical ward, depending on their diagnosis or stage of management. Physician consideration of and recommendation for cardiac rehabilitation is

**KEY** - see page 10 for details
A Well designed meta-analysis (MA) of RCT, or a body or evidence which are consistently applicable
B Very well designed observational studies or extrapolated evidence from RCTs or MAs
C Lower quality observational studies or extrapolated evidence from B
D Non analytical studies or expert opinion
important [282]. Initiation and delivery of this phase may be undertaken by ward staff or designated cardiac rehabilitation professionals.

Aspects to consider for inpatient needs include:

- Reassurance
- Information
- Risk factor assessment
- Education
- Psychological stresses and responses
- Mobilisation
- Involvement and support of spouse, partner, whānau and family.

Ensure that the information the patient and his or her spouse, partner, whānau and family receive is tailored to the needs of the patient and is consistent. Privacy is important. As soon as the patient is able to leave the bed area, discussion should take place in a private area on the ward and not by the bed.

Discharge information (for discussion with patient, spouse, partner, whānau and family) should cover as a minimum:

- Physical activity plan until return for Phase II
- Smoking cessation plan and support (if appropriate)
- Angina action plan
- Medication (dosage and possible side effects)
- Feelings and relationships
- Work
- Driving
- Nutrition (simple changes until return for Phase II)
- Alcohol.

A written invitation to attend the Phase II cardiac rehabilitation programme should be provided prior to discharge [7].

Delivery of the requirements for this initial phase will depend on the resources available at each hospital. Ward staff are ideally positioned but may be limited by other patient care priorities with high patient turnover. A designated cardiac rehabilitation professional will generally be more appropriate [277], and they can then initiate a relationship with the patient, their spouse, partner, whānau and family which may facilitate subsequent attendance at the Phase II programme. A health professional who is involved in coordinating the Phase II outpatient programme can initiate a relationship with patient’s spouse, partner, whānau and family which may facilitate subsequent attendance at the programme.

Programme attendance

Effective referral processes from primary, secondary and tertiary care settings need to be available for patients.

The Cardiac Rehabilitation Co-ordinator, cardiologist/physician and general practitioner have a shared responsibility for referral of patients to cardiac rehabilitation. A clinician’s recommendation and referral are important factors in ensuring patient attendance [7, 277].

A database for cardiac rehabilitation services should be established to monitor attendance rates, establish effectiveness of the programme and ensure quality improvement.

A programme register should record details of patients who have been referred to the programme and of those who enrolled. Attendance at each session should be documented. Patients who have been referred to the programme but do not attend or who attend a few sessions should be contacted and encouraged to resume. Reasons for non-attendance and drop out should be documented. The programme co-ordinator should communicate with general practitioners and specialists advising them of their patients’ enrollment, non-attendance, drop out and progress through the programme.
Phase II. Outpatient programme
(from one or two up to twelve weeks after discharge)

The patient’s motivation to address lifestyle changes is strongest during this phase. The emphasis is on health education and resuming normal daily and physical activities [284, 285]. General practitioner referrals may be scheduled during this phase.

The programme may range from six to twelve weeks duration depending on the resources available.

Education topics should include:
- Modifiable and non-modifiable risk factors
- Nutrition (including meal planning, shopping and budgeting)
- Physical activity and exercise
- Stress management
- Psychological aspects
- Spouse, partner, whānau and family support
- Return to work
- Resumption of intimate and sexual activity
- Medication
- Coronary disease management including investigation, medical and surgical treatment
- Cardio pulmonary resuscitation (CPR) (for spouse, partner, whānau and family as well as the patient).

Before entry into the programme the patient and spouse, partner, whānau and family should ideally have a personal interview with a designated rehabilitation specialist to tailor the programme to individual needs and set realistic goals [284]. Tailoring the programme to the patient’s needs should empower the patient and improve adherence [7, 285]. A midpoint review of initial programme goals can aid adherence by the provision of feedback and encouragement.

Phase III. Long term maintenance

Phase III is a lifetime maintenance stage in which physical activity and positive lifestyle and psychological changes are supported in a minimally supervised or unsupervised setting. Cardiac club/support group networks throughout New Zealand are widespread. Currently there are more than 50 such groups and of these 40 are affiliated to the National Heart Foundation of New Zealand. The members of these groups provide emotional support to one another, learn new coping strategies, and discover ways to improve their condition and help others while helping themselves. Frequently people who attend such groups are more compliant with medications, maintain lifestyle changes and suffer less anxiety and depression.

6.4 INFORMATION NEEDS

Key point
Patient recovery may be enhanced by tailoring individual information needs and by using a variety of methods for information delivery.

RECOMMENDATIONS

B The educational component of a comprehensive cardiac rehabilitation programme should be individually tailored to the specific circumstances, readiness to change, cultural background and socio-economic circumstances of the patient.

B Varied methods of providing patients with information during their hospital stay need to be considered to optimise patient learning and recovery.

KEY - see page 10 for details
A Well designed meta-analysis (MA) of RCT, or a body or evidence which are consistently applicable
B Very well designed observational studies or extrapolated evidence from RCTs or MAs
C Lower quality observational studies or extrapolated evidence from B
D Non analytical studies or expert opinion
The educational process

Shorter hospital stays for cardiac patients sometimes prevent adequate risk factor education prior to discharge. Providers of health information to adults need to remember that adults learn in a different way from children. Adults prefer a style of learning that is based on their previous experience and environmental influences. Age, spousal support, personality, socioeconomic status, years of education and culture can all influence the adult learning process [281]. Meta-analysis of controlled trials of cardiac patient education [262 (1-)] has shown that cardiac education programmes provided a measurable impact on clinical and behavioural outcomes. Blood pressure and mortality were significantly improved. The average effects for morbidity and return to work were not significant. Behavioural outcomes were positive and significant for exercise and diet but not for smoking, drug adherence and stress measures. The review found that the mode of communication did not have an effect on the outcomes. This replicates an earlier overview of the effects of patient education on adherence to long term medication.

Kingsbury [286] refers to the barriers that could hinder the learning process. These include time (limited amount of time per patient), environmental (access to a room, lack of privacy), physical (fatigue, sensory deficits), psychological (emotional states, increased anxiety), sociocultural (differences in culture and economic status), patient labelling (increases the sick role, increases patient’s sense of guilt of having a preventable disease) and illiteracy, (language barriers, relying on printed material to convey teaching message).

The patient education process

General information

Leaflets and other written materials may be important sources of information for patients. The provision of leaflets is accepted as good practice although it is largely unsupported by published evidence [288]. In their study, Newens, et al, found that patient education following myocardial infarction was largely dependent on written information and the topics of exercise, diet, sexual activity, and stress were not routinely or opportunistically discussed by nurses or other hospital staff. They found that the existence of a dedicated rehabilitation nurse was associated with higher levels of nurse/patient contact and discussion.

Tooth & McKenna [281] refer to the concept of modelling by which patients learn through viewing other patients undergoing or explaining a procedure as it happened to them. This concept relies on the realism of the model with patients being more likely to learn from those of a similar age, gender and culture and is best effected by videotape, audiotape, pamphlet or other written literature.
With the short hospital stays and the brief time available for inpatient education, the role of the ward nurse in the early provision of effective patient education is important. This is particularly so when considering that less than fifty percent of eligible patients may actually attend Phase II cardiac rehabilitation [5].

Information needs post myocardial infarction

Wang [289] has reviewed patient perceptions of information needs in the coronary care unit, the step down ward and post discharge.

Coronary care unit

Common areas identified were factors contributing to the onset of heart disease, how to reduce the likelihood of recurrence and how risk factors effect the heart. Anatomy and physiology were ranked as second priority in two of the studies reviewed.

Step down unit and post discharge

Patients identified the risk factors, medications, and anatomy and physiology as the most important areas of information.

Differences in patients’ and nurses’ perceptions

Three of the studies reviewed by Wang [289] found that both patients and nurses felt that all categories of information were important. Patients ranked risk factors as the most important category, whereas nurses felt medication was the foremost priority. In another study of perceived learning needs, Ashton [290] found that men ranked risk factors as the most important category, but women felt that medication was most important. Wang [289] also found that patients felt that it was more realistic for the learning process to take place after discharge.

Information needs of coronary artery bypass grafting patients

A study which assessed the impact on patients of receiving an audiotape of information focusing on expected physical symptoms and their management in addition to usual care, found positive effects on physical functioning at one month following surgery [285]. Audiotaped information could be an inexpensive and feasible approach to provide discharge information, especially with the relatively short stay for many patients after such surgery.

A randomised controlled trial, which looked at the effect of two experimental video tapes with different approaches for preparing coronary artery bypass patients for the post hospital recovery period, found that patients who viewed either of the videos had higher self efficacy in relation to low fat dietary recommendations [115 (1+)]. Those patients who viewed the video that portrayed recovery as a time of ups and downs, significantly reported more frequent moderate exercise at one month and more frequent strenuous exercise at three months. Another controlled study using experimental videotapes with different approaches to help prepare coronary artery bypass patients for surgery and the in hospital recovery period [291 (1-)], found that patients viewing any of the three experimental videos reported feeling significantly better prepared for the recovery period. The patients also demonstrated higher self efficacy with the use of the incentive spirometer, had shorter stays in intensive care, and were discharged from hospital sooner.

For patients undergoing elective surgery, the waiting time can be utilised to enhance their post-operative recovery. In a randomised trial, patients waiting for elective coronary artery bypass grafting received exercise training twice a week, education and reinforcement and a monthly telephone call from a nurse as opposed to usual care [292 (1+)]. These patients were found to stay one day less in hospital overall [292 (1+)].

Information needs of angioplasty patients

Patients undergoing coronary angioplasty may be less motivated to modify risk factors because of a perception of being less sick than other cardiac patients. They may also believe themselves cured by the intervention. The length of hospital stay of this patient group is generally brief, so opportunities for patient education are particularly limited [281].

Tooth & McKenna [281] recommend that education for the coronary angioplasty patient involve a pre-admission clinic with continuing education following the procedure, and information offered post discharge. Angioplasty patients may not require all the sessions offered to the myocardial infarction or CABG patients in the cardiac rehabilitation programme. However identification of their educational needs should enable them to attend appropriate sessions. In a qualitative study Gulaniick [293] found that in focus groups of angioplasty patients, non cardiac rehabilitation participants ‘felt cheated’ at not having been exposed to such supportive and educational environments.

Information needs of partners

Receipt of information has been identified as the most significant concern for spouses/partners of cardiac patients. The spouse/partner may retain more information following an education session and can therefore reinforce the information to
the patient. In a focus group of post angioplasty patients, men identified their partner as the source of necessary information on diet [293].

The needs of the partner have been found to vary over time. Dickerson [294] discovered that the needs varied according to the phase their partner was in. She identified three distinct Phases: 1. Finding out; 2. Hospitalisation; 3. Discharge, recovery, and return to normal. Phase one was dominated by a need for accessible information, the convenience of hospital facilities such as telephones to make arrangements, and the opportunity to have other family members around for support. Phase two was dominated again by the need for information particularly around discharge and homecoming and the need to have access to volunteers who have had first hand experience of cardiac illness. Phase three was characterised by a need to talk in a safe environment, vent feelings and ask questions. Health professionals can assist by offering support groups for spouses and partners.

6.5 SETTINGS FOR CARDIAC REHABILITATION

**Key point**
Offering cardiac rehabilitation in different settings will widen choice, improve access and uptake.

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<th>RECOMMENDATIONS</th>
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<tbody>
<tr>
<td><strong>D</strong> Hospital based cardiac rehabilitation must be comprehensive and should be individualised to meet the needs of each patient.</td>
</tr>
<tr>
<td><strong>B</strong> Cardiac rehabilitation programmes should be offered within the primary care setting for which workforce development is required.</td>
</tr>
<tr>
<td><strong>D</strong> Home based cardiac rehabilitation is recommended for patients who are either unable to attend or unwilling to use a hospital based service.</td>
</tr>
</tbody>
</table>

To increase uptake there is a need to offer a range of cardiac rehabilitation programmes. The majority of programmes in New Zealand are hospital-based [295]. Community cardiac rehabilitation will widen choice and access and is in line with the Government’s primary health care strategy.

**Cardiac rehabilitation within the community care setting**

Placing cardiac rehabilitation within the primary care setting should increase the accessibility of the service. In a recent audit of cardiac rehabilitation facilities in New Zealand, distance from the programme was one of the reasons given for exclusion from the programme by 35% of respondents [296]. For many people, a hospital visit involves extra transport and parking costs which can preclude attendance. The hospital service invariably takes place during the working day adding to the inconvenience. In a qualitative study looking at the role of the primary care nurse following up patients with heart disease, accessibility and contact with a health professional who had knowledge and social and emotional skills were listed as benefits of the service [297].

Continuity of contact is an important factor for adherence to lifestyle modification and medication [298]. The primary health care team is in a unique position to offer this. Modification of lifestyle can take time, frequently longer than the length of the average rehabilitation programme. Continued support from a familiar health professional is important. The role of the primary care nurse in cardiac rehabilitation however, is somewhat different from their usual primary prevention role. The challenge with secondary prevention is to enable the patient to sustain change and encourage adherence to lifestyle changes and medication.

The SHIP project [299 (1+)] showed that although the liaison nurse was effective in promoting follow up in general practice, this did not result in improved health outcomes, possibly because of lack of individualised advice. This highlights the need for the upskilling of the workforce in the primary health care setting to enable them to provide the benefits of cardiac rehabilitation effectively in a setting that is more accessible and convenient for patients.

**Home-based cardiac rehabilitation programmes**

Facilitating cardiac rehabilitation within the home environment enables patients who are unable due to domestic and/or work commitments, or people who are not comfortable in the group situation, to attain the benefits of cardiac rehabilitation. An individualised plan can be developed by the cardiac rehabilitation nurse/practice nurse for the patient to follow. Monitoring
of the patient’s progress towards the agreed goals can take place at the patient’s home, at the rehabilitation programme or primary health care centre, or by telephone.

Home visits in the immediate discharge period are an excellent way of providing support and education to individuals and families following a cardiac event. A pilot project in London utilising the skills and knowledge of district nurses and health visitors showed there was an increase in the attendance at the cardiac rehabilitation programme from 55% to 75% [300]. These health professionals have knowledge of health promotion, secondary prevention, social security benefits and the community resources available to patients. The liaison between a community based service and the cardiac rehabilitation programme can help to bridge the divide between the secondary and primary care services.

**Use of the telephone in cardiac rehabilitation programmes**

In the rehabilitation setting the telephone can be used to:

- Communicate information and instructions
- Aid patients with problem solving
- Provide support and reassurance
- Teach skills
- Offer feedback and promote positive reinforcement
- Collect data
- Provide surveillance.

The advantages of the telephone in an era of cost containment and short hospital stays have been outlined [301] and include:

- Decreasing the logistical burden of travelling long distances to carry out home visits
- Decreasing waiting times in outpatient clinics
- In most cases providing the patient with immediate access to a health professional.

There have been no studies to establish the ideal frequency of telephone contact. Frequency will depend on the needs of the individual and will have to be tailored accordingly. The average duration of follow up telephone contact for multiple risk factor interventions has been reported as about ten minutes [302].

Cardiac rehabilitation teams should develop a policy regarding the number of times they will attempt to contact a patient before they record it as a ‘missed contact’.

**Cardiac clubs, support groups and maintenance programmes**

New Zealand has more than 50 such groups nationally. The majority are affiliated to the National Heart Foundation of New Zealand and are supported by the Affiliation Programme Co-ordinator. The Heart Foundation provides guidelines for establishing a cardiac group and also guidelines for the affiliated groups to follow once they have been set up.

A literature search showed only sparse data on the benefits of these groups to people post cardiac event. One qualitative research paper [303] drew attention to the themes that were apparent in comments including caring, belonging, sharing and confidence. These groups may be valuable, particularly for attendees who may have missed Phase II cardiac rehabilitation for various reasons. These groups provide an important forum for social support, physical activity, education and secondary prevention.

Most of the groups in New Zealand receive support from health professionals in their area to facilitate the educational component. The Affiliation Programme Co-ordinator assists in the forming of new groups, provides training sessions for members, provides a bi-annual newsletter and regional seminars which provide the chance to network.
6.6 THE MULTIDISCIPLINARY TEAM

Key points
Cardiac rehabilitation involves a number of disciplines through the various phases. These numerous disciplines all have potentially important roles to improve patient outcomes. Coordination and teamwork are essential to optimise patient outcomes.

RECOMMENDATION
A range of knowledge and skills are recommended for a comprehensive cardiac rehabilitation service. The disciplines of medicine, cardiology, dietetics, nursing, exercise physiology, occupational therapy, physiotherapy, psychology and social work all contribute to ensuring a comprehensive service. The model chosen locally will vary but all disciplines included need to be committed to a co-ordinated and collaborative approach.

Cardiac rehabilitation is a multidisciplinary service.

The World Health Organisation defines cardiac rehabilitation as:
The rehabilitation of cardiac patients is the sum of activities required to influence favorably the underlying cause of the disease, as well as the best possible physical, mental and social conditions, so that they may, by their own efforts preserve or resume when lost, as normal a place as possible in the community. Rehabilitation cannot be regarded as an isolated form of therapy but must be integrated with the whole treatment of which it forms only one facet. (WHO 1993)

Stokes [304] points out the complexity of the service required and the scope of the knowledge and skills necessary to address all the elements in cardiac rehabilitation. As a result there is a need for a range of disciplines to input into the service, including cardiology, dietetics, nursing, exercise physiology, occupational therapy, physiotherapy, psychology, social work and hospital chaplaincy. There is a lack of evidence to support which disciplines are essential to the team. No single composition of a team is best. The model chosen will depend on the resources available and the way the cardiac rehabilitation programme fits into the integrated service for cardiac patients in a particular area. However, everyone on the team must be committed to the concept of a co-ordinated and collaborative approach [305].

Competency
Clinical effectiveness has been described as ‘doing the right thing to the right person at the right time’. Stokes [304] suggests that the definition may be lacking two elements: who it is done by and their competence to do it.

Many professionals do not, as yet, have documents specifically designed to communicate their occupational standard. This makes it difficult to find out what qualified people are competent to do and to judge the validity of their assessment systems [306].

Cardiologist or physician
Willison and Soumerai, et al. [307] found overall that the use of consultations between general physicians and cardiologists resulted in improved quality of care. This could be a result of the increased use of recommended therapies following the consultations. Casale [308] found that treatment by a cardiologist or a physician treating a high number acute myocardial infarction patients was an independent predictor of lower in-hospital mortality. Nash [309] also found that physician caseload was of significant importance. Nash [310] showed that patients treated by cardiologists had a shorter length of stay. Chen [311] suggested that the better outcomes associated with cardiologists’ care may be related to their greater use of guideline supported therapies.

Cardiac rehabilitation programme co-ordinator
The team can be led by any of the disciplines involved. The programme co-ordinator needs to have effective management skills, strong leadership qualities, capable budget management skills and posses strategic vision for the programme. The rehabilitation co-ordinator can draw on the skills of the other team members when delivering the programme and should not need to assume any of the many roles required in the service delivery beyond that of her/his own professional training [312].
The role of the cardiac liaison nurse

The Southampton Heart Integrated Project [299 (1+)] was able to show that the intervention of a liaison nurse was effective in ensuring that practice nurses follow up patients after hospital discharge following a myocardial infarction or newly diagnosed angina. In another review of the same study from the practice nurse perspective, liaison nurses were shown as effective in bridging the gap between hospital and community care and in providing educational support to nurses working in the community [313].

The role of the primary health care team in cardiac rehabilitation

An in depth analysis of the qualitative findings of the SHIP project, Bradley [314] suggested that for primary care nurses to be more effective in their follow up of patients with established heart disease, the following requirements should be met:

- Status within the primary health care team must be developed
- Training must address knowledge and skills of cardiac assessment, drug use and adherence, as well as facilitating behaviour change in relation to lifestyle
- Opportunity must be given for nurses to give continuity of care
- Improved integration at the primary-secondary interface is required, with secondary care staff clearly recognising the role of the practice nurse.

Wenger [315] highlighted the benefits of non-medical staff in the primary care setting monitoring patients, noting that the legal constraints placed on their decision-making can increase the rigor with which they follow protocols and guidelines. In one referenced study, patients randomised to the nurse intervention were 2.5 times more likely to reach their target cholesterol level.

The role of the exercise physiologist

Exercise physiologists have been trained to lead and prescribe exercise for persons with medical limitations, especially persons with cardiorespiratory diseases. Physical education graduates who have as part of their course taken a paper in exercise prescription would also be qualified to prescribe exercise within a cardiac rehabilitation programme. Physiotherapists undertake specific theoretical and clinical modules as part of their four year programme which enables them to provide accurate/safe and effective exercise prescription for specific cardiac populations as well as tailoring the prescription for the many elderly patients presenting with multiple co-morbidities. These health professionals have the knowledge to design exercise prescriptions appropriately based on the clinical state of the patient and the exercise test results, evaluate the patient’s responses to exercise and adapt the prescription suitably as well as assist in the ongoing education of patients and their partners.

The role of the physiotherapist

Generally in New Zealand the physiotherapist supervises the exercise session in a cardiac rehabilitation programme. The role of the physiotherapist is to assess the physical needs and cardiovascular fitness of patients prior to the programme, to provide a safe effective programme promoting reconditioning and subsequently analysing the patient’s response to exercise. Physiotherapists are trained in the scientific basis of exercise testing and prescription, having a role with patients presenting with multiple co-morbidities and the elderly. They have the ability to adapt programmes appropriately for these patients. Physiotherapists take a holistic approach focusing on health promotion, rehabilitation and performance enhancement to facilitate the achievement of individual goals, return to work and normal activities. Physiotherapists also provide ongoing education for patients and their families encouraging them to maintain a healthy lifestyle.

The role of the psychologist

The psychologist directs the treatment of psychosocial problems that accompany heart disease and promotes the adoption of healthy lifestyle behaviours. The psychologist is involved in psychological assessment of referred patients and psychological treatment. Psychological treatment can involve conducting a group session as part of one of the education classes, or in one-to-one sessions with patients and/or their spouses, partners, whānau and family.

The psychologist can also be involved in indirect patient care. She or he can be involved in promoting a more patient centred care climate and in the upskilling of staff involved in the promotion of lifestyle changes with the patients.

The role of the dietitian

A Cochrane systematic review [316] found that dietitians were better than doctors in lowering blood cholesterol through dietary change in the short to medium term but there was no evidence that they were better than self help resources. There was no evidence that dietitians provided better outcomes than nurses.

KEY - see page 10 for details
A Well designed meta-analysis (MA) of RCT, or a body or evidence which are consistently applicable
B Very well designed observational studies or extrapolated evidence from RCTs or MAs
C Lower quality observational studies or extrapolated evidence from B
D Non analytical studies or expert opinion
The role of the occupational therapist
Occupational therapists will often have a role in the rehabilitation of specific individual cases, particularly in the presence of significant co-morbidity, but will not necessarily be regularly included in the multidisciplinary team.

The role of the ward nurse
With shorter hospital stays following a cardiac event, the window of opportunity for the initial education of patients is brief. The ward nurse is ideally placed to augment the education given by the cardiac rehabilitation nurse, the cardiologist, the dietitian and the pharmacist. The ability of the general ward nurse to provide such support may be limited by training and experience, and competing patient demands.

The role of the pharmacist
A recent Cochrane review of the role of the pharmacist in the community concluded that pharmacists could reduce health service use and lead to improved patient outcomes [317]. Other studies suggest that including the pharmacist as part of the team may result in increased efficacy and an optimisation of drug regimes [318].

The role of the social worker
Cardiac rehabilitation programmes seek to enhance the vocational and psychosocial status of patients. This involves where possible, the return of patients back to the roles they occupied prior to the cardiac event. The social worker is well qualified to assist in this process and will play an important role in many individual cases.

The role of the lay health worker
Community health workers play an important role in bridging the language and cultural divide between middle class health professionals and ethnically and culturally different patient populations [318].

The role of the mobile Māori disease state management nurse
These nurses are advanced practitioners. The aim of the initiative is to improve the health of Māori adults through the provision of a mobile nursing service that will have a focus on heart disease, as well as diabetes and respiratory disease. They liaise with other healthcare services, develop the knowledge of the whānau and improve access to the full range of primary and secondary care services. They also co-ordinate services with other health care providers and the development of plans of care with whānau in ways that are culturally appropriate.
SPECIFIC POPULATIONS

Key points

Women, the elderly, rural and socio-economically disadvantaged patients require special attention.

Patients with diabetes and cardiovascular disease have particularly high risk of recurrent events.

Spouse, partner, whānau and family are affected by the cardiac event and can make important contributions to the rehabilitation of their family members.

RECOMMENDATIONS

D Women’s needs should be addressed in comprehensive cardiac rehabilitation programmes.

D All patients should be referred to comprehensive cardiac rehabilitation irrespective of age.

D Disadvantaged patients may need extra support to attend and complete programmes.

D Rural patients need options for rehabilitation at home or within a primary care setting.

D Patients with diabetes warrant priority for rehabilitation.

D Spouse, partner, whānau and family should be offered access to an appropriate support group and be involved in all stages of the rehabilitation process.

Women

Most research on the impact of cardiac rehabilitation has focused on white, middle class males. Relatively little is known about how women cope physically, psychologically and socially with a heart attack or coronary bypass surgery.

A survey of patient characteristics at enrolment into cardiac rehabilitation programmes [9], found women to be older, more likely to be single and to have more of the traditional risk factors than men. A retrospective chart review of patients admitted to an inpatient rehabilitation unit following coronary bypass surgery also found that a greater number of women lived alone [319]. An observational study carried out by O’Farrell [320] noted that at baseline, men and women had similar measurements for body mass index, blood pressure and glucose levels. Women however, had higher mean baseline measures for total cholesterol (5.6 mmol/L vs. 5.0mmol/L P<0.001) and low density lipoprotein cholesterol (3.4 mmol/L vs. 3.1 mmol/L P=0.012), but also higher density lipoprotein cholesterol (1.2 mmol/L vs. 1.0mmol/L, P<0.001). Men had a higher exercise capacity than women coming into the programme.

Psychosocial differences also exist at programme enrolment. Women have been found to report significantly lower perceived exercise tolerance and more functional and...
psychosomatic complaints. Women were also more anxious and scored higher on social inhibition and vital exhaustion [321]. In a review of the literature referring to women and cardiac rehabilitation Fleury and Cameron-Go [322] found that women were more likely to be diabetic, obese and hypertensive but were less likely to participate in or be referred to cardiac rehabilitation programmes [237].

A feature of cardiac rehabilitation that women particularly appreciate is the positive encouragement received from staff. Their preference for not feeling pain or fatigue while exercising were not well met in the cardiac rehabilitation setting [285, 322].

Women were less likely to adhere to the walking regimes recommended by their physicians following bypass surgery, but they were found to perform house work during the recovery period. It is possible that the reason that they return to this activity as opposed to their walking regime is due to the feelings of uselessness and stress because other family members are undertaking the task, or the task is left undone [322].

Women have reported more support needs up to six weeks post myocardial infarction [323, 324]. These increased needs can present as various forms of emotional and physical support as a result of their mean older ages and higher levels of social isolation.

A randomised controlled trial which focused on women post coronary bypass surgery, found that a nurse directed behavioural programme in the home, based on the self efficacy theory, assisted women to decrease dietary intake of fat, quit or decrease smoking and increase levels of exercise [325 (1+)].

O’Farrell [320] found that following a programme of cardiac rehabilitation there were no significant differences in improvement in MET levels achieved for women compared to men. Men and women were also found to improve in health related quality of life scores, although women reported less increase than men in their level of overall vitality.

The elderly
The proportion of elderly in the population is increasing, but robust evidence is lacking regarding their specific needs. There is evidence that the elderly can improve in functional capacity through participation in cardia rehabilitation programmes. However, the elderly are not actively referred to cardiac rehabilitation or actively encouraged to pursue this intervention.

The disadvantaged patient
A retrospective study of the influence of socio-economic deprivation on the uptake of cardiac rehabilitation found that deprivation score was not a significant factor in whether a patient was referred. Uptake of cardiac rehabilitation was found to be significantly associated with four factors [11]. These were: type of consultant; hospital; deprivation; patients with peripheral arterial disease. Once the rehabilitation programme was commenced, only deprivation was an independent factor for completion. People with low socio-economic status can often perceive that they have low control over their lives and this can impact on their conviction that they can make lifestyle changes [326].

Rural populations
There are a range of social, economic, geographical, infra-structural and cultural factors that impinge on the cardiovascular health of rural populations:
- **Diet.** Difficulties in accessing food retailers and fresh fruit and vegetables
- **Transport.** Problems in terms of accessing health care services
- **Employment.** Limited employment opportunities, low wages
- **Poverty.** Associated problems with diet, transport and employment
- **Health care services.** Fewer services, difficulty with access, less consumer choice, difficulty in recruiting and retaining healthcare staff in rural areas.

In a retrospective study to identify the factors which influence attendance at a rural Australian cardiac rehabilitation programme, Schulz & McBurney [327] found the following factors to be significantly related to attendance; being referred to the programme; proximity; living with a partner and being male. Cardiac rehabilitation programmes that cater for a population from a rural area need to offer a flexible service designed to meet the needs of their user group.

People with diabetes
Diabetes is a significant cardiovascular risk factor which is often clustered with other risk factors. In a prospective study Milani [328] found that enrolled diabetic patients were more likely to be female, hypertensive and obese. In addition, the diabetic...
patients had reduced exercise capacity, lower HDL, higher LDL and increased triglyceride levels. The diabetic patients also demonstrated higher levels of depression.

In a retrospective study, Suresh [329] found that aspirin and beta blockers were particularly under prescribed in diabetics compared with other patients enrolled in cardiac rehabilitation and smoking cessation was less successful. The study also highlighted the higher mortality at one year of the diabetic patients, most of which was associated with cardiovascular disease.

Considering the high incidence of silent ischaemia in diabetic patients, a graded exercise test should be undertaken by all patients planning to participate in physical activity programmes more strenuous than walking.

The needs of the spouse, partner, whānau and family

The spouse, partner, whānau and family members are effected by the cardiac event. Rehabilitation programmes need to cater for the needs of the spouse, partner, whānau and family and provide:

- A safe forum to express their feelings of sadness, fear, and anger, and a chance to tell their story and be the focus of attention
- One of the major concerns of spouse, partner, whānau and family members of cardiac patients is the possibility of sudden cardiac death. Training in cardiopulmonary resuscitation (CPR) can alleviate this concern considerably.

Spouse, partner, whānau and family members need to be told how important their support is to the patient and they need to be made aware that this support may be needed long-term. They should be made aware of the physical and psychological impact that the cardiac event may have on their relative. The potential physical problems are weakness due to the event and the time spent in hospital, and angina on exertion. Common psychological reactions include mood swings, irritability, tearfulness, poor concentration, frustration and sleep disturbances. Many patients are also acutely aware of all aches and pains following discharge and this can increase levels of anxiety. Informing the patient and their partner of these potential problems will provide better insight and assist recovery.
The burden of cardiovascular disease falls disproportionately on Māori. Therefore it must be ensured that Māori receive timely, high quality and culturally appropriate cardiac rehabilitation services. Cardiac rehabilitation programmes must be accessible and meet the needs of Māori patients and their whānau.

Māori leadership and participation in the development, purchasing and provision of cardiac rehabilitation programmes in New Zealand is necessary.

**RECOMMENDATIONS**

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<tr>
<td><strong>D</strong></td>
<td>The development of Māori provider cardiac rehabilitation programmes is recommended.</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Mainstream cardiac rehabilitation programmes must be reoriented to meet the needs of Māori.</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>It is necessary that Māori have input into the policy and decision making processes of cardiac rehabilitation services.</td>
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**How can disparities for Māori in cardiovascular disease be addressed through the process of cardiac rehabilitation?**

The solution to this question is neither simple nor straightforward. However, this section of the guidelines provides some clear directions by presenting health professionals involved in cardiac rehabilitation with information and recommendations from a Māori perspective. As such, this chapter cannot strictly be considered a guideline, but rather a pathway toward achieving best practice. This chapter will help identify specific ways by which cardiac rehabilitation programmes can re-orient their service to be more responsive to meeting Māori needs. It will also identify some of the key issues to be addressed to support Māori to achieve whānau (family) health and wellbeing, and remove inequalities in Māori cardiovascular disease status.

There is no doubt that the process of rehabilitation for people following a cardiac event could be better. But for Māori, this will involve commitment to a different process. Such enormous scope for Māori health gains can be made through cardiac rehabilitation. Cardiac rehabilitation programmes can play a key role toward achieving this goal. However, there is a need for a more organised process of cardiac rehabilitation for Māori.

The Treaty of Waitangi and ‘He Korowai Oranga, Māori Health Strategy’ [330] formed the foundation for the development of this section. It drew on the knowledge of the four Māori members of the Cardiac Rehabilitation Guidelines Committee, with input from the Māori Cardiovascular Advisory Group and other Māori health professionals, researchers and colleagues. One caveat therefore is that many Māori who might have made a significant contribution to these guidelines have not had the opportunity to do so. A request for feedback, particularly that from Māori consumers, is therefore
encouraged. For Māori to attain a sense of ‘ownership’ of these guidelines, Māori must assist in their ongoing refinement, implementation and monitoring.

Another obvious caveat is that there is limited scientific evidence on which to make recommendations on best practice for the cardiac rehabilitation needs of Māori. Therefore most recommendations in this section are not supported by appropriate evidence. This is not an excuse for inaction, but instead identifies an important gap in knowledge that requires research.

Despite these shortcomings, it is hoped that this chapter of the guideline provides the beginnings of a process for cardiac rehabilitation to help remove inequalities in cardiovascular disease outcomes for Māori in New Zealand.

Tēnā koutou katoa.

Profile of cardiovascular disease for Māori – key data
Making Māori priority
The burden of cardiovascular death and disease falls disproportionately on Māori in New Zealand. Table one presents recent statistical information that reflects this.

Table 7: Death rates and rate ratios from selected cardiovascular diseases for Māori and non-Māori, 1996

<table>
<thead>
<tr>
<th>Disease</th>
<th>Māori male rate</th>
<th>non-Māori male rate</th>
<th>Male rate ratio</th>
<th>Māori female rate</th>
<th>non-Māori female rate</th>
<th>Female rate ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary heart disease</td>
<td>258</td>
<td>142</td>
<td>1.7</td>
<td>150</td>
<td>64</td>
<td>2.3</td>
</tr>
<tr>
<td>Hypertensive disease</td>
<td>17</td>
<td>4</td>
<td>4.3</td>
<td>13</td>
<td>3</td>
<td>4.3</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>48</td>
<td>39</td>
<td>1.2</td>
<td>46</td>
<td>36</td>
<td>1.2</td>
</tr>
<tr>
<td>Rheumatic heart disease</td>
<td>10</td>
<td>2</td>
<td>5.0</td>
<td>8</td>
<td>2</td>
<td>4.0</td>
</tr>
<tr>
<td>Cardiomyopathy</td>
<td>33</td>
<td>5</td>
<td>6.6</td>
<td>9</td>
<td>1</td>
<td>9.0</td>
</tr>
</tbody>
</table>

Source: Modified from Hay 1999 [240]
Note: Rate per 100,000, age-standardised to Segi’s World Population, rounded.

Premature death from coronary heart disease among Māori is significant as illustrated in Figure 1.

Figure 2: Coronary heart disease death rates by age group and ethnic group, 2001

Source: Modified from Hay 2002 [331]
Note: Rate per 100,000, age-specific, rounded

28-day case fatality rates following an acute coronary event are 65% for Māori, compared to 45% for non-Māori [332].

KEY - see page 10 for details
A Well designed meta-analysis (MA) of RCT, or a body or evidence which are consistently applicable
B Very well designed observational studies or extrapolated evidence from RCTs or MAs
C Lower quality observational studies or extrapolated evidence from B
D Non analytical studies or expert opinion
The prevalence of smoking [240], diabetes [333], and hypertension with multiple cardiovascular risk factors [334] is much higher for Māori compared to non-Māori.

Population attributable risk for Māori was calculated as 44% for smoking and coronary heart disease, and 58% for raised serum cholesterol and coronary artery disease [335], indicating enormous scope for heart health gains to be made.

Since the late 1960s (when CHD death rates peaked), age-standardised death rates for CHD have fallen at a slower pace for Māori compared to non-Māori [336].

Given the prevalence of cardiovascular diseases among Māori, and the enormous disparities in cardiovascular disease outcomes, one would expect to find a level of health service intervention which matches that need. To the contrary, Māori have significantly less access to cardiovascular procedures than non-Māori, as shown in Table 8.

Table 8: Cardiovascular procedure rates and rate ratios for Māori and non-Māori, 1996/97

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Māori rate</th>
<th>non-Māori rate</th>
<th>Rate ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>CABG</td>
<td>4.6</td>
<td>6.5</td>
<td>0.7</td>
</tr>
<tr>
<td>Angioplasty</td>
<td>4.2</td>
<td>8.8</td>
<td>0.5</td>
</tr>
<tr>
<td>Carotid endarterectomy</td>
<td>0.3</td>
<td>1.6</td>
<td>0.2</td>
</tr>
<tr>
<td>Pacemaker implant</td>
<td>2.3</td>
<td>3.3</td>
<td>0.7</td>
</tr>
</tbody>
</table>

Source: Modified from MOH 2001 [337].

Note: Rate per 10,000, age-standardised, not adjusted for cardiovascular disease prevalence among Māori and non-Māori populations.

The Treaty of Waitangi provides a suitable framework within which to consider this data. It highlights that making Māori priority is essential. Clearly, real and substantive cardiovascular health inequalities exist that require correcting. Within cardiac rehabilitation the scope for this correction is large.

The socioeconomic and ethnicity context

Socioeconomic status is a powerful determinant of health [338-342]. There is a clear and significant relationship between deprivation and the likelihood of dying from cardiovascular disease – those who are more deprived are more likely to die of the disease [343-347].

Using NZDep96, Figure 3 shows how differently Māori and non-Māori are distributed across the range of deprivation deciles in New Zealand – the distribution for Māori is sharply skewed with over one-half of the Māori population living in the areas represented by the three most deprived deciles.

Figure 3: Distribution of Māori and non-Māori populations by deprivation decile

Source: Modified from Reid 2001 [348].
This figure demonstrates an unjust socio-economic distribution that is often forgotten in the day-to-day decision making of health professionals and clinicians. Questions of why Māori have failed to modify their lifestyles, or why the mainstream approach has been unsuccessful with Māori need to be reformed. Instead, we must start to question why it is that deprivation is unequally distributed by ethnicity and why there are such wide ethnic variations in health service practice and provision in New Zealand. This suggests that strategies to reduce the excess burden of cardiovascular disease among Māori must take a fundamental look at the possible causes, as well as cardiac treatment and rehabilitation services.

It is important to emphasise however, that not only are Māori over-represented in deprivation, but also experience further health inequalities over and above those experienced by non-Māori within the same socioeconomic groups [159, 349-351]. That is, Māori health outcomes are worse than non-Māori outcomes at all levels of deprivation. This is not acceptable. Removing these disparities is a necessary goal of Māori health development, and a logical starting point for effective interventions.

While it is beyond the scope of these guidelines to provide detailed recommendations on public policy, it is recommended that the importance of macro-economic and social policies that affect Māori are not neglected. This focus for intervention demands political will for the development of whānau, hapū (groups of whānau), iwi (tribe) and Māori communities, and commitment to the Treaty of Waitangi. An opportunity exists for cardiac rehabilitation professionals to engage in a course of action by taking a leadership role in addressing the wider determinants of Māori health and co-ordinating the delivery of services to whānau across sectors. But the task is to use this opportunity and information and apply it in practice.

Reorienting cardiac rehabilitation services – key issues

There are a number of issues for cardiac rehabilitation programmes to consider in order to meet the needs of Māori [352]. These can be considered under the following subheadings.

1. Service provision
2. Role of the health professional
3. Provision of information
4. Role of research.

Service provision

In order to address the full picture, both the development of Māori providers and improved mainstream provider responsiveness to Māori needs must be actioned. A Māori provider is defined as being Māori, providing a service or programme that is controlled by Māori, delivered by Māori and is primarily for Māori, and delivering Māori programmes or services [353].

Māori seek to exercise tino rangatiratanga (self-determination) by actively participating in and controlling the provision of health services for Māori. Therefore, Māori must be funded as service providers in the area of cardiac rehabilitation, and the development of new Māori cardiac rehabilitation programmes should be viewed as a priority by purchasers.

Building the capacity of the Māori cardiovascular workforce is an urgent prerequisite. Cardiac rehabilitation programmes must plan and provide resources for Māori staff recruitment, advancement and retention. Māori cardiovascular workforce development initiatives such as targeted training programmes and scholarships are necessary.

One of the most important ways a cardiac rehabilitation programme can improve its responsiveness to Māori is to address whānau.

During hospitalisation when the patient occupies the sick role and is perceived to be passive in the hands of health professionals, whānau need to be consulted and involved in all decision making. Furthermore, hospital staff must support and recognise the skills and contribution of whānau members who take on a primary caregiver role. Issues of tapu (sacredness) and noa (free from tapu) in relation to hospital care can be distressing for Māori and detrimental to wellbeing. Whānau members are able to deal appropriately with hospital practices that compromise cultural safety, such as the removal of commodes at mealtimes, or assistance with personal cares.

Hospital and cardiac rehabilitation programme staff can also support whānau by informing them of their options. Examples may include access to the services of a Māori liaison officer, provision for whānau to be accommodated on the ward or in the hospital grounds, and information on available financial allowances for care, transport or accommodation in the community.

1 We wish to acknowledge Helen Moewaka Barnes, Megan Tunks and participants of the study ‘Māori me te ikura roro – Māori and Stroke’ [352] for highlighting and exploring some of these areas.

2 A Māori provider is defined as: being Māori; providing a service or programme that is controlled by Māori, delivered by Māori, and is primarily for Māori; and, delivering Māori programmes or services [353].

KEY - see page 10 for details
A Well designed meta-analysis (MA) of RCT, or a body or evidence which are consistently applicable
B Very well designed observational studies or extrapolated evidence from RCTs or MAs
C Lower quality observational studies or extrapolated evidence from B
D Non analytical observational studies or expert opinion
Other examples of increased mainstream service responsiveness would include attention to the way in which a Māori patient’s age, occupation, area of residence and socioeconomic status are likely to influence their ability to access and use cardiac rehabilitation programmes. Innovative solutions could include conducting programmes and activities in conjunction with Māori groups in Māori settings such as marae (meeting place/ground), Māori sports clubs, workplaces or schools that promote whānau participation. Another response is to provide Māori patients with increased support (such as follow-up telephone calls, or access to nicotine replacement therapy) to help sustain difficult lifestyle changes, at the same time as fostering ongoing attendance. Options for home visiting, or provision of transport (especially in remote rural areas), and/or resourcing of whānau who provide transport, are other practical measures that require consideration.

**Role of the cardiac rehabilitation health professional**

The role of cardiac rehabilitation programme health professionals is manifold, and may include and span:

- Referral and referral follow-up
- Expert assessment/evaluation and management/treatment
- Patient advocacy - working across disciplines bearing in mind that Māori (as ‘high risk’ patients) require increased access to specialist investigations, treatment, management and follow-up
- Comprehensive evaluation of a Māori patient’s risk factor profile
- Establishment of a programme for secondary prevention that incorporates a whānau and lifecourse approach, rather than a medical ‘compliance’ approach
- Working to ensure all necessary information and support is provided to Māori patients and whānau
- Liaising and coordinating with all other cardiac rehabilitation programme team members to ensure continuity of care
- Education and counselling of patients and whānau
- Documentation of the care plan, including reviewing/altering the plan to suit patient and whānau needs
- Responsibilities for programme audit, including the evaluation of Māori specific performance indicators.

These roles are not exhaustive and it is unrealistic to expect that all cardiac rehabilitation professionals possess advanced skills in all areas. However, it is not unreasonable to expect that they have some skill in most roles, and are able to identify areas that need developing. It is essential therefore that cardiac rehabilitation staff have the opportunity to undertake continuing education and upskilling. Treaty of Waitangi workshop attendance may provide an appropriate initiation to address identified gaps in knowledge and skills.

**Provision of information**

For many Māori patients and whānau, coping with the unknown can be very frightening, and coping with busy health professionals whose daily lives revolve around cardiac care and rehabilitation can be daunting.

Information sharing thus serves a number of roles for Māori patients and whānau:

- Contribute to and maintain optimal understanding
- Enhance ongoing communication with health professionals
- Minimise stress.

Cardiac rehabilitation information that is developed and delivered by Māori is the ideal solution to achieving quality information sharing with Māori patients and their whānau. Such information would be specific to Māori cardiac rehabilitation needs and would address issues of concern for Māori such as premature onset of disease, and the differing cardiovascular disease risk factor profile for Māori as a population.

An information needs analysis for Māori in the area of cardiac rehabilitation would provide valuable input into the development of appropriate resources. However, until there are Māori information needs analyses and Māori specific resources available, mainstream providers must increase their ability to share information about cardiac rehabilitation with Māori.

Various aspects of information delivery, context and content are important for cardiac rehabilitation staff to consider.

**The environment**

The creation of a rehabilitation environment that is open, respectful, supportive and empowering, and acknowledges the needs of Māori is an important first step to achieving quality information sharing and delivery.

**Information delivery**

Health professionals involved in cardiac rehabilitation must strive to impart information to patients and whānau that is clear and simple. Careful explanations that avoid medical jargon are important.
Consistency of information is important.

Information that is client-specific will be most useful. Asking Māori patients and whānau what they want to know, or what their information needs are, will help establish a relationship that is built on rapport.

It is prudent to offer the same information repeatedly and to recheck patient and whānau understanding. The integration and acceptance of external information may take some time, and information sharing must be tailored to the pace of patient and whānau needs.

As early as possible following a cardiac event, Māori patients and whānau require some information, and more detailed information at a later stage when they are better able to integrate it.

To share information a variety of formats and media must be used that suit Māori needs and preferences. Kanohi ki te kanohi (face to face) discussion with sufficient time and without other distractions, is essential to provide Māori patients and whānau with a sense of trust in the information deliverer. Other information formats can be used to reinforce discussions. These might include printed materials (books and pamphlets) and videos (such as ‘Kei te mate to manawa? Living with heart failure’ available from Te Hotu Manawa Māori). Where possible, resources that are Māori specific should be offered. Where appropriate, resources in te reo (the Māori language) will be appreciated. Finally, group discussions with other Māori patients and whānau who have a shared experience of a cardiac event may prove helpful to many Māori at different stages of cardiac rehabilitation.

In order to achieve maximal information sharing and delivery, cardiac rehabilitation programme staff require ongoing communication training and skills.

The information

Māori patients and whānau need to know about the nature of the medical diagnosis - what it is, its causes, course, outcomes, complications, long-term implications, and its secondary prevention including treatment options, medications and their side-effects.

Māori patients and whānau must also be given a full explanation of the cardiac rehabilitation programme that they are most likely to attend. This will include the programme’s location, timing and format. The concept of a multi-disciplinary team requires explanation. As does the concept of partnership between Māori patient/whānau and members of the cardiac rehabilitation programme team, so that joint decision making about assessment, planning and goal-setting is a shared expectation.

Availability of services has been identified as a major gap in the information needs of Māori [352]. It is thus important to impart full information about other service options that are available and that may be appropriate for Māori, such as Māori general practitioner and social worker services, and Māori disease state management nurses. However, it is equally important to inform whānau about general services such as home care and Income Support assistance. Such information sharing may prove invaluable where whānau intend leaving paid employment to take on the role of caregiver at home.

Lastly, information on the impact of the disease and its rehabilitation in relation to whānau roles and expectations is necessary. This may be particularly important where whānau members undertake more tasks than they are able, or where role reversal is likely. A particular concern for whānau may be the fear of sudden cardiac death at home. Information about appropriate training in cardiopulmonary resuscitation (CPR) and an action plan can alleviate this concern for many Māori whānau.

Role of research

It is acknowledged that there have been differences in the way that ethnicity has been defined and measured over time, and across agencies, making it difficult to know how ethnicity should be collected. The chapter ‘Audit, programme evaluation and patient satisfaction’ provides a clear method for the accurate and consistent collection of ethnicity data, based on the 2001 Census questionnaire. Self-identification of ethnicity, as defined in this manner, is recommended for all health and national datasets.

There is a clear paucity of information on cardiac rehabilitation for Māori in New Zealand. It is thus difficult to direct service development, purchasing and provision given this lack of data. Obvious knowledge deficiencies that must be seen as priority areas for future cardiac rehabilitation research include:

- Identification of barriers to access and utilisation of cardiac rehabilitation programmes, including referral pathways
- Routine collection and analysis of treatment patterns and processes of care including echocardiography, pharmaceutical, and surgical (PTCA and CABG) treatment rates
- A Māori cardiac rehabilitation needs analysis that identifies levels of unmet need. This would incorporate qualitative studies of the experiences of Māori patients and whānau using mainstream cardiac rehabilitation programmes.

KEY - see page 10 for details
A Well designed meta-analysis (MA) of RCT, or a body or evidence which are consistently applicable
B Very well designed observational studies or extrapolated evidence from RCTs or MAs
C Lower quality observational studies or extrapolated evidence from B
D Non analytical studies or expert opinion
Key point
For Pacific peoples the extended family, church and community, together with socio-economic circumstances have a particular influence on health.

RECOMMENDATIONS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D</strong></td>
<td>Current cardiac rehabilitation programmes should be redefined to meet the needs of Pacific peoples.</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Cardiac rehabilitation services serving Pacific people should consider the importance of the Pacific family unit, spiritual needs and socio-economic status.</td>
</tr>
</tbody>
</table>

The burden of cardiovascular disease falls heavily on Pacific peoples, as for Māori. Cardiac rehabilitation can significantly reduce the effects of cardiovascular disease on Pacific families and communities. Significant health and economic gains can be made for all New Zealanders when Pacific peoples’ cardiovascular health is improved.

There are 22 island nations in the population referred to as Pacific peoples in New Zealand, each with its distinct language and culture. To address the cardiac rehabilitation needs of such a diverse population requires flexibility, innovation and a will and commitment by health professionals.

This chapter provides key information to guide cardiac rehabilitation health professionals and identify specific approaches to best practices in service design and delivery to reduce the disparities which currently exist. There is limited scientific evidence upon which to base recommendations for best practice for Pacific peoples. Recommendations in this chapter are derived from personal knowledge and experiences of the Pacific Working Team.

It is hoped that this chapter despite its limitations, will provide a framework to make cardiac rehabilitation services more responsive to the needs of Pacific peoples, to improve their cardiovascular outcomes.

Soifua
Profile of cardiovascular disease in Pacific peoples
Cardiovascular disease is the leading cause of death in Pacific peoples. The burden of cardiovascular disease falls disproportionately on this population.

Table 9: Death rates from cardiovascular disease for Pacific peoples

<table>
<thead>
<tr>
<th>Disease</th>
<th>Pacific</th>
<th>Māori</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary Heart Disease</td>
<td>26</td>
<td>35</td>
<td>21</td>
</tr>
<tr>
<td>Cerebrovascular Disease</td>
<td>15</td>
<td>11</td>
<td>8</td>
</tr>
</tbody>
</table>

Note: ASR-age and New Zealand deprivation-age standardised mortality rates (per 10,000 population)
Source: [354]

- Mortality rates from coronary heart disease for Pacific peoples (199 per 100,000) are lower than Māori rates (267 per 100,000) but higher than others (158 per 100,000)
- 30 day case fatality for Pacific peoples 250 per 1,000 AMI discharges are higher than Māori (194/1000) and others (153/1000)
- Diabetes in New Zealand is 2.5% for Europeans, 5 – 10% for Māori, 4.8% for Pacific peoples (age standardised)
- Diabetics are 2 – 4 times more likely to develop cardiovascular disease
- Diabetics have the same risk of a myocardial infarction as people who have had a previous infarction
- Rheumatic fever rates for Pacific peoples 47/100,000 population are six times higher than the national rates age-standardised [354].

Table 10: Procedural interventions for Pacific peoples

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Pacific</th>
<th>Māori</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>CABG</td>
<td>7</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Angioplasty</td>
<td>3</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Pace implant</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Note: ASR-age and New Zealand deprivation-age standardised rates (per 10,000 population)
Source: [354]

Socio-economic factors and ethnicity
Socio-economic status is a powerful determinant of health. It is particularly difficult for people whose socio-economic circumstances are insecure to make changes that will improve health [355]. Social deprivation is worse for Pacific peoples than for Māori and others. One third of the Pacific population is concentrated in the most deprived deciles 9 and 10, compared with Europeans who are highly represented in the least deprived deciles. Social deprivation and cardiovascular disease are strongly linked.
Health professionals designing cardiac rehabilitation programmes are encouraged to explore alternative approaches that take account of Pacific peoples’ socio-economic situation and health status.

Re-orienting cardiac rehabilitation services for Pacific peoples

There are currently no cardiovascular rehabilitation services provided by Pacific health professionals for Pacific peoples or little input to mainstream cardiac rehabilitation programmes by Pacific peoples [13]. There is also strong anecdotal evidence to suggest that many Pacific patients are not utilising mainstream cardiac rehabilitation services.

There are a number of areas to consider in the reorientation of cardiac rehabilitation programmes in order to meet Pacific peoples’ needs:

- Pacific peoples
- The family
- Pacific concept of and attitudes to health
- Service provision
- Information sharing
- Role of research.

**Pacific peoples**

Pacific peoples in New Zealand refers to populations of Pacific Islands ethnic origin. They are heterogeneous and culturally diverse. Different ethnic groups have their own language, customs and traditions. Pacific peoples do, however share a common migration and assimilation history in New Zealand [356]. Over 80 per cent of the Pacific population have a religious affiliation [357].

**The family**

The family is the main unit upon which Pacific communities are based. ‘Family’ to Pacific peoples means ‘extended family’ regardless of locality, living arrangements and the number of households. The family plays a vital role in providing its members with a material, emotional, spiritual and cultural environment. Involving the family in the decision making process is vital to the success of the patient’s cardiac care and rehabilitation.

Most Pacific peoples believe and uphold family, culture and spiritual values. Respect of elders, church ministers and people of high standing, and commitment to family, church and community are instilled into Pacific children from an early age. Many Pacific peoples believe that spiritual well-being is essential to health. It is an accepted belief that good health and well-being are blessings from God and likewise, sickness and disease are attributed to the will of God. Healing is often viewed as the answer to prayer.

Pacific peoples present late to both primary and secondary care services. Unless the illness prevents them from functioning in their daily life, they will not seek medical care.
The Pacific concept of and attitudes to health

Many Pacific peoples see health as a holistic concept encompassing the total well being of the individual within the context of the family. Often they will seek medical care only when the illness is so serious that it prevents them from functioning in their daily life. Some take a fatalistic view of health based on personal beliefs and attitudes, therefore rating health a lower priority to family, church, cultural or work responsibility.

Service provision

‘By Pacific for Pacific’ is the ideal model of best practice for the provision of cardiac rehabilitation services for Pacific peoples. This is the ultimate goal. However, in the absence of Pacific providers, mainstream providers are encouraged to consider the following recommendations to assist in overcoming barriers and to improving responsiveness of their services to the needs of Pacific peoples.

Programme development

- Involvement by Pacific peoples in the process is vital
- Recruitment, development and support of Pacific staff
- Programmes to include a component for the family and caregivers
- Upskilling of non-Pacific staff on Pacific values, beliefs and issues
- Development and strengthening of partnerships with key Pacific providers
- Fostering of linkages between mainstream cardiac rehabilitation programmes, Pacific organisations and community networks
- Evaluation and audit of Pacific specific performance indicators which are tied to accountability (Ministry of Health, [357]).

Programme delivery

- Involving family members in consultation, decision-making and implementation process
- Providing the patient with follow-up support, for example, telephone call or home visit
- Facilitating support for the family and caregiver’s programmes
- Providing community/church based cardiac clubs as an option to hospital and mainstream venues
- Providing assistance with transport where needed
- Facilitating access to social services by providing appropriate information.

Information sharing

Information sharing is essential to assist both the patient and family. For the Pacific patient and family, coping with the unknown is a frightening and distressing experience. Timely access to appropriate and responsive cardiac information is likely to enhance communication between health professionals and patient, setting the scene for a successful cardiac rehabilitation programme. Information should be simple, clear and linguistically appropriate.

Type of information

Lack of information for Pacific patients, their families and health professionals has been identified as an urgent need. Cardiac information should include the following:

- Cause and risk factors for cardiovascular disease
- Cardiopulmonary resuscitation (CPR) for sudden cardiac event in the home and community
- Accessing medical assistance
- Clear advice on management of chest pain
- Treatment options and rehabilitation programmes.

Presentation of information

Cardiac rehabilitation information should be disseminated utilising appropriate delivery methods. Resources developed by/with Pacific peoples are most effective. Pacific peoples are more likely to promote and advocate for cardiac rehabilitation services if they participate in the planning and development processes.

- Creation of an environment which is welcoming, respectful, empowering and supportive is likely to make the Pacific patient and family feel accepted and comforted.
• Privacy is important when sharing sensitive and personal information
• Information should be simple, clear and consistent
• Use bright colours and Pacific imagery when developing resources
• Use of medical jargon to be avoided. Simple explanations of processes, treatment, role of and importance of adherence to medication and modified lifestyle programme
• Use of Pacific staff including qualified/certified interpreters where English is second language, is recommended
• Avoid overload of information for both patient and family
• Repeated presentations are more likely to achieve expected results
• Use of a variety of media and formats is encouraged
• Personal interface, video and television are preferred and the most effective methods. Written information has a place but is not as effective [357, 358].

Role of research
There is an urgent need to gather cardiovascular disease information which is credible and specific to Pacific peoples. This information is vital in advising policy development, resource allocation, design and delivery of appropriate and effective health care. Research in this area should be a priority.

A way forward
Cardiovascular disease is the leading cause of death and disability in the Pacific community. It is an important contributor to inequalities in health outcomes among Pacific peoples and other New Zealanders. Reducing inequalities in service provision and health outcomes will make a significant contribution to the cardiovascular health of Pacific peoples. The task is huge and the solution is not straightforward.

Improvements in access, appropriateness and responsiveness of mainstream cardiac rehabilitation services are required. Ongoing audit and research is necessary to ensure Pacific peoples receive high quality service.

It is acknowledged that the application/implementation of these guidelines will be reliant on the commitment and good will of the cardiac rehabilitation work force.

It should also be acknowledged that Pacific peoples must take some ownership in improving their own cardiovascular health outcomes. Collaboration is key to the successful achievement of this goal which should ultimately benefit all New Zealanders.
AUDIT, PROGRAMME EVALUATION AND PATIENT SATISFACTION

Key point
Audit, evaluation and patient feedback are integral aspects of quality improvement.

RECOMMENDATIONS

- **D** Audit of programme performance indicators is necessary to monitor service provision and quality of care. Audit should take place every six months.
- **D** The collection and audit of ethnicity data is recommended to monitor services for equitable access and delivery of programmes.
- **D** All comprehensive cardiac rehabilitation programmes should monitor and evaluate data relevant to their locality, the population served and the stakeholders of the service.
- **D** All comprehensive cardiac rehabilitation programmes should ascertain the views of the consumers to assist the development of a quality service.

Quality

The consumers, service providers, purchasers and funders of cardiac rehabilitation services all have a particular interest in the quality of cardiac rehabilitation care. This puts a responsibility on service providers for the collection of data relevant to the different perspectives. Often different levels of data will be required for different purposes and this chapter describes:

- The minimum data required for programme evaluation that a service provider should collect (obtained routinely and by patient satisfaction questionnaire)
- Additional data for periodic audit (by internal or external agencies)
- Suggested performance indicators that a provider could report against or that District Health Boards could include in service specifications.

Programme evaluation

Programme evaluation is a way of monitoring and improving the quality of care. The information gathered should reflect the values of the cardiac rehabilitation programme and meet the needs of all the stakeholders, patients included. Information collected regarding the programme outcomes should be presented at a level the different target stakeholders understand [364].

For cardiac rehabilitation programmes the ability to measure and classify characteristics of patients and to monitor outcomes has become increasingly important. It is critical, not optional, for cardiac rehabilitation programmes to document outcomes in order to quantify both the effectiveness and efficiency of rehabilitation care.

Programme evaluation criteria relate to the phases of cardiac rehabilitation. Some can be applied at three, six and twelve months to evaluate long-term effectiveness of
the intervention. Analysed information should be used to improve performance in identified areas and celebrate the success of others. When deciding which outcomes to measure it is important to measure those that are important to the patient as well as the provider and purchaser. It is important to remember when auditing outcome data and comparing results with a similar time period problems may arise because of case mix.

Audit is a systematic, independent and documented process for obtaining evidence and evaluating it objectively to determine the extent to which the audit criteria are fulfilled [359]. Audit evidence is comprised of statements of fact or other information, which are relevant to the audit criteria and verifiable. Audit evidence can be qualitative or quantitative. There are no randomised controlled trials of the efficacy of audit and whether it is a good use of resources. There are many observational studies, both quantitative and qualitative that have sought to evaluate audit.

Audit is a strategy that assists in the enhancement of the quality of a service. Audit is not an endpoint but a precursor to aid improvement. Audit can evaluate [360]:

- Whether changes in practice are actually happening
- Whether those changes in practice are actually effective.

The ultimate aim of audit is to improve the quality of patient care. Lord and Littlejohn [361] state that good quality refers not only to clinical effectiveness but also to other factors such as equity and respect for patients’ autonomy. As well as seeking to improve patient care by bringing about direct changes in clinical practice, audit can produce beneficial changes through indirect effects on professional education and team development. Audit has benefits for the consumers, providers and purchasers of a service.

There needs to be effective facilitation of audit if the benefits are to be accrued. Johnston [362] identified methods that enabled audit to take place. These included modern medical records systems, dedicated staff, protected time and structured programmes of shared dialogue between purchasers and providers.

McBurney [363] recommended that each cardiac rehabilitation programme should, at a minimum, record the number of cardiac patients who are referred, as well as the proportion who enter and complete a rehabilitation programme, including the basic demographic information of age, gender and diagnosis.

**Patient satisfaction and consumer input to the programme**

Patients are increasingly involved in the evaluation of their care. There are no universally accepted means for measuring patient satisfaction. Measures of patient satisfaction have been developed primarily so that patients could furnish health care providers with feedback on the services provided to them. A patient’s satisfaction with a service may bear no relationship to the health professional’s concept of a quality service. This emphasises the importance of coupling patient satisfaction with outcome evaluation.

If using patient satisfaction surveys it is important to be aware of the percentage of:

- Patients given a patient satisfaction survey
- Spouses/partners given a satisfaction survey
- Spouses/partners completing a satisfaction survey
- Dropouts contacted and asked for feedback
- Patients completing a satisfaction survey.
### Minimum data for routine collection

<table>
<thead>
<tr>
<th>Process evaluation</th>
<th>Outcome evaluation</th>
<th>Consumer feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic demographics (age, gender and ethnicity)</td>
<td>Risk factor reduction outcomes (smoking, BP, lipids, BMI, physical activity)</td>
<td>Annual Patient satisfaction questionnaire</td>
</tr>
<tr>
<td>Admitting medical condition/diagnosis</td>
<td>Mortality and re-infarction</td>
<td></td>
</tr>
<tr>
<td>Source of referral</td>
<td>Psychosocial outcomes (return to work, quality of life)</td>
<td></td>
</tr>
<tr>
<td>The numbers attending (including partners)</td>
<td>Adverse events</td>
<td></td>
</tr>
<tr>
<td>The drop out rate</td>
<td>Non-compliance with medication and lifestyle changes</td>
<td></td>
</tr>
<tr>
<td>Reasons for non-attendance</td>
<td>Re-admission</td>
<td></td>
</tr>
</tbody>
</table>

A Recommended Cardiac Rehabilitation Data Form is attached in Appendix 7.

### Additional data for periodic audit

<table>
<thead>
<tr>
<th>Phase I</th>
<th>Phase II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cardiac rehabilitation patients seen per month</td>
<td>Number of cardiac rehabilitation patients seen per month</td>
</tr>
<tr>
<td>Percentage seen by a cardiac rehabilitation nurse within 72 hours of admission</td>
<td>Percentage with risk assessment completed</td>
</tr>
<tr>
<td>Percentage of notes containing a risk factor assessment</td>
<td>Percentage with record of an exercise test result</td>
</tr>
<tr>
<td>Percentage seen (with their partner where appropriate) prior to discharge by a cardiac rehabilitation nurse for pre discharge planning</td>
<td>Percentage with formal assessment of need prior to commencing the Phase II programme</td>
</tr>
<tr>
<td>Percentage with discharge medication recorded in the cardiac rehabilitation notes</td>
<td>Percentage with goals identified and agreed</td>
</tr>
<tr>
<td>Percentage receiving a written invitation to cardiac rehabilitation</td>
<td>Percentage resumed activities of daily living</td>
</tr>
<tr>
<td>Percentage receiving a discharge plan</td>
<td>Percentage resumed previous work</td>
</tr>
<tr>
<td></td>
<td>Percentage of notes containing a written recommendation to attend their nearest cardiac club</td>
</tr>
<tr>
<td></td>
<td>Percentage with a summary of progress sent to general practitioner</td>
</tr>
</tbody>
</table>

### Performance indicators

Reporting of programme performance indicators is necessary to monitor service provision and to review the quality of care. These performance indicators will form the basis of the service specifications developed between service providers and District Health Boards.

<table>
<thead>
<tr>
<th>Number of admissions to hospital with the primary reason for admission being the condition for which the patient attended the programme by cardiac condition</th>
<th>Number of readmissions to hospital with cardiac conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average length of hospital stay (in days)</td>
<td>Number seen by ethnicity and cardiac condition in Phase I cardiac rehabilitation</td>
</tr>
<tr>
<td>Average number of sessions attended per patient</td>
<td>Number of individuals referred by ethnicity and cardiac condition to Phase II cardiac rehabilitation</td>
</tr>
<tr>
<td>Number of individuals attending primary care-based cardiac rehabilitation programmes</td>
<td>Number of individuals in hospital-based cardiac rehabilitation programmes</td>
</tr>
<tr>
<td>Number of individuals referred back to primary care practitioner</td>
<td>Number with self management plan participating in a home based programme</td>
</tr>
</tbody>
</table>
IMPLEMENTATION OF THE
COMPREHENSIVE CARDIAC
REHABILITATION GUIDELINE

The guideline development team recommend the following multi-faceted strategies be adopted to disseminate the guideline and encourage its implementation throughout New Zealand.

**Dissemination of the Guideline**
The guideline should be disseminated as widely as possible to the following groups;

- General practitioners
- IPAs and PHOs
- Primary health care nurses
- Cardiac rehabilitation nurses
- Cardiac Society members
- Disease state management nurses
- Exercise physiologists
- Dietitians
- Cardiac rehabilitation clubs
- Medical and nursing colleges.

**Provision of Consumer Information**
Māori, Pacific and English resources will be published to raise the awareness of people experiencing a cardiac event of the benefit of cardiac rehabilitation, what it involves and how to access the service. The information will also contain advice on appropriate resources that can also assist the person in their recovery.

**Liaison with DHB and other Rehabilitation Service Providers**
It is recommended that a number of District Health Boards (DHB) be invited to trial comprehensive cardiac rehabilitation programmes based in the community and the hospital, and to design programmes specifically to meet the needs of Māori and Pacific peoples. A number of the guideline development team members are willing to provide advice and assistance on how these could be achieved. It is recommended that these trials should be formally evaluated to assess consumer satisfaction, improved health outcomes and cost effectiveness.

**Liaison with the Ministry of Health**
It is proposed that the Ministry of Health review the service specifications for DHBs cardiac rehabilitation programmes to include home based care programmes, the collection of ethnicity data and the ongoing review and evaluation of the programmes.

**Events and Training**
To assist the uptake of the guideline in primary care, it is recommended that;

- The guideline is launched at the Cardiac Society Conference
- A CME pack be developed for IPA facilitators and other educators
- The guideline development team members around the country make presentations at relevant conferences and CME meetings
- Training programmes be developed specifically for cardiac rehabilitation nurses
• Te Hotu Manawa Māori develop training resources based on the guidelines for Māori practitioners
• Pacific Heart Beat develop training resources based on the guidelines for Pacific practitioners.
APPENDICES AND RESOURCES

1. Assessment of Overweight and Obesity
2. Foods to Include in the Cardioprotective Dietary Pattern
3. The Hospital Anxiety and Depression Scale
4. Sexual Activity and Heart Disease
5. Drugs that May Prolong the Half-life of Sildenafil
6. Ethnicity pamphlet
7. Recommended Cardiac Rehabilitation Data Form
8. Evidence Tables
   • Physical activity
   • Overview of trials of patient education
   • Nutrition management
   • Psychosocial aspects
   • Pharmacotherapy
   • Comprehensive cardiac rehabilitation programmes
   • Information needs
   • Settings
   • Specific populations
APPENDIX 1: ASSESSMENT OF OVERWEIGHT AND OBESITY

Defining risk
An individual’s absolute risk of obesity-related disease should be assessed by determining the degree of overweight or obesity based on body mass index (BMI), the degree of abdominal obesity based on waist circumference (WC) and the presence of other risk factors.

Body mass index
Body mass index (BMI) measures weight in relation to height. The BMI ranges shown below are for adults over 18 years of age.

Calculations: BMI = weight (Kg) divided by height in metres squared (m²). Example of BMI calculation - A person who weighs 78 kg and is 1.77m tall has a BMI of 24.9 (78/1.77²).

Table 1. Proposed classification of weight by BMI in different adult ethnic groups

<table>
<thead>
<tr>
<th>BMI</th>
<th>New Zealand European people</th>
<th>Māori and Pacific Island peoples</th>
<th>Asian and Indian people</th>
<th>Risk of co-morbidities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>&lt; 18.5</td>
<td>&lt; 18.5</td>
<td>&lt; 18.5</td>
<td>Low</td>
</tr>
<tr>
<td>Healthy</td>
<td>18.5 - 25</td>
<td>18.5 - 26</td>
<td>18.5 - 23</td>
<td>Average</td>
</tr>
<tr>
<td>Overweight</td>
<td>25 - 30</td>
<td>26 - 32</td>
<td>23 - 25</td>
<td>High</td>
</tr>
<tr>
<td>Obese</td>
<td>&gt; 30</td>
<td>&gt; 32</td>
<td>&gt; 25</td>
<td>Very high</td>
</tr>
</tbody>
</table>

Waist circumference
Waist circumference is used to assess abdominal obesity when BMI is ≤ 35. The subject stands with feet 25-30cm apart, weight evenly distributed. Measurement is taken midway between the inferior margin of the last rib and the crest of the ilium in a horizontal plane. The measurement is made at a normal minimal expiration to the nearest 0.1 cm.

Table 2. Proposed waist circumference measures in different adult ethnic groups

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Zealand European people</td>
<td>&lt; 102 cm</td>
<td>&lt; 88 cm</td>
</tr>
<tr>
<td>Pacific Islands and Māori people</td>
<td>&lt; 102 cm</td>
<td>&lt; 88 cm</td>
</tr>
<tr>
<td>Asian and Indian people</td>
<td>&lt; 90 cm</td>
<td>&lt; 80 cm</td>
</tr>
</tbody>
</table>
APPENDIX 2: FOODS TO INCLUDE IN THE CARDIOPROTECTIVE DIETARY PATTERN

Benefits of dietary treatment
Dietary treatment now involves the promotion of a cardioprotective dietary pattern. This pattern offers more than simple LDL-cholesterol reduction, via mechanisms that improve the lipid profile and glycaemic control, lower blood pressure, and reduce the risk of clotting. Dietary treatment is additive to drug therapy and integral to reducing cardiovascular risk.

A variety of dietary patterns reduce cardiovascular risk. These patterns have in common a high plant food content and minimal content of meat or dairy fats, and commercially hardened plant oils or fats. They include most of the following food components:

<table>
<thead>
<tr>
<th>Food Component</th>
<th>Recommendation</th>
<th>Serving Size Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables and fruit</td>
<td>Aim for at least 8 servings daily</td>
<td>½c cooked vegetables, 1c raw green vegetable or salad, 1 medium apple, pear, orange, nectarine, banana, ½c stewed, frozen or canned fruit</td>
</tr>
<tr>
<td>Whole grain breads and cereals</td>
<td>Aim for 6 or more servings daily depending on body weight and activity</td>
<td>1 medium slice of bread or ½ bread roll, ½c bran cereal or ½c wheat cereal, ½c cooked porridge or 3T muesli, ½c cooked pasta or ½c cooked rice</td>
</tr>
<tr>
<td>A variety of oils and spreads (including sterol-fortified spreads), nuts, seeds or avocado</td>
<td>Aim for 3 or more servings daily depending on body weight and activity</td>
<td>1t soft table margarine or oil, 2t light margarine (45-60% fat), 3t low fat mayonnaise (10% fat or less), 1T avocado, 1D nuts or pumpkin seeds, 1D peanut butter, 1T sunflower or sesame seeds</td>
</tr>
<tr>
<td>Low fat or fat-free milk products</td>
<td>Include 2 – 3 servings daily or replace with soy products</td>
<td>1 glass trim or low-fat milk, 1 pottle low fat yoghurt, ½c cottage cheese, 2T parmesan cheese, 2cm cube cheddar cheese, 3cm cube standard camembert, brie, edam, feta, mozzarella</td>
</tr>
<tr>
<td>Fish, dried peas, beans, soy products, skinned chicken, or very lean meats</td>
<td>Include 1 – 2 fish servings weekly</td>
<td>2 small/medium fillets of cooked fish, 1c mussels, ½c salmon or ½ can sardines, 1c cooked dried beans, chickpeas, lentils, dahl, ½c tofu or tempeh, 1 glass fortified soy milk</td>
</tr>
<tr>
<td></td>
<td>Include bean servings daily</td>
<td>2 small/medium fillets of cooked fish, 1c mussels, ½c salmon or ½ can sardines, 100-120 grams trimmed meat/chicken, ½c mince or casserole</td>
</tr>
</tbody>
</table>

Abbreviations: c = cup D = dessertspoon T = tablespoon t = teaspoon

When considering a healthy dietary pattern think about the following:

- Choose plenty of fresh foods
- Choose more dried peas, beans, or nuts if you do not eat fish, meat, or poultry
- Select ready prepared and packaged foods labelled low in saturated fat and salt and high in fibre
- Mostly avoid deep fried foods, butter, palm oil products, hard or visible white fat, salty foods, or adding salt to foods.

The National Heart Foundation of New Zealand acknowledges the support of Mrs Janice Bremer (DipHSc, NZRD) and Dr Alex Chisholm, (DipHSc, MCAPSc, PhD, NZRD) in developing this document.
### APPENDIX 3: THE HOSPITAL ANXIETY AND DEPRESSION SCALE

This questionnaire is designed to help know how you feel. Read each item and tick the box which comes closest to how you have been feeling in the last week.

Don’t take too long over your replies. Your immediate reaction to each item will probably be more accurate than a long thought out response.

<table>
<thead>
<tr>
<th>1. I feel tense or ‘wound up’</th>
<th>2. I still enjoy the things I used to enjoy</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Most of the time</td>
<td>□ Definitely as much</td>
</tr>
<tr>
<td>□ A lot of the time</td>
<td>□ Not quite so much</td>
</tr>
<tr>
<td>□ From time to time</td>
<td>□ Only a little</td>
</tr>
<tr>
<td>□ Not at all</td>
<td>□ Hardly at all</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. I get a sort of frightened feeling as if something awful is about to happen</th>
<th>4. I get a sort of frightened feeling like butterflies in my stomach</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Very definitely and quite badly</td>
<td>□ Not at all</td>
</tr>
<tr>
<td>□ Not too badly</td>
<td>□ Occasionally</td>
</tr>
<tr>
<td>□ A little but it doesn’t bother me</td>
<td>□ Quite often</td>
</tr>
<tr>
<td>□ Not at all</td>
<td>□ Very often</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5. I can laugh and see the funny side of things</th>
<th>6. Worrying thoughts go through my mind</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ As much as I always could</td>
<td>□ A great deal of the time</td>
</tr>
<tr>
<td>□ Not quite as much now</td>
<td>□ A lot of the time</td>
</tr>
<tr>
<td>□ Definitely not so much now</td>
<td>□ From time to time but not too often</td>
</tr>
<tr>
<td>□ Not at all</td>
<td>□ Only occasionally</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7. I feel cheerful</th>
<th>8. I can sit at ease and feel relaxed</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Not at all</td>
<td>□ Definitely</td>
</tr>
<tr>
<td>□ Not often</td>
<td>□ Usually</td>
</tr>
<tr>
<td>□ Sometimes</td>
<td>□ Not often</td>
</tr>
<tr>
<td>□ Most of the time</td>
<td>□ Not at all</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9. I feel as if I am slowed down</th>
<th>10. I have lost interest in my appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Nearly all the time</td>
<td>□ Definitely</td>
</tr>
<tr>
<td>□ Very often</td>
<td>□ I don’t take as much care as I used to</td>
</tr>
<tr>
<td>□ Sometimes</td>
<td>□ I may not take quite so much care</td>
</tr>
<tr>
<td>□ Not at all</td>
<td>□ I take just as much care</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>11. I feel restless as if I have to be on the move</th>
<th>12. I look forward with enjoyment to things</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Very much indeed</td>
<td>□ As much as I ever did</td>
</tr>
<tr>
<td>□ Quite a lot</td>
<td>□ Rather less than I used to</td>
</tr>
<tr>
<td>□ Not very much</td>
<td>□ Definitely less than I used to</td>
</tr>
<tr>
<td>□ Not at all</td>
<td>□ Hardly at all</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Very often indeed</td>
<td>□ Often</td>
</tr>
<tr>
<td>□ Quite often</td>
<td>□ Sometimes</td>
</tr>
<tr>
<td>□ Not very often</td>
<td>□ Not often</td>
</tr>
<tr>
<td>□ Not at all</td>
<td>□ Seldom</td>
</tr>
</tbody>
</table>

**Thank you**

Anxiety score [ ]

Depression score [ ]
**Using the Hospital anxiety and depression scale**

Ask the client to read each item and please tick in the box opposite the answer that most reflects how they have been feeling during the previous week.

It is important to highlight the fact that the questions reflect the previous week. Also encourage the client to score their immediate reaction and not to think about the question for too long.

**How to score the HADS questionnaire**

The HAD Scale scores both depression and anxiety.

The rating is based upon a four-point scale.

1. For items 2, 4, 5, 8, 12 and 14 a tick in the top box scores zero points and the last box three points.
2. For items 1, 3, 6, 7, 9, 10, 11, and 13 the points are reversed (ie, a tick in the top box scores three points, the second box two points etc.).

**For Depression:**
Total all the scores given for the depression questions (add up the scores for the questions 2, 5, 7, 9, 10, 12, 14).

**For Anxiety:**
Total all the scores given for the anxiety questions (add up the scores the questions 1, 3, 4, 6, 8, 11, 13).

**Implications of the result**

<table>
<thead>
<tr>
<th>Assessment</th>
<th>HADS score</th>
<th>Action</th>
</tr>
</thead>
</table>
| Assess illness perception, coping skills and factors present that may place a patient more at risk of significant psychosocial distress:  
  - Unexpected or first time illness  
  - Changes to diagnosis/treatment  
  - Complications or cancellations  
  - Prolonged stay/repeated admissions  
  - Person under 50 years of age  
  - Lack of spouse, partner, whānau or family support  
  - Other negative health and illness beliefs  
  - Other recent life stressors | 11 – 21 | Probable significant depression or anxiety  
  Referral to appropriate person  
  Tailor cardiac rehabilitation programme accordingly, check on progress |
| | 8 – 10 | Possible or borderline depression  
  Tailor cardiac rehabilitation programme accordingly, may need referral to appropriate person check on progress |
| | 0 – 7 | No depression or anxiety state, but may be ‘at risk’ as determined by assessment  
  Usual cardiac rehabilitation programme, check on progress |
APPENDIX 4: SEXUAL ACTIVITY AND HEART DISEASE

Some people, for a variety of reasons, may not resume sexual activity straight away and other ways of expressing their feelings should be considered. Advise caution, not timidity.

After the shock of being diagnosed with heart disease and the natural fear of losing each other, a couple may find that their relationship is made stronger by resuming their sex life.

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does sexual intercourse pose any risk for people with heart disease and with stable angina or a past history of a myocardial infarction?</td>
<td>A healthy sex life is part of returning to a normal life after a cardiac event and can be very beneficial for the couple’s relationship, helping them to feel secure and happy.</td>
</tr>
<tr>
<td>Does sexual intercourse pose any risk soon after a cardiac event (acute myocardial infarction or a period of unstable angina)?</td>
<td>Choose a time when you are rested and relaxed, having had your prescribed medications. Start slowly, allowing the intimacy to build before starting intercourse. This can sometimes be associated with fear and anxiety related to the fear of losing each other.</td>
</tr>
<tr>
<td>Will sexual activity damage my heart?</td>
<td>No. Intercourse represents a very small risk of triggering a myocardial infarction. Sexual intercourse uses only 3 – 5 METS, about the equivalent of walking up two flights of steps briskly. If your typical angina pain starts, stop and take your nitroglycerin spray as you have been directed. When your pain has completely resolved, you may resume sexual activity, though you may want to go more slowly. Report chest pain when you next see your doctor. It might be that your medications need adjusting or you may need to use nitroglycerin spray before intercourse.</td>
</tr>
<tr>
<td>Is it common for people to lose interest in sex after a cardiac event or a myocardial infarction?</td>
<td>Yes. These feelings are common in both the person who has had the cardiac event and/or their partner. Cardiac blues, anxiety or fear can significantly decrease the desire for sex. This situation is normal and often temporary. Open communication about the issue can help, along with cardiac rehabilitation that can help build confidence. There are many ways of expressing your love and fondness without having intercourse, including touch, cuddling and kissing each other without the goal of orgasm. Impotence or a dry vagina may be helped by changing medications and should be discussed with your doctor.</td>
</tr>
<tr>
<td>How does depression impact on sexual intimacy?</td>
<td>Depression occurs in approximately 14% of people who have suffered a myocardial infarction. Common symptoms of depression may include some of the following: a loss of interest in things normally found pleasurable – that includes sex, withdrawal from family and social interaction, depressed mood, anger or irritability and disturbance in normal sleep patterns.</td>
</tr>
<tr>
<td>Will sex be different now?</td>
<td>More than 75% of people don’t change the way they engage in foreplay and sexual positions, though don’t hesitate to experiment in ways that make it easier for the individual with the heart condition.</td>
</tr>
<tr>
<td>Will medications affect sex?</td>
<td>Modern medications tend to be more specific and have less side affects, though if you are troubled by impotence or not having enough vaginal fluid to make intercourse comfortable, then consult your doctor.</td>
</tr>
<tr>
<td>Is it safe to use drugs like Viagra?</td>
<td>Sildenafil (Viagra) should not be used by those using nitroglycerin tablets or spray. It may be used safely for those with stable angina and not taking nitrates.</td>
</tr>
<tr>
<td>What if it is not the same?</td>
<td>Like in any relationship, there are many reasons why couples may experience problems with sex. Contributing factors can be too much alcohol, medications (see above), fatigue and stress related to recovery, fear, relationship conflict and depression to name a few.</td>
</tr>
<tr>
<td>When should I seek help?</td>
<td>If sex becomes a concern for you, don’t hesitate to contact your nurse or doctor.</td>
</tr>
</tbody>
</table>
APPENDIX 5: DRUGS THAT MAY PROLONG THE HALF-LIFE OF SILDENAFIL

Drugs that are metabolised by or that inhibit Cytochrome P450 3A4 and therefore prolong the half-life of Sildenafil citrate (Viagra) [231].

**Antibiotic/Antifungal**
Clarithromycin, Clotrimoxazole, Erythromycin, Fluconazole, Itraconazole, Ketoconazole, Miconazole, Norfloxacin, Troleandomycin.

**Cardiovascular**
Amiodarone, Amlodipine, Digoxin, Diltiazem, Disopyramide, Felodipine, Isradipine, Losartan, Nifedipine, Quinidine, Verapamil.

**HMG-CoA reductase inhibitor**
Atorvastatin, Cerivastatin, Lovastatin, Simvastatin.

**CNS**
Alprazolam, Carbamazepine, Fluoxetine, Fluvoxamine, Imipramine, Nefazodone, Phenobarbital, Phenytoin, Sertraline, Triazolam.

**Other**
Acetaminophen, Astemizole, Cimetidine, Cisapride, Cyclosporine, Dexamethasone, Ethinyl estradiol, Naringenin (grapefruit juice), Omeprazole, Rifampicin, Terfenadine, Tacrolimus, Protease inhibitors eg, nelfinavir.
APPENDIX 6: ETHNICITY PAMPHLET

Who collects ethnicity data?

Many organisations now collect ethnicity data, such as:
- doctors’ surgeries
- hospitals
- schools
- funeral directors

Information that you provide to organisations such as those listed above is protected by privacy rules. If you wish, you can ask to see your information and make any changes.

This brochure was developed in 2001 by HURA, with funding from the WFA. HURA is a joint project between Te Rūnanga Rangahau Hauora a Eru Pōmare, Departments of General Practice and Public Health at the Wellington School of Medicine and Health Sciences, and the Wellington Independent Practitioners Association (WIPA).

Ka wai kei te kohi korero mo te karangatanga tangata?

He maha tonu ngā whakahaere e kohi korero ana mō te karangatanga tangata, pāra:
- ngā tari tiānui
- ngā hūipapa
- ngā kura
- te hanga whāhārii tūpāpali
- Tataranga Aoteaora

I raro i ngā tikanga metsatapu, ko nōho tapu tonu nga korero ke whakina e koe ki ngā whakahaere pera i 0 rangia eke nei. Ki te hīhia koe, ke ahī koe ki te toto kia kīte i ngā kōrero moa, ke whakatatika haere.

Te Karangatanga Tangata

HURA
Health Utilisation Research Alliance

This is the question being asked about ethnicity in the 2001 Census.

Which ethnic group do you belong to? Mark the space or spaces which apply to you.

NZ European
Maori
Samoan
Cook Island Maori
Tongan
Niuean
Chinese
Indian
other (such as DUTCH, JAPANESE, TONGAANU). Please state:

Ethnicity

In New Zealand, ethnicity is based on self-identification. You can belong to more than one ethnic group, at different times of your life you may wish to identify with other groups.

Ethnicity is not the same as the country you were born in, the country you live in, or your ancestry.

Many organisations are now using the 2001 Census question to collect ethnicity information.

Why do people need to ask this question?

This information helps in developing appropriate services and policies for everyone and ensuring that people’s needs are met.

The best way to collect ethnicity data is to ask you to fill in the ethnicity question.

Deciding from appearance or guessing is not reliable, so the best way is to ask. It is your decision which ethnic group(s) you belong to.

Te Karangatanga Tangata

I Aoteaora nei, ka riro māu tonu e whakatau mō te karangatanga tangata koe. Neko atu i te karangatanga koe i taea, i tōna wai anō tārua koe ka whai pāngia ki ētahi atu karangatanga.

Kāore i rite te karangatanga tangata koe ki te whenua i whanau mai a koe, ki te whenua rānei e noho ana koe, ki te whakapapa rānei.

He maha tonu ngā whakahaere kei te whakamahi i te kitea pāhai hei kohi kohi korero mō te karangatanga tangata.

He aha i patahi ai tei kerei patahi?

He aha i hīhia kei ona kōrero e whakataukitoria ai ngā ratonga me ngā kaupapa hura e hangai i anā ki te kore, e tutuki anō ai ngā hīhia o te hou, o te tena.

Ki te itakā pai koe e kei ai nga kōrero mō te karangatanga tangata, ko te iō mai māu tonu e whakatū te patahi e pā ana iā ērā te karangatanga tangata.

Te aha i patahi ai tei kerei patahi?

Ki te itakā pai koe e kei ai nga kōrero e whakataukitoria ai ngā ratonga me ngā kaupapa hura e hangai i anā ki te kore, e tutuki anō ai ngā hīhia o te hou, o te tena.

Ki te itakā pai koe te patahi, ko te whakamahia i runga i te āhua o te kiri, ki te whakapae e o ia rānei. Māu anō e whakatau ko ēhia karangatanga tangata e tika ana moā.
Collecting ethnicity data

In New Zealand, ethnicity is based on self-identification. Some people will identify with more than one ethnicity.

Guessing a person’s ethnicity is not reliable, so the best way is to ask. Everyone should be asked the question so that they have the choice of responding.

Some people may also choose not to answer this question. Their response can be recorded as ‘not stated’.

How do I ask?

- Give patients the opportunity to complete the ethnicity question themselves. If a person needs help or wants more information, you can show them the information pamphlet for patients.

- If you are asking the question directly, be confident and matter-of-fact. Most people will not object to being asked this question. You can introduce the question by saying something like: “We are currently updating our patient information and adding ethnicity to our patient register. Would you mind completing this form/answering this question?”

- Avoid questioning an individual’s response – it is their right to define their own ethnicity.

- Remember a child’s ethnicity is not always the same as their parents’. For children, ask the parent or caregiver to complete the ethnicity question.

- Avoid transferring data from another source.

- Reassure the person about confidentiality if they are concerned about privacy.

It is important that ethnicity data is collected consistently and accurately. We recommend using the question from the 2001 Census of Population and Dwellings.
### APPENDIX 7: RECOMMENDED CARDIAC REHABILITATION DATA FORM

<table>
<thead>
<tr>
<th>Male</th>
<th>Female</th>
<th>Date of Birth</th>
<th>/</th>
<th>/</th>
</tr>
</thead>
</table>

#### Ask the patient to which ethnic group they identify
- Māori
- NZ European
- Tongan
- Niuean
- Cook Island Māori
- Samoan
- Indian
- Chinese
- Other

#### Admitting medical condition
- Myocardial infarction
- Coronary artery bypass grafting
- Unstable angina
- Percutaneous transluminal coronary angioplasty (with or without stent)
- Heart failure
- Arrhythmia and CABG
- Valve

#### Source of referral to the programme
- Medical team
- Practice nurse
- Patient
- Cardiac rehabilitation nurse
- Other hospital
- Other health professional (eg physiotherapist)
- Ward nurse
- General practitioner

#### Referral and utilisation
- Has the patient been referred to Phase II? Yes No
- If yes, did the patient receive a written referral? Yes No
- Has the patient previously attended Phase II? Yes No
- Did the patient attend Phase II? Yes No

#### How many sessions did the patient attend? __________
## APPENDIX 8: EVIDENCE TABLES

### Physical activity – Evidence table 1

<table>
<thead>
<tr>
<th>Evidence statements</th>
<th>Summary</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>For the whole population</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>That at least 30 minutes of moderate exercise at least three times a week will result in health benefit. Moderate activity (between 3 - 6 METS) carries benefit and greater intensity exercise may carry additional benefit for those with low risk of vigorous exercise.</td>
<td>Surgeon General’s Statement 1996. CDC/ACSM guidelines debate this. (Laukkonen, Min Lee) selected populations</td>
<td>The exercise patterns of Māori and Pacific peoples are different than Pakeha and consideration of acceptable activities may enhance participation. Level of evidence statement B.</td>
</tr>
<tr>
<td><strong>For those with established cardiovascular disease, post event</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Exercise based cardiac rehabilitation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise based cardiac rehabilitation will result in lower total mortality and mortality due to cardiovascular disease.</td>
<td>Cochrane meta-analysis</td>
<td>No effect on non-fatal myocardial infarction, CABG or angioplasty rates, restricted generalisability (men, post myocardial infarction, no ‘modern’ interventions), Publication bias may overestimate effect, some RCTs of low quality. Level of evidence statement B.</td>
</tr>
<tr>
<td>Regular exercise is likely to reduce cardiovascular mortality in persons at greater risk because of one or more risk factors, but the effect exercise has on cardiovascular risk factors such as obesity, smoking, hypertension and dyslipidemia is relatively small.</td>
<td>RCTs as listed in [3]</td>
<td>Exercise is confounded in epidemiological studies by lifestyle factors not measured. Only 1/3 of the reduction in CV risk observed to result from exercise is accounted reduction in CV risk factors. Level of evidence statement A.</td>
</tr>
<tr>
<td>Exercise training improves exercise capacity in patients with cardiac disease and increases functional capacity by reducing angina and dyspnoea.</td>
<td>35 RCTs</td>
<td>Mainly session based exercise, not generalisable to unsupervised activity. Level of evidence statement A.</td>
</tr>
<tr>
<td>Resistance based exercise improves muscular strength and aerobic exercise capacity. Resistance training is generally safe.</td>
<td>4 RCTs quality</td>
<td>Level of evidence statement B.</td>
</tr>
<tr>
<td><strong>Exercise habits</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiac rehabilitation increases post rehabilitation exercise levels. Long-term change is unlikely unless rehabilitation is extended long term.</td>
<td>AHCPR guidelines</td>
<td>High intensity rehab has lower adherence. Participation in group based activity may not be acceptable to cultural groups and older people. Personal encouragement and behavioural techniques aid adherence. Level of evidence statement C.</td>
</tr>
<tr>
<td>Long-term regular exercise is needed to maintain health benefits. Participation in Phase III rehabilitation may improve long-term exercise participation.</td>
<td></td>
<td>Level of evidence statement D.</td>
</tr>
</tbody>
</table>
## Exercise prescription

<table>
<thead>
<tr>
<th>Evidence statements</th>
<th>Summary</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise sessions during cardiac rehab should gradually increase in intensity, duration and frequency into 3-5, 30-45 minute sessions of moderate activity per week.</td>
<td>Dose dependent exercise (Manson, Minlee observational), stick to studies on rehab patients</td>
<td>No evidence to support vigorous exercise. Level of evidence statement B.</td>
</tr>
<tr>
<td>Exercise sessions should last between 30 and 60 minutes including warm up and cool down.</td>
<td>(Pollock, Haskell)</td>
<td>No evidence to support sessions longer than 45 minutes. Level of evidence statement C.</td>
</tr>
<tr>
<td>Prolonged continuous low to moderate intensity using large muscle groups achieve the best aerobic training effects.</td>
<td>ACSM guidelines</td>
<td></td>
</tr>
<tr>
<td>Resistance training with light weight, many repetitions without valsalva manoeuvre is safe.</td>
<td>ACSM guidelines, observational studies.</td>
<td>Level of evidence statement B.</td>
</tr>
<tr>
<td>There may be a dose dependent relationship between intensity of exercise and benefit to cardiac patients. Moderate intensity (3-6 METS) with a clear explanation of what activities constitute this group is beneficial.</td>
<td>ACSM/CDC guideline</td>
<td></td>
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</table>

### Older people

- Older male and female cardiac patients have comparable trainability and improvement in outcomes as younger participants in exercise rehabilitation.
- No complications or adverse reactions to exercise rehabilitation were reported in any studies of rehabilitation for older people.
- Every effort should be made to enable older people to be referred for rehabilitation, as at present they are less likely to participate.

### Risks during cardiac rehabilitation exercise

- The absolute risk of sudden death and myocardial infarction during exercise based cardiac rehabilitation programmes is small for most individuals and reduced by regular exercise.
- Myocardial infarction and sudden death are more likely during strenuous, compared to low to moderate intensity exercise. The risk of vigorous exercise is greater for normally sedentary individuals and with more severe cardiac disease.
- For some individuals stress testing and other investigations should be performed to identify persons who should not have exercise training, or who should be referred to a supervised cardiac exercise programme.
- Exercise for people at moderate risk is recommended as part of a 2-3 month medically supervised programme. Staff training in exercise prescription enhances exercise programmes.
## Overview of trials of patient education – Evidence table 1

<table>
<thead>
<tr>
<th>Search</th>
<th>Selection criteria for articles</th>
<th>Data extraction and appraisal</th>
<th>List of studies included</th>
<th>Data synthesis</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computerised searches of:</td>
<td>RCTs, quasi-experimental comparison group design, or a one-group pretest-posttest design with a sample size of at least 10 in the experimental group at the end of the follow up period. 38 studies were identified. 14 RCTs, 14 quasi-experimental comparison group design and 10 pretest-posttest design. The meta-analysis was restricted to the controlled trials (28 studies).</td>
<td>Not stated how data was extracted from the primary studies. A second coder assessed a subset (31%) of the studies and 90.6% agreement was achieved. Three raters worked in rotating pairs.</td>
<td>Arntzenius 1986 Barnard et al, 1983 Bengtsson 1983 Burt et al, 1974 Chubb and Winship 1972 Daltry 1985 DeBusk et al, 1985 Dracup 1982 Ehsani et al, 1981 Fielding 1980 Frasure-Smith and Prince 1985 Greenstein 1982 Healy 1983 Hertanu et al, 1986 Hertanu et al, 1986 Ibrahim et al, 1974 Kavanagh et al, 1973 Kavanagh et al, 1973 Langosch et al, 1982 Linde and Jonz 1979 Linde and Jonz 1979 Maeland and Havik 1987 Marshall et al, 1986 Mayou et al, 1983 Millar et al, 1988 O’Callaghan et al, 1984 O’Callaghan et al, 1984 Oldridge and Jones 1983 Oldridge et al, 1978 Rahe et al, 1979 Rahe et al, 1979 Rosenberg 1971 Roviaro et al, 1984 Salonen et al, 1985 Shaw 1981 Sivarajan et al, 1983 Waites et al, 1983 Wilhelmsen et al, 1975 Young et al, 1982</td>
<td>Weighted average effect sizes were:  • 0.51 for blood pressure (95% CI: 24-0.77) based on 5 studies, 0 outliers excluded;  • 0.24 for mortality (95% CI:0.14-0.33) based on 7 studies, 1 outlier excluded;  • 0.18 for exercise (95% CI:0.07-0.29) based on 12 studies, 1 outlier excluded;  • 0.19 for diet (95% CI:0.05-0.34) based on 9 studies, 2 outliers excluded;  • 0.08 for return to work (95% CI:0.11-0.27) based on 6 studies, 1 outlier excluded;  • 0.05 for morbidity (95% CI:0.04-0.13) based on 9 studies, 1 outlier excluded;  • 0.07 for smoking (95% CI:0.08-0.22) based on 9 studies, 2 outliers;  • -0.09 for drug adherence (95% CI: 0.39-0.22) based on 3 studies, 0 outliers excluded.</td>
<td>The systematic exclusion of outlying studies may lead to bias in the results. Variable follow up period from 0 to 1460 days. Inconsistencies between the inclusion criteria and details of the primary studies presented in the tables. No cost data presented. SIGN level of evidence 1+.</td>
</tr>
</tbody>
</table>

[262]
### Nutrition management – Evidence table 1

Randomised controlled trials of dietary therapy in patients treated with HMGCoA reductase medications

<table>
<thead>
<tr>
<th>Author, date, study design, setting</th>
<th>Population</th>
<th>Intervention and duration of trial</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Chisholm et al, 1992 [96 (1+)] Randomised single blind controlled crossover trial with switchback. Setting - Lipid clinic (Dunedin, New Zealand).</td>
<td>19 patients with possible familial hypercholesterolaemia. Five subjects with manifest CHD. At time of recruitment patients were taking a variety of lipid lowering medications. Baseline TC 9.8 mmol/L.</td>
<td>HF (38% total fat and 14% SFA energy, P: S $\leq 0.6$) and LF (27% total fat and 8% SFA energy, P:S $\geq 0.9$) diets. Crossover at 8 week periods. Patients were maintained on 40 mg/d simvastatin. 24 weeks.</td>
<td>Blood cholesterol and TG concentrations.</td>
<td>TC (p&lt;0.02), LDL cholesterol (p=0.06) were significantly higher on the HF diet. Diet-induced reduction in TC 6.5%. HDL cholesterol and apo A1 were significantly lower on the LF diet (p&lt;0.05).</td>
<td>Contact made with patients fortnightly or at least monthly by research Dietitian. Four day records confirmed compliance with intervention diet. HF diet group only achieved 33% total fat energy and LF group 23% total fat energy. SIGN level of evidence 1+.</td>
</tr>
<tr>
<td>Clifton et al, 1992 [97 (1+)] Randomised, single blind controlled trial. Setting - Lipid clinic (Adelaide, Australia).</td>
<td>20 patients with TC &gt; 6.5 mmol/L and TGs &lt; 4 mmol/L</td>
<td>Lipid lowering medications including fish oil supplements were ceased 12 weeks prior to commencement of trial. 5 treatment phases each 4 weeks in duration. LF diet. LF diet+simvastatin. LF diet+simvastatin (high dose). HF diet+simvastatin (high dose). HF diet. Patients were instructed by a Dietitian to eat 20% of energy as fat (LF) and increase this by 30-50 g/d depending on BW. 20 weeks.</td>
<td>Blood cholesterol and TG concentrations.</td>
<td>Simvastatin equally effective on HF or LF diets (29% vs. 25% reduction in TC). Some evidence of a drug-nutrient interaction. 10.7% reduction TC with change from HF to LF diet in absence of simvastatin (p&lt;0.001) but same dietary change with simvastatin produced 5.2% reduction in TC (p&lt;0.05). Lowest TC levels achieved with simvastatin on LF diets (15 of 19 patients).</td>
<td>Washout periods between treatment phases may have been too short resulting in carryover. SIGN level of evidence 1+.</td>
</tr>
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<tr>
<td>Cobb et al, 1991 [98 (1+)]. Randomised single blind 3 controlled crossover trial. Setting - Metabolic kitchen and outpatient clinic (New York, USA).</td>
<td>29 patients with LDL cholesterol greater than upper quartile. Five subjects met clinical criteria for monogenic familial hypercholesterolaemia. Eight subjects exhibited coronary and/or PVD. Baseline TC 8.0 mmol/L.</td>
<td>Lipid lowering medications ceased 4 weeks prior to washout period. Initial 3 week washout diet typical USA diet. Patients counselled as outpatients. Metabolic diets 43% total fat energy vs. 25% total fat energy (AHA Step II diet). Natural food supplement was offered to ensure weight maintenance. Lovastatin (20 mg taken twice per day) and placebo. 3 week intervention periods followed by 10 day washout.</td>
<td>Blood cholesterol and TG concentrations.</td>
<td>Three subjects stopped the 25% fat intervention and were not included in the final analysis. 25% fat diet reduced total, LDL, and HDL cholesterol by 17%, 23% and 13% compared to the 43% fat diet (placebo vs. placebo). No diet-drug interaction. Lovastatin reduced TC 23% and LDL cholesterol 30% compared with placebo on both dietary regimens. Therapeutic goals (LDL cholesterol &lt; 3.36 mmol/L) achieved by 47% of subjects on HF regimen vs. 81% of subjects on LF regimen (p&lt;0.02).</td>
<td>HF diet actually achieved 43.1% total fat energy, 37.1% carbohydrate energy and 17.8% protein energy. LF diet achieved 26.8% total fat energy, 55.7% carbohydrate energy, and 17.5% protein energy. Accompanying fat-modified diet with lipid modifying agents remains advisable for additional reduction of LDL cholesterol to specified therapeutic goals. HDL cholesterol lowering could be avoided by further modification of type and quantity of fat as well as carbohydrate containing foods. SIGN level of evidence 1+.</td>
</tr>
<tr>
<td>Hunninghake et al, 1993 [100 (1+)]. Randomised, single blind 3 controlled crossover trial. Setting - Lipid clinic (Minneapolis, USA).</td>
<td>111 patients with LDL cholesterol between 4.14-5.17 mmol/L. Excluded patients with atherosclerotic disease, liver disease, BW &gt; 30% above ideal, poorly controlled hypertension, smoking &gt; 10 cigarettes per day, in postmenopausal women treatment with oral contraceptives and TG &gt; 3.39 mmol/L.</td>
<td>Lipid lowering medications ceased 6 weeks prior to washout period. Initial 4-week run in period on typical diet. Isoenergetic NCEP Step II diet (LF) and lovastatin (20 mg/d) vs. HF diet (HF) and placebo. Four combinations of treatment. HF diet+placebo. LF diet+placebo. HF diet+lovastatin. LF diet+lovastatin. Dietary advice provided by Dietitians at beginning of each treatment period and subsequent visits at 3, 6 and 9 weeks. Used food models and diaries to teach portion control and measure compliance. 40 weeks.</td>
<td>Blood cholesterol and TG concentrations. apo A-I, A-II, B, E and Lp (a).</td>
<td>14 patients lost to follow-up. Intention to treat analysis was able to use data from all but 6 subjects. 5% reduction of LDL cholesterol with LF diet compared to HF diet whether placebo or lovastatin (p&lt;0.001). 27% reduction in LDL cholesterol with lovastatin vs. placebo (p&lt;0.001). 32% reduction in LDL cholesterol with lovastatin and LF diet. No significant interaction between diet and drug, so effects are additive. Poor response to dietary change may be explained by P:S where equal 1.0 in LF diet group. Other food components of the diet are not specified. Despite efforts to individualise diets on an isoenergetic basis mean difference of 2.87 MJ/d (685 kcal/d) between LF and HF diets (p&lt;0.001). SIGN level of evidence 1+.</td>
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</table>

3 Double blind to lovastatin intervention but not diet.
<table>
<thead>
<tr>
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<tr>
<td>Neil et al, 2001 [101 (1-)].</td>
<td>63 patients. Two groups of aged 18-69 years. Inclusion criteria included (i) TC ≥ 6.5 mmol/L not on lipid lowering medications and (ii) those treated with a statin for a diagnosis of definite or possible familial hypercholesterolaemia. Excluded patients with secondary hyperlipidaemias, fasting TG &gt; 3.5 mmol/L, BMI &gt; 35 kg/m², a history of alcohol abuse, use of lipid lowering drug (other than statin treatment for patients with familial hypercholesterolaemia), gastrointestinal diseases, or severe concomitant diseases, pregnancy or breastfeeding.</td>
<td>Usual diet plus study or control fat spreads. Study spread 25 g/d supplied 2.5 g/d phytosterols. After two months intervention, patients were crossed over for final two months.</td>
<td>Blood cholesterol and TG concentrations, apo A and B.</td>
<td>No significant change in LDL cholesterol for control vs. 10% reduction for treatment group at 8 weeks (p&lt;0.0001). Small but statistically significant increase in apo A-I and a decrease in apo B in treatment group.</td>
<td>Patients not equal at baseline with TC and LDL cholesterol lower in patients with statin-treated familial hypercholesterolaemia than those with type IIa hypercholesterolaemia (p&lt;0.001). Results confounded by carry-over effect and changes to background diet for some patients. Some reporting of side effects in treatment group (10 patients) including flatulence, abdominal discomfort, diarrhoea and constipation. SIGN level of evidence 1-.</td>
</tr>
<tr>
<td>Pedersen et al, 2000 [90 (1-)].</td>
<td>151 patients aged 35-75 years with confirmed diagnosis of acute myocardial infarction or unstable angina and with mean LDL cholesterol &gt; 3.0 mmol/L. Exclusion criteria included patients currently on statins, having a LDL cholesterol &lt; 3.0 mmol/L or having secondary hypercholesterolaemia, active severe liver disease, drug addiction, a clinical history of alcohol abuse, or history of intolerance to simvastatin were excluded.</td>
<td>Dietary advice plus immediate simvastatin therapy (40 mg/d 4 days post myocardial infarction) vs. dietary advice plus deferred simvastatin therapy (40 mg/d 3 months post myocardial infarction). Diet described as Mediterranean-style with &lt;30% total fat energy, P:S ≥ 4.0, and increased fruits and vegetables. Counselling delivered by a nurse for ≥ 20 minutes. Baseline questionnaire used to counsel and then adherence measures at time of randomisation, 26 and 52 weeks.</td>
<td>Blood cholesterol and TG concentrations.</td>
<td>12 patients lost to follow-up. At 12 months, therapeutic goals (LDL cholesterol &lt; 3.0 mmol/L) achieved by 86% of subjects in the group with diet plus immediate simvastatin treatment vs. 79% of subjects in the group with diet plus deferred simvastatin treatment (NS).</td>
<td>No dietary data reported or compliance recorded. SIGN level of evidence 1-.</td>
</tr>
</tbody>
</table>
## Nutrition management – Evidence table 2

Randomised controlled trials investigating different nutrition education interventions for individuals at high risk of, or with manifest cardiovascular disease

<table>
<thead>
<tr>
<th>Author, date, study design, setting</th>
<th>Population</th>
<th>Intervention and duration of trial</th>
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<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>Bemelmans et al, 2000 [111 (1+)]. Randomised, single blind controlled trial. Setting - Primary care setting (Groningen, Netherlands).</td>
<td>266 patients with TC 6-8 mmol/L with at least two other CVD risk factors. Exclusion criteria were age below 30 or over 70 years, diabetes mellitus, hypothyroidism and use of anticoagulants, lipid lowering medications.</td>
<td>Group nutrition education (Three education sessions to (1) raise consciousness and increase knowledge of a healthy Mediterranean diet; (2) promote a positive attitude towards the diet and (3) improve skills in preparing a Mediterranean diet); group education plus tailored health education (stage-matched individual approach) vs. usual care. 12 months.</td>
<td>Rate of CVD events and CVD death, 4 years after baseline. Secondary endpoints are levels of CVD risk factors and changes in dietary behaviour.</td>
<td>Significant improvement in food intake for treatment group in fish, fruit, poultry, and bread (reported at 4 and 24 months). Increased BMI after 12 months. Total fat and SFA above recommended levels. No significant lowering of TC.</td>
<td>Participants not blinded to cholesterol results. Supplementation with study margarine provided to all participants is likely to have changed energy and fat content for some diets. High baseline levels for some food groups may have diluted effect of nutrition intervention. SIGN level of evidence 1+.</td>
</tr>
<tr>
<td>Karvetti 1981 [105 (1-)]. Randomised, single blind controlled trial. Setting - Rehabilitation research centre (Turku, Finland).</td>
<td>194 men aged 27-64 years post myocardial infarction. No exclusion criteria reported.</td>
<td>A nutrition education programme consisting of individual counselling and group education; food cooking demonstrations; as part of a comprehensive cardiac rehabilitation programme or normal health care. 24 months.</td>
<td>Diet and nutrient intakes of myocardial infarction patients. Comparison of two methods of education - lectures and food preparation.</td>
<td>Completeness of follow-up 89% in treatment group and 85% in control. Significant improvement in food intake for treatment group (reported at 12 and 24 months), fats (p&lt;0.05), vitamin C (p&lt;0.01), SFA (p&lt;0.01) and the P:S ratio (p&lt;0.001). Mean BW and blood cholesterol levels were lower (p&lt;0.001). No significant differences between food and nutrient intakes for lecture and food preparation groups.</td>
<td>No attempt to blind investigators or patients to interventions. Unequal intensity of observation between treatment and control groups. SIGN level of evidence 1+.</td>
</tr>
<tr>
<td>Ni Mhurchú et al, 1998 [112 (1+)]. Randomised, single blind controlled trial. Setting - Hospital-based outpatient clinics (Southampton, UK).</td>
<td>121 patients with blood cholesterol &gt; 5.2 mmol/L with or without raised serum TGs. Excluded patients with any of the following conditions; thyroid disease, hepatic disease, renal disease, diabetes mellitus, pregnancy, or if they were taking lipid lowering medications, or had a myocardial infarction within previous 3 months.</td>
<td>Motivational intervention vs. usual care. 12 weeks.</td>
<td>Increasing motivation for change, increasing knowledge of recommended diet, achieving reductions in dietary fat, improving lipid profile and reducing weight where appropriate.</td>
<td>13 patients lost to follow up and 11 excluded because they started lipid lowering medication. Both methods resulted in reductions in self-reported intakes of energy, fat, carbohydrate and cholesterol (p&lt;0.001) and improvements in dietary habits and knowledge. No significant reduction in blood cholesterol.</td>
<td>Motivational interviewing was not more effective than usual care however, 80% of patients reported later stages of dietary change and 90% of patients reported having altered diets and reduced fat intakes before initiating intervention. SIGN level of evidence 1+.</td>
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</tbody>
</table>
**Nutrition management – Evidence table 3**

Randomised controlled trials of dietary intervention aiming for a reduction in cardiovascular mortality or incidence (including angiographic trials) during secondary prevention

<table>
<thead>
<tr>
<th>Author, date, study design, setting</th>
<th>Population</th>
<th>Intervention and duration of trial</th>
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<tbody>
<tr>
<td>Ball et al, 1965 [365]. Randomised single blind controlled trial. Setting - Multi-centre, hospital-based outpatient clinics (central and west London, UK).</td>
<td>264 men aged &lt; 65 years, who had recently recovered from myocardial infarction (within previous 3 months). Excluded patients on long term anticoagulants, with syphilis, diabetes, myxoedema, severe hypertension, notable cardiac enlargement or persisting heart failure and patients who could not cooperate.</td>
<td>LF diet (40 g/d fat) or usual diet. Reducing diets were prescribed for both intervention (15%) and control (21%) groups if the patient was overweight. 36 months.</td>
<td>Total mortality, re-infarction and death from CHD.</td>
<td>12 patients lost to follow up. 48 relapses in the control and 46 in the intervention group; deaths from all causes 24 in the control and 20 in the intervention group. Downward trend in mortality but no significant difference between groups.</td>
<td>Intensive follow up with Doctor and Dietitian reviewing patient with partner 2 weeks post discharge, every 2 weeks for the first 3 months, every 3 months for 2 years, and every 6 months thereafter. Weight loss and micronutrient changes to the diet may have contributed to downward trend in mortality. SIGN level of evidence 1+</td>
</tr>
<tr>
<td>Burr et al, 1989 [127 (1+)]. Randomised single blind controlled trial. Setting - Multi-centre, hospital-based outpatient clinics (Cardiff, UK).</td>
<td>2033 men under 70 years, post myocardial infarction (mean 41 days). Excluded patients with diabetes, men awaiting cardiac surgery, and men who already intended to eat one of the intervention diets.</td>
<td>Fat advice, (&lt; 30% energy) and to increase the P:S; fish advice, at least two weekly portions (300 g/wk) or 0.5 g/d MaxEPA; and fibre advice, increased intake of cereal fibre to 18 g/d. 24 months.</td>
<td>Total mortality and CHD events (CHD deaths plus non-fatal myocardial infarction).</td>
<td>116 CHD deaths and 149 cardiac events in no fish advice group and 78 CHD deaths and 127 cardiac events in fish advice group. RR for total mortality fish advice only 0.71(0.54-0.93). No significant reduction for total mortality or CHD events across any other group.</td>
<td>Randomised groupings slightly imbalanced and monitoring of compliance by means of questionnaire may have introduced bias. Subjects were followed up by Dietitian at 1 month, 3 months, and 3 month intervals thereafter. SIGN level of evidence 1+</td>
</tr>
<tr>
<td>de Lorgeril et al, 1994 [123 (1+)]. Randomised, single blind controlled trial. Setting - Multi-clinic outpatient services (six services within Lyon Cardiovascular Hospital, Lyon, France).</td>
<td>605 patients less than 70 years old, post myocardial infarction within previous 6 months. Excluded patients with overt heart failure, hypertension, an incomplete exercise tolerance test.</td>
<td>AHA Step II diet vs. Mediterranean-type diet (more bread, more root and green vegetables, more fish, less meat, no day without fruit, and butter and cream replaced with canola oil based margarine). 27 months.</td>
<td>Cardiovascular mortality, primary cardiac death and non-fatal myocardial infarction. Additional end-points included non-cardiac deaths and conditions requiring hospitalisation.</td>
<td>16 cardiac deaths in the control and 3 in the intervention group; 33 primary end-points in the control and 8 in the intervention group. Mean rate of withdrawal from follow-up 7% control and 8% in intervention. RR for cardiac deaths 0.24 (0.07-0.85). RR for major primary end-points 0.27(0.12-0.59).</td>
<td>Doctor and Dietitian review at 8 weeks, then annually. Evaluation of control diet only at follow-up compared to intervention group at 0, 8, 52 and 104 weeks by means of a 24-hour recall and food frequency questionnaire. Protection from death, especially cardiac death; all CVD events evident after only two months on Mediterranean-type diet. SIGN level of evidence 1+</td>
</tr>
<tr>
<td>Author, date, study design, setting</td>
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<tr>
<td>Morris et al, 1968 [366]. Randomised, single blind controlled trial. Setting - Multi-centre, hospital-based outpatient clinics (north and west London, UK).</td>
<td>393 patients aged &lt; 60 years discharged from hospital after first myocardial infarction. Excluded patients with severe obesity, diabetes, syphilis, hypertension, patients with cardiac lesions which significantly prejudice the prognosis, previous significant modification of dietary fat, inability of the patient to comply with the dietary regimen, unsuitability for prolonged anticoagulant therapy.</td>
<td>40 g/d fat diet, reduced in SFA plus an 80g supplement of unhydrogenated soybean oil (46% energy from fat, P:S 2:1), or usual care. 40 months.</td>
<td>Myocardial infarction, sudden death, angina and all deaths from cardiovascular diseases and other causes. Relapse measured under four broad criteria including definite, probable, possible and other ischaemic cardiac death.</td>
<td>51 fatal or non-fatal CHD events in the control and 45 in the intervention group. Reduced relapse rate. No reduction in cardiovascular mortality, or total mortality.</td>
<td>Seven day food records completed. Intensive follow up with Doctor and Dietitian reviewing patient with partner 2 weeks post-discharge, every 2 weeks for the first 2 months, then 3 months and every 3 months thereafter. Intervention and control groups not equal at baseline, small significant difference in weight and more controls on reducing diets. SIGN level of evidence 1+.</td>
</tr>
<tr>
<td>Rose et al, 1965 [367]. Randomised controlled trial. Setting - Hospital outpatient clinics (St Mary’s Hospital, London, UK).</td>
<td>52 patients aged &lt; 70 years, ECG evidence of myocardial infarction or clear history of angina. Excluded patients with heart failure and presence of non-cardiac disease likely to threaten life within 2 years.</td>
<td>LF diet (mean for intervention group 29% total fat energy) with added corn or olive oil supplements (80 g/d) or usual diet. 24 months.</td>
<td>Major cardiac events including, sudden death, fatal infarction, definite infarction, non-fatal and probable infarction, non-fatal.</td>
<td>Six patients lost to follow up. No reduction in mortality between the groups. At 24 months, proportion of patients remaining free of major cardiac events was greater for usual care group (75%) than the two intervention groups (olive oil 57% and corn oil 52%).</td>
<td>Heavy glycosuria occurred in patient with diabetes. Improved once oil supplement withheld. Trial raises the safety of some oils at this extraordinary intake. Dietary assessment only performed on those patients still in the trial at 24 months. Poor compliance with intervention, estimated that average oil intake has fallen to 60% of ideal by 12 months. SIGN level of evidence 1+.</td>
</tr>
<tr>
<td>Ornish et al, 1998 [124 (1+)]. Randomised, controlled trial. Setting - Two tertiary care university medical centres (San Francisco, USA).</td>
<td>48 patients with angiographically documented CHD, aged 35-75 years. Excluded patients with myocardial infarction in the preceding 6 weeks, those on lipid lowering medications, or with one, two or three vessel CHD.</td>
<td>Usual care vs. lifestyle modifications including a strict LF (&lt;10% energy from fat) vegetarian diet. No animal products other than egg whites and 1 cup/d allowance of LF yoghurt. Required B₁₂ supplements. 5 years.</td>
<td>Adherence to dietary intervention. Changes in coronary artery percent diameter stenosis. Cardiac events.</td>
<td>45 cardiac events in control vs. 25 cardiac events in the experimental group. RR for any cardiac event 2.47 (p&lt;0.001). Mean percentage diameter stenosis regressed from 38.92% to 35.85% (p=0.001) in the intervention group.</td>
<td>Patients completed a 3-day diet diary at 0, 1 year and 5 years. Adherence measures reflected compliance with fat and cholesterol intakes. Strong relationship between programme adherence and lesion changes. Further work needed to address practicalities of such a strict dietary regime. SIGN level of evidence 1+.</td>
</tr>
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<tr>
<td>Schuler et al, 1992 [368]. Randomised, controlled trial. Setting - (Heidelberg, Germany).</td>
<td>113 men, with stable angina, coronary artery stenoses well documented by angiography. Excluded men with unstable angina, left main coronary artery stenosis &gt; 25% luminal diameter reduction, severely depressed LVF, significant valvular heart disease, type 1 diabetes, hypercholesterolemia, and occupational, orthopaedic, and other conditions precluding regular participation in exercise sessions.</td>
<td>LF diet (&lt; 20% total fat energy, 65% carbohydrate energy, 15% protein energy, &lt; 200 mg dietary cholesterol and P:S &gt; 1) and exercise vs. usual care. 12 months.</td>
<td>Relative and minimal diameter reductions of coronary lesions.</td>
<td>21 patients lost to follow up. Progression 23% vs. 48%, no change 45% vs. 35% and regression 32% vs. 17% (p &lt; 0.05) (intervention vs. control).</td>
<td>Self reported compliance to home-based exercise, dietary intervention assessed by repeated 24-hour recall. SIGN level of evidence 1-.</td>
</tr>
<tr>
<td>Singh et al, 1992 [125 (1+)]. Randomised, single blind controlled trial. Setting: Primary and secondary care research centre for patients with myocardial infarction (Moradabad, India).</td>
<td>406 patients with myocardial infarction or unstable angina. Excluded patients with dislike for prescribed diet, presence of co-morbidities such as cancer, diarrhoea, or dysentery. Baseline TC 5.91 mmol/L.</td>
<td>AHA Step II diet (Less than 30% total energy as fat, 7% or less as SFA, P:S greater than 1.4, dietary cholesterol less than 200 mg/d and energy intake to achieve desirable BW) vs. AHA Step II diet and increase in fruits and vegetables (≥ 400 g/d), nuts, pulses and fish. 12 months.</td>
<td>Mortality from cardiac disease and other causes, serum lipid concentrations and compliance with diet.</td>
<td>82 cardiac events in the control and 50 in the intervention group. Total mortality was also lower in the intervention group (21 vs. 38 deaths). RR for cardiac events 0.60 (0.31-0.75), RR for total cardiac mortality 0.58 (0.34-0.83), RR for total mortality 0.55 (0.34-0.75). Dietary intakes were obtained by a Dietitian before entry to study, and at 4 weeks and 12 weeks by 24-hour recall and weighing of fruits and vegetables intake. Strong relation between adherence to the intervention programme, lipid changes, and cardiac events. Weight reduction on the intervention diet has an independent beneficial effect. SIGN level of evidence 1+.</td>
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<tr>
<td>Watts et al, 1994 [369]. Randomised, placebo controlled, single-blinded trial. Setting - Hospital-based outpatient clinics (St Thomas' Hospital, London, UK).</td>
<td>90 middle-aged men with angina or myocardial infarction and TC in the range 6.0-10 mmol/L. Exclusion criteria patients with TG &gt; 4.0 mmol/L, cardiac failure, myocardial infarction in the previous 8 weeks, malignancy, organ disease, or hypertension.</td>
<td>Diet (27% total fat energy, 8-10% SFA, 8% PUFA, 100 mg/4.2 MJ dietary cholesterol and 3.6 g/4.2 MJ soluble fibre) vs. diet and cholestyramine or usual care. 39 months.</td>
<td>Change in mean absolute width of coronary segments.</td>
<td>Mean absolute width of the coronary segments studied increased by 0.003 mm (p=0.06) from diet alone and 0.103 mm in a diet plus cholestyramine group (p&lt;0.001). Progression of disease related to intakes of total fat (p&lt;0.001), SFA (p=0.001), MUFA (p=0.016) and dietary cholesterol (p=0.06). Dietary assessments by Dietitian on two occasions using dietary history (including interview, cross-check food frequency and 3-day record). Dietary change alone retarded overall progression and increased overall regression of CHD. Additional benefit seen with diet and cholestyramine. SIGN level of evidence 1+.</td>
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<tr>
<td>Author, date, study design, setting</td>
<td>Population</td>
<td>Intervention and duration of trial</td>
<td>Outcomes</td>
<td>Results</td>
<td>Comments</td>
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<td>Woodhill et al, 1978 (370). Randomised, controlled, single-blinded trial. Setting - (Sydney, Australia).</td>
<td>458 subjects aged 30-59 years with clinical coronary disease post myocardial infarction.</td>
<td>Reduced SFA, high PUFA diet (P:S &gt;1.0) vs. control (instruction to restrict energy if overweight). Diets assessed by interview 3 times per year for first year and twice yearly thereafter. 24-84 months.</td>
<td>5 year total mortality, blood cholesterol, blood pressure and BW.</td>
<td>67 deaths during follow up, 60 due to coronary heart disease, 3 to stroke, 2 to cancer and 2 to MVA. No significant difference in 5 year mortality.</td>
<td>History of dietary change and recent weight loss prior to intervention in all groups. Two-thirds of subjects had lost an average of 5.4 kg since infarction. Weight loss continued in both groups during intervention. Changes in smoking habits and physical activity may also have had an effect on outcomes. SIGN level of evidence 1-.</td>
</tr>
</tbody>
</table>
**Nutrition management – Evidence table 4**

Randomised controlled trials of nutrition supplements and cardiovascular mortality

<table>
<thead>
<tr>
<th>Author, date, study design, setting</th>
<th>Population</th>
<th>Intervention and duration of trial</th>
<th>Outcomes</th>
<th>Results</th>
<th>Comments</th>
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<tr>
<td><strong>GISSI-Prevenzione Investigators 1999 [135 (1+)].</strong> Randomised placebo controlled trial. Setting - Cardiology departments and rehabilitation centres (Santa Maria, Italy).</td>
<td>11324 patients surviving recent myocardial infarction (“3 months”).</td>
<td>Patients were assigned n-3 PUFA alone (850-882 mg/d), vitamin E alone (300 mg/d), n-3 PUFA and vitamin E combined, or no supplement. All the patients were given optimal medical treatment and were instructed to follow a traditional Mediterranean diet, including fish, vegetables and fruit. 42 months.</td>
<td>Primary combined endpoints were: cumulative rate of all-cause death, non-fatal myocardial infarction, and non-fatal stroke; and cumulative rate of cardiovascular death, non-fatal myocardial infarction, and non-fatal stroke.</td>
<td>Relative risk for combined endpoint n-3 PUFA only 0.85(0.74-0.98) and for cardiovascular death, non-fatal myocardial infarction, and non-fatal stroke 0.80(0.68-0.95). The effect of combined treatment was similar to that for n-3 PUFA. No statistically significant effect for vitamin E on primary combined endpoints.</td>
<td>No objective assessment of compliance. Results could be confounded by background Mediterranean diet. Weekly fish consumption (≥ 1 serving/wk) increased in all participants from 73.2% at baseline to 87.6% at 42 months. Vitamin E dose 30 times greater than current recommended allowances. Results obtained with n-3 PUFA consistent with DART Trial. SIGN level of evidence 1+.</td>
</tr>
<tr>
<td><strong>HOPE Investigators 2000 [371 (1+)].</strong> Randomised, placebo controlled trial. Setting - Secondary care research centre.</td>
<td>4761 high-risk patients (55 years of age or older) who had evidence of vascular disease or diabetes plus one other cardiovascular risk factor and who were not known to have a low ejection fraction or heart failure.</td>
<td>The trial was a two-by-two factorial study evaluating both ramipril and vitamin E. Patients were assigned vitamin E (400 IU/d) or placebo. 54 months.</td>
<td>Primary combined endpoints of myocardial infarction, stroke, and death from CVD. Secondary endpoints were death from any cause, unstable angina, heart failure, revascularisation or complications from type 2 diabetes.</td>
<td>772 cardiovascular events in treatment group. No statistically significant result for vitamin E on primary combined endpoint relative risk 1.05(0.95-1.16).</td>
<td>Excellent compliance throughout study with 89.2% compliance at 54 months for vitamin E group. SIGN level of evidence 1+.</td>
</tr>
<tr>
<td><strong>Rapola et al, 1997 [137 (1+)].</strong> Randomised placebo controlled study. Setting - Primary care research centre (Helsinki, Finland).</td>
<td>1862 men (smokers aged between 50 and 69 years) post myocardial infarction. Exclusion included patients with severe angina and on anticoagulant therapy.</td>
<td>Men received dietary supplements of vitamin E (50 mg/d), beta-carotene (20 mg/d), both or placebo. 63 months.</td>
<td>Primary endpoint first major coronary event after randomisation. Classified into non-fatal myocardial infarction and fatal CHD.</td>
<td>424 coronary events. No significant differences in number of coronary events between supplementation groups and placebo. Significantly more deaths from fatal CHD in beta-carotene group 1.73(1.16-2.64), combined vitamin E and beta-carotene 1.58(1.05-2.40) than placebo.</td>
<td>Multivariate-adjusted relative risks adjusted for age, number of daily cigarettes, serum total and HDL cholesterol, systolic blood pressure, body mass index, daily alcohol intake, physical activity and history of diabetes. SIGN level of evidence 1+.</td>
</tr>
<tr>
<td>Author, date, study design, setting</td>
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<td>Intervention and duration of trial</td>
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<td>Singh et al, 1997 (372).</td>
<td>360 patients admitted to hospital with myocardial infarction with onset of symptoms in the preceding 24 hours.</td>
<td>Patients randomised to one of three interventions; MaxEPA (1.08 g/d EPA and 0.72 g/d DHA)+NCEP Step II diet. Mustard oil (ALA 2.9 g/d)+NCEP Step II diet. NCEP diet only. Compliance to fish oil intervention measured by counting capsules, to mustard oil intervention by questionnaire. 12 months.</td>
<td>Sudden cardiac death, total cardiac deaths, non-fatal myocardial infarction and total cardiac events.</td>
<td>18 withdrawals from interventions but patients available for follow-up at 12 months. 64 cardiac events in treatment group vs. 41 in the control group. Total cardiac events significantly less for fish oil and mustard oil group vs. control (24.5% and 28% vs. 34.7%; p&lt;0.01). Non-fatal myocardial infarction significantly less for fish oil and mustard oil group vs. control (13% and 15% vs. 25.4%; p&lt;0.05). Total cardiac deaths only significant for fish oil vs. control (11.4% vs. 22.0%; p&lt;0.05). Reported side-effects included belching and nausea in patients receiving fish oil supplements.</td>
<td>Groups not comparable at baseline with previous myocardial infarction and angina higher in fish oil group, more current smokers in treatment groups vs. control. No instruction on nutrition management to a Step II diet provided and no compliance measures to this diet were reported. No baseline dietary information was reported. It is unclear how the mustard oil was administered and whether patient were blind to this. SIGN level of evidence 1-.</td>
</tr>
</tbody>
</table>
## Nutrition management – Evidence table 5

Meta-analysis of moderate alcohol consumption and coronary heart disease [373]

<table>
<thead>
<tr>
<th>Search</th>
<th>Selection criteria</th>
<th>Data extraction</th>
<th>List of studies</th>
<th>Data synthesis</th>
<th>Comments</th>
</tr>
</thead>
</table>
### Nutrition management – Evidence table 6

**Meta-analysis of ad libitum low-fat dietary interventions and obesity [177]**

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<thead>
<tr>
<th>Search</th>
<th>Selection criteria</th>
<th>Data extraction</th>
<th>List of studies</th>
<th>Data synthesis</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>Studies were identified from a computerised search of the Medline database from January 1966 to July 1999 and other non-identified sources [177].</td>
<td>Excluded studies if intervention period &lt; 2 months; if energy intake adjusted to maintain BW; if total energy intake was restricted; if there were other interventions which could affect weight loss apart from advice to increase physical activity; if subjects were living with type 2 diabetes; if drugs given which could affect BW; if no control; or if no numerical values for pre-treatment and final dietary fat intake.</td>
<td>Two authors independently selected the studies meeting the inclusion criteria.</td>
<td>Lee-Han 1988&lt;br&gt;Boyd 1990&lt;br&gt;Buzzard 1990&lt;br&gt;Ornish 1990&lt;br&gt;Bloemberg 1991&lt;br&gt;Sheppard 1991&lt;br&gt;Beier 1993&lt;br&gt;Hunninghake 1993&lt;br&gt;Kasim 1993&lt;br&gt;Raben 1995&lt;br&gt;Pritchard 1996&lt;br&gt;Siggaard 1996&lt;br&gt;Simon 1997&lt;br&gt;Weststrate 1998&lt;br&gt;Stefanick 1998.</td>
<td>Mean BMI for trials was 21-29kg/m²&lt;br&gt;% energy from fat ranged from 3.5-24.1% for interventions.&lt;br&gt;Dose-response relationship between reduction in % dietary fat and BW loss (r=0.66, p&lt;0.005).&lt;br&gt;1% reduction in dietary fat equates to 0.37(0.15-0.60) kg BW loss.</td>
<td>Selection criteria excluded any trials on obese subjects. Conclusions not entirely consistent with results obtained. SIGN level of evidence 1+.</td>
</tr>
</tbody>
</table>
### Nutrition management – Evidence table 7

Meta-analysis of lowering blood homocysteine with folic acid based supplements [155]

<table>
<thead>
<tr>
<th>Search</th>
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<th>Data synthesis</th>
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</table>
| Eligible studies were identified by Medline searches (using search terms and widely used variants for folic acid, vitamin B12, vitamin B6, and homocysteine, and including the non-English language literature), scanning reference lists, and personal contact with relevant investigators [374]. | All published and unpublished randomised trials that had assessed the effects on blood homocysteine concentrations of folic acid supplements, with or without the addition of vitamins B12 or B6. Studies were not eligible if they did not include an untreated control group, assessed treatment after methionine loading, or treated patients for less than three weeks. 14 trials identified that fulfilled the eligibility criteria included two completed trials from which data are not available for collaborative analyses until their publication. | No explicit description of data extraction by the Homocysteine Lowering Trialists’ Collaboration. | Landgren 1995  
Den Heijer I 1998  
Den Heijer II 1998  
Den Heijer III 1998  
Ubbink 1994  
Ubbink 1993  
Naurath 1995  
Dierkes I 1995  
Pietrzik II 1995  
Woodside 1997  
Cuskelly 1995  
Saltzman 1994. | The median pre-treatment blood concentration of homocysteine was 11.8 µmol/l and of folate was 11.6 nmol/l, but there were substantial differences between the trials. All of the trials compared folic acid alone vs. control or folic acid plus vitamin B6 or B12, or both, vs. control, although two trials also involved within trial comparisons of folic acid alone vs. combination therapy. For homocysteine concentrations of 12 µmol/l and folate of 12 nmol/l, dietary folic acid reduced blood homocysteine concentrations by 25% (95% CI 23 to 28%; p < 0.001) with similar effects in the range of 0.5 to 5.0 mg folic acid daily. Vitamin B12 (mean 0.5 mg) produced an additional 7% (2 to 10%) reduction in blood homocysteine. Vitamin B6 (mean 16.5 mg) did not have a significant additional effect. | Does not include information on food fortification with folic acid and nutrition education strategies to improve folic acid intake from foods. Size effect may be exaggerated by higher concentrations of homocysteine in pre-treatment groups. Exploration of heterogeneity between results of different trials. Some evidence of publication bias. SIGN level of evidence 1+. |
**Nutrition management – Evidence table 8**

Meta-analysis of garlic as a lipid lowering agent [167]

<table>
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<th>Search</th>
<th>Selection criteria</th>
<th>Data extraction</th>
<th>List of studies</th>
<th>Data synthesis</th>
<th>Comments</th>
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</table>
| Medline search using terms 'garlic', 'lipids', or 'blood pressure' between 1966 and July 1992 [167 (1+)]. Alternative Medicine database search 'garlic'. In addition published reviews, reference lists from clinical trials and conference abstracts. Letters sent to manufacturers of garlic preparations and authors of published reports to identify unpublished reports. | Studies had to meet two criteria; there had to be at least two treatment groups; and allocation to the groups must have been randomised. Also trials of less < 4 weeks were excluded. 16 randomised controlled trials. | Independently extracted from published reports by both authors and disagreements resolved by discussion. Non-English articles were examined with the assistance of a translator. Where methods or results unclear letters were sent to individual authors requesting the information (9 of 13 responded but only 3 could provide the information). | **Non-powder preparations**  
Blushan 1979  
Bordia 1981  
Barrie 1987  
Lau 1987  
Gadkari 1991. **Powder preparations**  
Sitprija 1987  
Kandiziora 1988  
Kandiziora 1988  
Plengvidhya 1988  
Auer 1990  
Mader 1990  
Vorberg 1990  
Kiesewetter 1991  
Holzgartner 1992  
Santos 1993  
Jain 1993. | Mean difference in reduction of TC -0.77 mmol/L (-0.65 to -0.89 mmol/L) and TG -0.31 mmol/L (-0.14 to -0.49 mmol/L) between garlic-treated subjects and those receiving placebo. Reduction evident after 1 month of therapy. No significant difference in size of reduction across a dose range of 600-900 mg/d. | Quality of meta-analysis determined by the quality of the studies included, and this compromised the analysis. Methodological quality assessment to assess potential sources of bias was generally poor. SIGN level of evidence 1+. |

---

4 Equivalent to approximately 100 g/d oily fish
### Psychosocial aspects – Evidence table 1

Prognosis: cohort studies investigating psychological factors and prognosis: Systematic review

<table>
<thead>
<tr>
<th>Author, date, study design, setting</th>
<th>Selection criteria</th>
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<th>Data Synthesis</th>
<th>Comments</th>
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</thead>
</table>
# Psychosocial aspects - Evidence table 2

Prognosis: observational studies investigating prognostic role of depression, anxiety and social support

<table>
<thead>
<tr>
<th>Author, date, study design, setting</th>
<th>Population</th>
<th>Duration of the trial, outcomes</th>
<th>Results</th>
<th>Comments</th>
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<tr>
<td>Allison T et al, 1995 [195 (2++)].</td>
<td>381 consecutive patients with CAD referred for rehab after hospitalisation for unstable angina, PTCA, CABG or myocardial infarction.</td>
<td>Used SCL-90 (symptom checklist 90) to determine psychologic distress. Differences analysed between distressed and non-distressed patients associated with CV hospitalisation, recurrent events or hard event (cardiac death, myocardial infarction or cardiac arrest) over a 6-month follow-up period.</td>
<td>Distressed patients significantly more likely to experience at least 1 early CV rehospitalisation compared with non-distressed (RR 2.39; p&lt;0.005), more likely to experience at least one hard event (RR 5.51;p&lt;0.015) recurrent CV event (RR 2.86; p=0.007) during 6 months follow-up.</td>
<td>Only one pt lost to follow-up. Validated instrument in cardiac patients. Outcome reviewer blinded to SCL-90 results. Strength of association remained following multivariate analysis with potential confounders. No CABG, diabetes and ejection fraction&lt;40% also found to be independent predictors of recurrent event or hospitalisation. SIGN level of evidence 2++.</td>
</tr>
<tr>
<td>Barefoot J, et al, 2000 [210].</td>
<td>N = 590/832 patients having had cardiac cath with CAD ≥ 75% stenosis of ≥ 1 coronary artery from one hospital. Non-participants accounted for.</td>
<td>Investigated the relationship between level of social support and depression. Follow up visit at home after one month, though not clear as to whether they were blinded to level of social support /depression at baseline.</td>
<td>Patients with high levels of social support showed more improvement in depressive symptoms during the subsequent month (p=0.001). High levels of social support and improvement were strongest with those with low income, and high levels of depression at baseline. Social support did not interact with gender, disease severity, or functional status.</td>
<td>Regression analysis used. Well validated instrument. Control for disease severity. SIGN level of evidence 2+.</td>
</tr>
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<td>Frasure-Smith et al, 2000 [196 (2+)].</td>
<td>887 patients who completed BDI and PSSS tools during hospitalisation after acute myocardial infarction. Recruited from 10 hospitals.</td>
<td>Perceived Social Support Scale (PSSS). Demographic and medical variables.</td>
<td>32% patients had baseline BDI&gt;10 indicative of mild to moderate depression. Depressed patients had significantly lower perceived social support scores and were at increased risk of 1 year cardiac mortality (OR 3.36; 1.68-6.7). Social support measures showed no overall relationship with cardiac mortality but significant interaction with depression in that high levels of social support appeared to buffer the impact of depression on 1 year mortality post-myocardial infarction.</td>
<td>Mortality classified independently by 2 cardiologists blinded to baseline data. Results remained significant after controlling for age, functional status, sex LVEF and smoking. Did not control for other co-morbidities. SIGN level of evidence 2+.</td>
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<tr>
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<td>Levine J et al; 1996 [204 (2-)]. Psychological predictors of subsequent medical care among patients hospitalised with cardiac disease. Prospective clinical Cohort study, USA.</td>
<td>N = 210/384 (54%) consecutive patients (men &amp; women) over 9 months from a single hospital. Patients a combination of those having had myocardial infarction, PTCA, or CABG. Good breakdown of non-participants, that tended to be older and have a shorter stay in hospital.</td>
<td>Base line data gained by assistant with a 6 months’ follow up by phone and gained 67% of the sample (141). Beck Depression Inventory (BDI). Disease severity tool used (LVEF &amp; number of vessels diseased).</td>
<td>Mean depression scores were considered close to that of the general public, suggesting that CAD patients are at no greater risk. The initial level of depression was predictive of both the number of days of cardiac related re-hospitalisation and the days of re-hospitalisation for any reason (p&lt;0.0001). Anxiety was not predictive of either outcome. Disease severity alone was not a good predictor, though together they may produce a synergistic result, amplifying the results of each other on re-hospitalisation.</td>
<td>Response rate may have underestimated the effects of depression. Valid and reliable tool, Regression analysis more strongly supported key findings. Age range not defined. SIGN level of evidence 2+.</td>
</tr>
<tr>
<td>Soejima Y, et al, 1999 [184 (2+)]. Psychosocial and clinical factors predicting resumption of work following acute myocardial infarction in Japanese men. Cohort study, Japan.</td>
<td>No 111/138 married men, 66 years and under in full time work, from hospitals in one Japanese city. First time myocardial infarction.</td>
<td>Follow up questionnaire at an average of 8 months. Interviews and questionnaire Japanese translation of Eysenck Personality Inventory (measures neuroticism &amp; introversion). Attitudes to health were assessed with Health Locus of Control scale. Study over 5 years.</td>
<td>Results overall demonstrated little significant differences when compared to Western studies. Failure to return to work was independently predicted by 3 factors: 1. Older age (p=0.019) 2. Introverted personality (p=0.011) 3. Depressive symptoms during hospitalisation (p=0.031). Delay in return to work was associated with: 1. Greater concern about health (p=0.011) 2. Low social support (p=0.021) &amp; 3. a failure to recognise a link between stress, coping style and illness (p=0.001). Clinical indices of infarction size and disease severity did not predict work-related outcomes.</td>
<td>Reliability &amp; validity of test? Some of the sub groups were small. Multivariate analysis used. Cultural validity of tools don’t appear to be tested. Social support structures different from NZ. SIGN level of evidence 2+.</td>
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<tr>
<td>Moser, D and Dracup, K, 1995 [232 (2+)]. Psychosocial recovery from a cardiac event. The influence of perceived control. Cohort study, USA.</td>
<td>176/228 patients with myocardial infarction, CABG or both, from 6 large metropolitan hospitals, USA. Inclusion &gt;18 years, living with spouse or other relative. Exclusion-serious co-morbidities, mentally incompetent, history of psychiatric illness.</td>
<td>Patients completed mailed questionnaires (Control Attitudes Scale, Psychosocial Adjustment to Illness Scale and Multiple Affect Adjective Checklist) within 2 weeks of recruitment and at 6 months. Patients placed into high/low control groups based on their Control Attitudes score at baseline.</td>
<td>Significant differences were seen in psychosocial recovery between patients with feelings of high control compared with those with feelings of low control (p=0.006). Patients with high control at baseline were less anxious (p=0.002), less depressed (p=0.001), less hostile (p=0.02) and had better psychosocial adjustment (p=0.009) at 6 month follow-up than those with low feelings.</td>
<td>77% completed study. No details given on source population?consecutive patients recruited, ?numbers refusing to participate. No differences seen at baseline between participants and those lost to follow-up. Instruments validated according to internal consistency and retest reliability. SIGN level of evidence 2+.</td>
</tr>
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<td>Mayou R, et al, 2000 [198 (2+)]. Depression and anxiety as predictors of outcome after myocardial infarction. Cohort study, Oxfordshire, UK.</td>
<td>344/546 patients &lt;80 years with definite or probable myocardial infarction (according to MONICA criteria) over one year period (1994-95) who completed baseline questionnaires.</td>
<td>Questionnaires included cardiological information, Hospital Anxiety and Depression Scale (HADS) and SF-36. Measures repeated at 3 months and 12 months.</td>
<td>15% patients scored as probable cases of anxiety or depression. At baseline, distressed patients compared to non-distressed were significantly younger (p&lt;0.001), had longer hospital stay, previous history of psychosocial difficulties. There were no baseline differences in cardiac history. Baseline distress strongly predictive of poor symptomatic psychosocial and social outcome (everyday activity, reports of chest pain, use of primary care and secondary care lifestyle changes), but not mortality at 3 months &amp; 12 months.</td>
<td>Multiple methods of case ascertainment to identify all cases over study period. Non-participants accounted for, non-responders described. Latter group: no differences at follow-up for mortality/socio-demographic characteristics. Well-validated instruments. No adjustments made for co-morbidities, previous cardiac history, functional status. SIGN level of evidence 2+.</td>
</tr>
<tr>
<td>Bosworth, H, et al, 1999. The association between self-rated health and mortality in a well-characterised sample of coronary artery disease patients. Cohort study, North Carolina, USA.</td>
<td>2,885 patients mean age 62.5 years with coronary artery disease (&gt;75% stenosis) on angiography. Mean follow-up 3.5 years. Exclusion: congenital heart disease, valvular disease, prior PTCA, heart transplant, alcoholics, drug users.</td>
<td>Examined the relationship between self-rated health and mortality after adjustment for sociodemographic variables, co-morbidities, disease severity, health-related quality of life and psychosocial measures. Questionnaires: Self-reported health-SF36, Interpersonal Social Evaluation List (ISEL), Duke Activity Scale (DASI), Centre for Epidemiologic Studies Depression Scale (CESD), Future Expectations regarding life with Heart Disease (CFE).</td>
<td>Total 3,700 patients, 387 refused to participate, 42% had less than 90% completed data and were not included in analyses. Adjusted for disease severity/co-morbidities, individuals who rated their health as fair or poor had an increased all-cause mortality risk 1.57 (1.03-2.4) and 2.89 (1.87-4.47) respectively compared with those who rated their health as very good. Depression was found to be an independent predictor of all-cause 1.44 (1.1-1.88) and cardiac mortality 1.41 (1.08-1.84).</td>
<td>68% men, 82% white Caucasian. Participants had to be highly motivated to fill in all the questionnaires. Evaluation of non-participants: less income &amp; education, more co-morbidities, older, 6% mortality over follow-up period (cf participants 11% mortality over study duration). No differences in gender, race, marital status, self-rated health. Validated internal consistency of psychosocial measures 0.85-0.88. SIGN level of evidence 2+.</td>
</tr>
<tr>
<td>Ziegelstein et al, 2000 [186 (2+)]. Patients with depression are less likely to follow recommendations to reduce cardiac risk during recovery from myocardial infarction. Cohort study, USA.</td>
<td>N=204/276 consecutive patients (57% men, 43% women) from one hospital, USA who had suffered a myocardial infarction. Sample taken over an 18 month period.</td>
<td>Baseline BDI, along with the Structured Clinical Interview to assess for current or lifetime mood disorder. Patients followed-up 4 months by telephone interview.</td>
<td>20% had mild to mod depression post admission. Those that were depressed had more difficulty following recommendations intended to reduce their risk of subsequent cardiac events (low fat diet, exercise, reducing stress and increasing social support at 4 months. P values ranged between p&lt;0.03 -&lt;0.001.</td>
<td>Validate &amp; reliable tools, interviewers blind to first interview, co-morbidity factors included. SIGN level of evidence 2+.</td>
</tr>
<tr>
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<td>Perski A, et al, 1999 (183) ((2+)). Intensive rehabilitation of emotionally distressed patients after coronary by-pass grafting. Cohort study, Sweden.</td>
<td>152 CABG patients, average age 54 years.</td>
<td>Patients referred for intensive in-house 4/52 CR related to residual angina ((20%)), low physical activity ((63%)), anxiety ((12%)) and depression ((5%)). The presence of emotional distress was tested using the Nottingham Health Profile.</td>
<td>Intensive CR improved all markers except return to work. 1. Patients who were emotionally distressed after the surgery did not differ in disease status or physical capacity from non-distressed patients though they experienced more angina. 2. Distressed patients were very successful in improving their functional status and reducing risk factors but were much less successful in returning to work.</td>
<td>Highly selected group of post CABG patients who were referred with either extensive physical or emotional distress symptoms. SIGN level of evidence (2+).</td>
</tr>
<tr>
<td>Steffens D, et al, 1999 (202) ((2-)). The effect of major depression in functional status in patients with coronary artery disease. Cohort Study, USA.</td>
<td>(N=335/805) ((42%)). Sample elderly males mean 70 years, female 67 years with CAD. One Hospital, USA.</td>
<td>Three reliable tools used. Duke Depression Evaluation Schedule, Diagnostic Interview Schedule, Cumulative Illness Rating Scale, along with two tools to measure instrumental and self-maintenance activities.</td>
<td>The presence of major depression was associated with functional disability in patients with CAD. (P&lt;0.001) especially in older females, with greater medical illness severity and presence of major depression were significant predictors of self-maintenance ADL disability.</td>
<td>Poor response rate, which may have skewed the findings more positively than they actually were. Regression models, female, older age, greater medical severity. SIGN level of evidence (2-).</td>
</tr>
<tr>
<td>Sykes D, et al, 1998. Socio-economic status, social environment, depression and post discharge adjustment of the cardiac patient. Cohort Study, Belfast.</td>
<td>(N=287/431) mainly first time admission to CCU with myocardial infarction or unstable angina.</td>
<td>Followed up three times over the first year post discharge. Tools used were the Family Environment Scale (FES), Social, Provisions Scale (SPS), Minnesota Personality Inventory &amp; SF-36 Health Survey.</td>
<td>Patients of lower socio-economic status were at risk of poorer adjustment across multiple areas of functioning in the 12 months following discharge. They tended to rate their families more negatively than their upper social class peers and reported a less supportive social environment and levels of depression were significantly higher pre-hospitalisation, and increased over the 12 months following discharge. Patients of lower socio-economic status (SES) were at risk of poorer adjustment across multiple areas of functioning in the 12 months following discharge.</td>
<td>Morbidity factors between social groups very similar high P values. Valid and reliable tools utilised. Attention should not be focused solely on biomedical variables, but should include indices of SES, which can be readily and easily obtained. SIGN level of evidence (2+).</td>
</tr>
<tr>
<td>Author, date, study design, setting</td>
<td>Population</td>
<td>Duration of the trial, outcomes</td>
<td>Results</td>
<td>Comments</td>
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<td>Spertus J, et al, 2000 [203 (2+)]. Association between depression and worse disease-specific functional status in outpatients with coronary artery. American Heart Journal. Cross-sectional survey.</td>
<td>N=1282/1793 (71%) from three hospitals, USA. Participants drawn from general internal medicine clinics. Base line questionnaires mailed out with 3 month follow-up.</td>
<td>Questionnaires used: Seattle Angina Questionnaire, mental health questions from SF-36 and Mental Health Inventory, all well-validated and reliable tools.</td>
<td>This is the first study to demonstrate the strong relation between a positive screen for depression in out patients with stable coronary disease and cardio symptom, limitations, and functional status. Depression is associated with significantly more physical limitation p&lt;0.001, more frequent angina p&lt;0.001, less treatment satisfaction p&lt;0.001, and lower perceived quality of life in outpatients with coronary artery disease p&lt;0.001.</td>
<td>Control for the possible confounding influence of medications checked by a sub study in one hospital. Random check of 200 patients hospital records for accuracy of participants information, found 93% accuracy. Some co-morbidity factors taken into account. SIGN level of evidence 2+.</td>
</tr>
<tr>
<td>Taylor D, et al, 1998 [200] (2-)]. The impact of post acute myocardial infarction (AMI) depression on patient compliance and risk factor modification. Cohort Study.</td>
<td>Size N=245/? AMI using 5 hospitals, USA. Predominately male, 93% Caucasian. Questionnaires given at 2-3 days and 3 month follow-up.</td>
<td>Aim of study was to find out whether depression adversely affected a client’s ability to follow instructions. Study used the CES-D tool that has been well validated.</td>
<td>There was no significance on first analysis, except for those that smoked was strongly linked to depression p=0.001. On secondary analysis they found difference between morbidity, socio-economic factors, and demographic characteristics 0.001. Only 30% attended CR.</td>
<td>Drop out rate and processes unclear. Difference compared to general population unclear. CR poorly attended. SIGN level of evidence 2-.</td>
</tr>
<tr>
<td>Welin C, et al, 2000 [201 (2++)]. Independent importance of psychosocial factors for prognosis after myocardial infarction. Cohort Study, Sweden.</td>
<td>N=230/288 (men), 45/55 (women). Below 65 years and previously had a myocardial infarction from two Swedish hospitals consecutively over 2 years. Last participants accounted for.</td>
<td>7 self administered questionnaires were used eg, Karolinska Scales of Personality (anger), Buss Durkee Hostility Inventory (guilt &amp; irritability), Trait Anxiety Inventory (anxiety &amp; irritability), Zung Self-Rating Depression Scale (depression), Beck’s Hopelessness Scale (meaningfulness), Jenkins’ Activity Scale, The Wallston 11-item scale (health locus of control) and Interview Schedule for Social Interaction. Follow up after 3 months.</td>
<td>In multivariate analysis a number of factors were found to increase coronary mortality, high depression score P= 0.0001 (CI 3.16), lack of social support P= 0.019 (CI 2.75), LVF P= 0.001 (CI 3.93), female who had suffered a first infarction P= 0.011 (CI 2.47). It was not significant with age, education, marital status, anxiety, dissatisfaction with family life, anger, and irritability.</td>
<td>Whether lack of social support is due to depression or vice versa could not be evaluated. Co-morbidities taken into account. The authors recommend the use of self-reporting scales to detect pragmatically important psychosocial problems. SIGN level of evidence 2++.</td>
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</tbody>
</table>
### Psychosocial aspects – Evidence table 3
Randomised controlled trials of the association between psychosocial factors and intermediate outcomes

<table>
<thead>
<tr>
<th>Author, date, study design, setting</th>
<th>Population</th>
<th>Exposure of interest, Duration of the trial</th>
<th>Outcomes</th>
<th>Results</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>Ickovics J, et al, 1997 [209 (1+)]. Functional recovery after myocardial infarction in men, the independent effects of social class. RCT. 25 clinical centres in USA and Canada.</td>
<td>2145 men, 29-69 years (mean age 54) hospitalised with acute myocardial infarction and recruited into the Beta Blocker Heart Attack Trial.</td>
<td>Social class, I, II, III defined as school years completed and occupation. 12 months. Change in NYHA functional class between baseline and 12 months after infarction adjusted for age, race, medical history including CVD risk, severity of infarction, and psychosocial features eg, life stress, social isolation and depression.</td>
<td>Following adjustment of confounding variables, persons of highest social class were significantly more likely than low or middle class to have improved functional status at one year. Low vs. High. OR 1.5(1.16-1.97). Middle vs. high. OR 1.34(1.08-1.67).</td>
<td>Mostly white (83.4%) vs. black ethnicity (6.6%). Self-reported stress measurement conducted via structured face-to-face interviews. Outcome assessment blinded to social class status- not described. No data on the association of social class and cardiac events or mortality. SIGN level of evidence 1+.</td>
<td></td>
</tr>
<tr>
<td>Meland E et al, 1999 [216 (1+)]. The importance of self-efficacy in cardiovascular risk factor change. RCT. Norway.</td>
<td>110/127 men (86% response) with IHD aged 30 – 59 years. 22 community general practice centres.</td>
<td>The two groups were ‘conventional care’ and ‘patient centred self-directive care’ over one year. Both groups offered lifestyle counselling every 3 months over the duration of the study. To validate the importance of self-efficacy in three behavioural domains diet, smoking and exercise.</td>
<td>Self-efficacy of increased physical exercise was the only variable significantly related to exercise, 37% increased exercise score by more than 1.1 p&lt;0.05 (20%, CI 0.3 –1.0). Age and self-efficacy were statistically significant predictors of smoking cessation success p= 0.02 &amp; 0.04 respectively.</td>
<td>Multiple and logistic regression analysis used. All men, co-morbidities don’t appear to be taken into account. Helps validate the importance of self-efficacy in both human behaviour and motivation for change. SIGN level of evidence 1+.</td>
<td></td>
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</tbody>
</table>
| Irvine, J, et al, 1999 [199 (1+)]. Depression and risk of sudden cardiac death after acute myocardial infarction, testing for the confounding effects of fatigue. RCT. Canada. 31 participating hospitals | 634/703 AMI survivors (mean age 63.8±/10.8 years) 83% men, participants also in the Canadian Amiodarone Myocardial Infarction Arrhythmia Trial (inclusion-frequent or repetitive ventricular depolarisation). Depression and Social support measured by 5 questionnaires. Beck Depression Inventory (BDI), Cook-Medley Hostility Scale, Multidimensional Scale of Perceived Social Support & Health and Daily Living Form. Follow-up 2 years. Outcomes- Sudden cardiac death (SCD) controlling for fatigue/dyspnoea previous myocardial infarction and CHF, NYHA functional class, VPBs, diabetes, treatment status. Elevated depressive symptoms were associated with twice the risk of mortality after an myocardial infarction in placebo treated patients. RR 2.45 (1.14-5.35; p<0.02). However after controlling for symptoms of fatigue and dyspnoea, the RR was no longer statistically significant. | No difference in mortality between responders and non-responders. Trend for cognitive-affective symptoms of depression vs. somatic symptoms associated with SCD after AMI that cannot be entirely explained by cardiac-related fatigue. Controlled for significant biological predictors. A blinded external validation committee reviewed outcome of events. Those declining to participate were more likely to ≥ 70 years of age. SIGN level of evidence 1+.
### Psychosocial aspects – Evidence table 4

Systematic reviews of psychosocial rehabilitation

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<th>Authors and search strategy</th>
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<th>Data extraction and appraisal</th>
<th>Studies included</th>
<th>Data synthesis</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>Dusseldorp et al, 1999 [259 (1+)]. Meta-analysis of psycho-educational programs for CHD patients. Search: Psychlit, Medline 1974-98.</td>
<td>Study Inclusion: CHD patients with myocardial infarction/CABG/PTCA &lt;6 months prior to intervention. Study outcomes: effects on risk factors, related behaviours, morbidity, cardiac mortality. Study design: RCTs and quasi-experimental (stratified samples or matched pairwise). No blinding.</td>
<td>Two independent evaluators and a third if needing consensus. Studies categorised by type of intervention: Health Education (HE) = info provision in an organised systematic way. Stress management (SM) = including psychotherapeutic interventions, relaxation, supportive Rx. HE or SM alone, together +/- exercise training compared with each other or standard care. SM only. HE only. SM and HE. HE and ET. SM, HE and ET.</td>
<td>37 studies included - 28 rcts, 9 quasi-experimental. Mean pre-test measurement occurred 4 weeks after event. Huge variation in duration and number of sessions (&lt;6/52-&lt;6 months). Average duration 28 weeks, average no of sessions 18. 22/37 multidisciplinary team. 15/37 unidisciplinary. Outcome measurement varied 6 months-10 years.</td>
<td>Results presented as weighted average effect size, standardised mean differences and OR according to outcome variable and short (&lt;1 year) medium (1-2 years) and long-term (&gt;2 years). Long term RRR 34% cardiac mortality (OR 1.52 treatment cf controls). RRR 29% recurrence of myocardial infarction at 2-10 years follow-up (OR 1.41). The effects were related to success on surrogate outcomes, eg, BP, cholesterol, weight, smoking, exercise, emotional distress or a combination of these. Significant intervention effects on most time periods were found for BP, total chol, smoking behaviour, weight, exercise behaviour, healthy eating but NO effect on CABG, anxiety or depression.</td>
<td>Programme characteristics (setting, length of programme, profession of programme provider, individual or group Rx, participation of partners), and patient characteristics (age, %women, type of event) were not found to modify success. No CIs given for ORs. No analysis for publication bias. Studies evaluated for heterogeneity using random effects model. Considerable diversity between studies. Limited search. Good description of data pooling and quality assessment. SIGN level of evidence 1+.</td>
</tr>
<tr>
<td>Authors and search strategy</td>
<td>Selection criteria</td>
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<td>Studies included</td>
<td>Data synthesis</td>
<td>Comments</td>
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<tr>
<td>Linden W et al, 1996 [258 (1-)]. Psychosocial interventions for patients with coronary artery disease- a meta-analysis. Search: Medline, only 1968-1995.</td>
<td>Study Inclusion: Patients with documented coronary artery disease, random assignment, one or more control conditions, psychosocial treatment offered in addition to usual care. Outcomes: cardiac mortality, morbidity. Subjective measures of anxiety depression, Physiological endpoints eg, BP, heart rate, lipids.</td>
<td>Data extraction and appraisal not described. Interventions included were an agglomeration of different programmes including group psychotherapy, group education, individual and cognitive behavioural therapy, counselling, relaxation therapy, music therapy, stress management training +/- spouse/partner. Wide diversity of underlying rationales, treatment techniques and type of person delivering interventions.</td>
<td>23 RCTs –18 post-myocardial infarction, 1 post-myocardial infarction or CABG, 4 with documented coronary artery disease. Follow-up and outcome measurement divided into 2 groups &lt;2 years and &gt;2 years.</td>
<td>Results presented as weighted average effect size due to wide variability in sample sizes, standardised mean differences and OR, and p-values via 2-tailed Student’s t-test allowing for unequal variances according to outcome variable and short (&lt;1 year) medium (1-2 years) and long-term (&gt;2 years). &lt;2 years follow-up, RRR 46% treatment cf controls for non-fatal cardiac events (OR 1.84; 1.12-2.99). &gt;2 years of follow-up RRR 39% (OR 1.64; 1.06-2.54). For fatal cardiac events &lt;2 years follow-up, treatment cf controls RRR 41% (OR 1.70; 1.09-2.64). &gt;2 years of follow-up (OR 1.35; 0.83-1.53). On the whole, treatment effects weakened when follow-up was extended. Psychosocial intervention associated with reductions in psychological distress, heart rate, cholesterol and systolic blood pressure compared with usual care.</td>
<td>Limited search. Possibility of publication bias not tested. Studies evaluated for heterogeneity. Limited description data pooling and no description of quality appraisal and assessment. No definitions given for interventions. Included interventions with both health education and stress management. Despite marked diversity of interventions effects almost uniformly positive? Linked with emotional support, establishment of hope and a sense of control. SIGN level of evidence 1-.</td>
</tr>
<tr>
<td>Mullen P et al, 1992 [262 (1-)]. A meta-analysis of controlled trials of cardiac patient education. Search: Electronic databases-Medline, Health Planning and Administration File, Sociological Abstracts, Books in Print, Dissertation Abstracts, Books info. 1971-1990.</td>
<td>Study Inclusion: Published or unpublished reports of studies testing a psychosocial or educational intervention with adult patients with coronary artery disease, including myocardial infarction, CABG and angina. Sample size at least 10 in each experimental group at end of follow-up period, randomised or quasi experimental comparison group design or a one-group pretest-post test design.</td>
<td>Data appraisal described. Study validity assessed according to contact frequency and total length of contact; channel (eg, one-to-one or group education, media etc), use of specific educational techniques, educational emphasis (didactic vs. behavioural) and rated according to 5 principles of education (relevance, individualisation, feedback, reinforcement and facilitation).</td>
<td>38 studies met inclusion criteria. Outcomes: exercise, diet including cholesterol, lipids, weight, smoking, morbidity including rehospitalisation and reinfarction, mortality, return to work, BP, drug adherence and stress / relaxation. Duration: 6/38 follow-up 1 year or longer, the remainder &lt;1 year.</td>
<td>Results presented as weighted average effect sizes, with no OR or confidence intervals or p-values given. Cardiac patient education programmes reported to have a significant impact on BP, exercise, diet and mortality. Type of communication channel did not influence impact but adherence to educational principles did.</td>
<td>Two raters for each study, 3 raters in rotating pairs. 90.6% agreement for codes. Tests for homogeneity conducted. 1/3 interventions judged as too vague for replication to be based on description. Only ½ studies randomly assigned groups. SIGN level of evidence 1-.</td>
</tr>
</tbody>
</table>
### Psychosocial aspects – Evidence table 5
Randomised controlled trials of psychosocial rehabilitation interventions compared with usual care

<table>
<thead>
<tr>
<th>Author, date, study design, setting</th>
<th>Population</th>
<th>Intervention and duration of trial</th>
<th>Outcomes</th>
<th>Results</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oldenburg B et al, 1995 [253 (1-)]. A controlled trial of behavioural and educational intervention following coronary artery bypass surgery. RCT. Sydney, Australia.</td>
<td>N=91/131 (69% of eligible patients) enrolled post-CABG. &lt;70 years old.</td>
<td>Control group of usual care compared with a behavioural and educational intervention based on social learning theory involving goal setting, skills training, feedback, reinforcement, contracts, social support etc. – via 6x weekly group sessions post-discharge. Repeated baseline measures at 4 months, 8 months and 1 year post CABG.</td>
<td>Outcomes measured by dietary questionnaire, serum lipids, self-reported exercise, smoking, and quality of life via General Health Questionnaire, Spielberger Trait Anxiety Inventory, Somatisation scales from SCL-90.</td>
<td>Reported differences in mean scores and p-values. No differences between the two groups except that VO2 Max was increased in the behavioural intervention group (p&lt;0.05). All patients tended to improve steadily over time.</td>
<td>Randomised in 2-week blocks based on their date of admission. Outcome assessment not blind. Definitions of educational and behavioural intervention scant. Baseline characteristics similar except for differences in medications. Not analysed according to intention to treat. Underpowered according to sample size calculations. SIGN level of evidence 1-</td>
</tr>
<tr>
<td>Trzieniecka-Green A &amp; Steptoe A, 1996 [264 (1-)]. The effects of stress management on the quality of life of patients following acute myocardial infarction or coronary bypass surgery. RCT. London, UK.</td>
<td>100 patients &lt;70 years old recruited 2-3 months post-myocardial infarction or CABG.</td>
<td>Randomised to 10 week relaxation/stress management group or usual care control group. Repeated baseline measures at 6 months.</td>
<td>Measurement of emotional and psychological well-being, functional status and social activity and chest pain by using Hospital Anxiety and Depression Scale (HAD) and Psychological Well-being Scale (GWB), Functional Status questionnaire and the WHO Rose angina questionnnaire.</td>
<td>Reported differences in mean scores. Statistically significant differences between control and stress management groups’ scores for HAD, GWB, FSQ, and chest pain.</td>
<td>87% men. Self-selected participants following letter of invitation—nearly half had already attended cardiac rehab with a stress management component in it—highly motivated participants. Method of randomisation not described. Group characteristics comparable at baseline. Four validated questionnaires. Outcome assessment not blind. SIGN level of evidence 1-</td>
</tr>
<tr>
<td>Author, date, study design, setting</td>
<td>Population</td>
<td>Intervention and duration of trial</td>
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<tr>
<td>Johnston M, et al, 1999 [211 (1-)]. Impact on patients and partners of inpatient and extended cardiac counselling and rehabilitation: a controlled trial. Dundee, UK.</td>
<td>117 patients &lt;70 years old admitted to coronary care unit with first myocardial infarction recruited within 72hrs of admission.</td>
<td>Concealed random allocation to one of 3 groups, normal care group (control), those to receive cardiac rehabilitation by nurse counsellor while in hospital, those to receive both inpatient and extended outpatient sessions up to 6/52 post discharge. Duration 1 year.</td>
<td>4 outcomes studied: knowledge of heart disease and treatment, mood (HADS) questionnaire, satisfaction with treatment, disability measured by Functional Limitations Profile.</td>
<td>Reported differences in mean scores. Statistically significant differences between control and rehabilitation groups with extended rehabilitation achieving the most improvement in knowledge, anxiety, depression, greatest satisfaction and less disability with effects enduring to 1 year.</td>
<td>Group characteristics comparable at baseline except extended rehabilitation group had fewer cardiac misconceptions. No intention to treat analysis- 17 who died or withdrew were not analysed. Outcome measures well defined and measurable and outcome assessment by researchers blind to intervention group. Did not investigate mortality, morbidity endpoints. SIGN level of evidence 1-.</td>
</tr>
<tr>
<td>Van Dixhoorn J &amp; Duivenvoorden H, 1999 [263 (1+)]. Effect of relaxation therapy on cardiac events after myocardial infarction: A 5-year follow-up study. The Netherlands.</td>
<td>156 patients referred to regional rehabilitation centre within one month of myocardial infarction and able to participate in a physical exercise programme.</td>
<td>Randomised to receive either exercise training plus relaxation therapy (relaxation group) or exercise training only.</td>
<td>Outcomes of interest - cardiac events (deaths, reinfarction or cardiac surgery) and rehospitalisation at 5 year follow-up period.</td>
<td>Relaxation group compared with control group had decreased risk of a cardiac event after adjustment for previous angina, size and location of infarction and signs of mild heart failure OR 0.52 (0.28-0.99) Total number of hospitalisations was reduced by 31% as a result of relaxation instruction.</td>
<td>Eligibility and recruitment to cardiac rehabilitation not described. Method of randomisation not described. Baseline characteristics similar in both groups. Intention to treat analysis. No blinding participants or researchers. SIGN level of evidence 1+.</td>
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</table>
### Pharmacotherapy – Evidence table 1

Considerations in secondary prevention for patients with coronary and other vascular disease

<table>
<thead>
<tr>
<th>Author, date, study design, setting</th>
<th>Population</th>
<th>Intervention and duration of trial</th>
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<tbody>
<tr>
<td>Antiplatelet agents. Antiplatelet Trialists Collaboration 1994 [375 (1++)]. Overview of 133 trials in patients with vascular disease including 11 post myocardial infarction trials.</td>
<td>More than 100,000 patients with vascular disease, including more than 18,000 post myocardial infarction patients.</td>
<td>Antiplatelet agents, mainly aspirin, dosage 75 mg-1500 mg daily. Varying duration up to several years, average approx. 2 years.</td>
<td>Composite of myocardial infarction, stroke or vascular death.</td>
<td>Combined event rate reduced from 17% to 13% (OR 0.75, SD 0.04, 2P&lt; 0.00001). Proportional reduction in events in post myocardial infarction patients similar to that in all trials in which event rate reduced from 11.9% to 9.5%. For post myocardial infarction patients, the NNT to prevent one event during one year approx. 50 patients. Low dose aspirin 75 mg as effective as higher doses. SIGN level of evidence 1++.</td>
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<tr>
<td>Beta blocker agents. Yusuf et al, 1985. [376 (1++)]. Overview of 65 trials in post myocardial infarction patients.</td>
<td>About 50,000 post myocardial infarction patients.</td>
<td>Long and short term oral and short term IV treatment with various beta blockers. Long term oral treatment duration average approx. 2 years.</td>
<td>Total mortality, sudden death, non-fatal reinfarction.</td>
<td>Total mortality reduced from 10% to 8% (OR 0.77, 95% CI 0.70-0.85 P&lt; 0.0001). Sudden death and non-fatal reinfarction significantly reduced. These numerous trials were carried out in the period before thrombolysis and ACE inhibition became standard treatments and patients with heart failure were generally excluded. The NNT to prevent one death during one year approx 100 patients. SIGN level of evidence 1++.</td>
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<tr>
<td>ACE inhibitors. Flather et al, 1997 [377 (1++)]. Overview of 3 large RCTs in post myocardial infarction patients (SAVE, AIRE, TRACE).</td>
<td>5966 patients with post myocardial infarction LV dysfunction or heart failure.</td>
<td>ACE inhibitor treatment (captopril, ramipril, trandolapril respectively) from about one week post myocardial infarction for average duration 2-3 years.</td>
<td>Total mortality, CV death, heart failure, recurrent myocardial infarction.</td>
<td>Total mortality reduced from 29.1% to 23.4% (OR 0.74, 95% CI 0.66-0.83 P&lt;0.0001). CV death, heart failure and recurrent myocardial infarction significantly reduced. A selective treatment approach in high risk patients with LV dysfunction or heart failure. The NNT to prevent one death during one year approx 40 patients. SIGN level of evidence 1++.</td>
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<td>HOPE Study Investigators, 2000 [371 (1++)]. Multicentre RCT, 2x2 factorial design with ramipril and vitamin E in patients with CV disease or high risk.</td>
<td>9297 patients with CV disease or diabetes plus at least one other CV risk factor. Patients with LV dysfunction or heart failure excluded.</td>
<td>ACE inhibition with ramipril 10mg daily and vitamin E for average duration 5 years.</td>
<td>Composite of myocardial infarction, stroke or CV death.</td>
<td>Combined event rate reduced from 17.8% to 14% with ramipril. (RR 0.78, 95%CI 0.70-0.86, SD 0.04, P&lt; 0.001) Vitamin E no effect. Significant benefit with ACE inhibition demonstrated in patients with CV disease generally. The NNT to prevent one event during one year approx. 120 patients. SIGN level of evidence 1++.</td>
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<tr>
<td>Author, date, study design, setting</td>
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<td><strong>Lipid lowering agents.</strong>&lt;br&gt;4S Study Group, 1994 [378 (1++)]. Multicentre RCT with simvastatin in patients with coronary heart disease.</td>
<td>4444 patients 35-70 years with CHD and serum cholesterol 5.5-8.0 mmol/L</td>
<td>Simvastatin 20mg daily increased if required to 40mg daily with target serum cholesterol 3.0-5.2mmol/L for average duration 5-6 years.</td>
<td>Total mortality, CV mortality, non CV mortality, CABG or angioplasty.</td>
<td>Total mortality reduced from 12% to 8% (RR 0.70, 95%CI 0.58-0.85, P&lt; 0.003). CV mortality and need for CABG or angioplasty significantly reduced. Non-CV mortality not affected.</td>
<td>The first major study to demonstrate the efficacy and safety of serum cholesterol lowering with a statin. The NNT to prevent one death during one year approx 150 patients</td>
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<tr>
<td><strong>LIPID Study Group, 1998 [379 (1++)].</strong></td>
<td>9014 patients 31-75 years with CHD and serum cholesterol 4.0-7.0 mmol/L</td>
<td>Pravastatin 40mg daily for average 6 years.</td>
<td>Total mortality, CV mortality, non CV mortality, CABG or angioplasty.</td>
<td>Total mortality reduced from 14.1% to 11% (RR 0.78, 95%CI 0.69-0.87, P&lt; 0.001). CV mortality and need for intervention significantly reduced. Non-CV mortality not affected.</td>
<td>Confirmed the 4S results in a larger study with more older patients and women and in a lower serum cholesterol range</td>
</tr>
</tbody>
</table>

SIGN level of evidence 1++.
### Comprehensive cardiac rehabilitation programmes – Evidence table 1

Haskell et al, 1993 [274]. Effects of Intensive Multiple Risk Factor Reduction on Coronary Atherosclerosis and Clinical Cardiac Events in Men and Women with Coronary Artery Disease. The Stanford Coronary Risk Factor Intervention Project (SCRP)

<table>
<thead>
<tr>
<th>Author, date, study design, setting</th>
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<tr>
<td>Haskell et al. 1993 [274 (1+)]. Randomised controlled trial. Four participating hospitals: Stanford University Hospital, Palo Alto Veterans Administration Hospital, Sequoia Hospital and Good Samaritan Hospital.</td>
<td>Inclusion criteria-men and women &lt;75 years, lived within 5 hours drive of Stanford University, free of severe congestive heart failure, pulmonary disease, intermittent claudication, or non cardiac life threatening illness. Following anterography patients either treated medically, received PTCA, or CABG. Patients remained eligible if had at least one coronary artery, had a segment with lumen narrowing between 5% and 69% that was unaffected by revascularisation.</td>
<td>Multifactor risk reduction programme: Individualised risk reduction programme based on subjects risk profile, his/her motivation and resources for making specific changes. Duration of intervention 4 years.</td>
<td>Angiographic changes, risk factor changes and clinical events.</td>
<td>Difference in the rate of change in minimal diameter of diseased segments between usual care and risk reduction groups remained significant when adjusted for age and baseline segment diameter (p=0.03). Risk reduction group reduced LDL-C and apo B – 22%, Tg 20%. Framingham risk score 22% and HDL-C increased 12%. Risk factor changes in usual care group were small. Difference in the number of cardiac deaths and hospitalisations for nonfatal myocardial infarction, PTCA and CABG was significant (P = 0.05). The total number of patients with a primary cardiac event over the 4 years in the usual care group was 35 and in the risk reduction group was 20 (P= 0.07).</td>
<td>Risk factor changes were similar between men and women, however small number of women in both groups. At baseline, average mean and minimal diameters for visibly disease segments were significantly larger in usual care group, however the difference in rate of change remained significant even after adjustment for age and baseline segment diameter. SIGN level of evidence 1+.</td>
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</tbody>
</table>
**Comprehensive cardiac rehabilitation programmes – Evidence table 2**

O’Connor et al, 1989 [267]. An overview of randomisation trials of rehabilitation with exercise after myocardial infarction

<table>
<thead>
<tr>
<th>Search</th>
<th>Selection criteria</th>
<th>Data extraction and appraisal</th>
<th>List of studies included</th>
<th>Data synthesis</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literature including abstracts from meetings scanned by a formal computer aided search and informal search for studies that were known to our research group [267 (1+)]. Often the principal investigator of the individual studies were contacted for additional details.</td>
<td>All included trials had to have a structured exercise component. Endpoints used: Total mortality, cardiovascular mortality, sudden death, fatal and non fatal myocardial infarction.</td>
<td>For each individual trial, the observed and expected values for total mortality were calculated.</td>
<td>Sanne, 1973 Wilhelmsen et al, 1975 Shaw 1981 Lamm et al, 1982 Hakkila, 1977 Kallio et al, 1978 Kallio et al, 1979 Carson et al, 1982 Rechnitzer et al, 1983 Vermeulen et al, 1983 Hare et al, 1983 Marra et al, 1985 Bethell 1982 Kentala 1972 Lamm et al, 1982 Palatsi 1976 Froelicher et al, 1984 Miller et al, 1984 Blumenthal et al, 1988.</td>
<td>In 17 of 21 studies the difference between observed and expected numbers of deaths was 0 or less indicating a protective effect against total mortality. The overview also showed a moderate reduction of about 20% in cardiovascular mortality as well. Both results were apparent at a year after randomisation, are statistically significant and persist throughout the follow up period.</td>
<td>Method of literature search poor. Data on endpoints missing to a greater or lesser degree at 3 years. All of the trials included focused on patients ≤ 70 years, not reflective of today’s demographics. 12 of the trials were men only. Length of time from myocardial infarction varied – participants not reflective of the current situation in New Zealand. SIGN level of evidence 1+.</td>
</tr>
</tbody>
</table>
**Comprehensive cardiac rehabilitation programmes – Evidence table 3**

Bobbio, 1989 [268]. Does post myocardial infarction rehabilitation prolong survival?

<table>
<thead>
<tr>
<th>Search</th>
<th>Selection criteria</th>
<th>Data extraction and appraisal</th>
<th>List of studies</th>
<th>Data Synthesis</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Medline 1980-1986 [268 (1++)].              | Controlled and randomised trials. Follow up at least 2 years. End points concerning total deaths, cardiac deaths and non fatal myocardial infarctions. Participants followed and studied by intent to treat methodology. Papers published in peer review journals. Only trials with at least a two year follow up were selected. | Effect of rehabilitation programmes was evaluated within each trial. The difference between observed and expected endpoints (O-E) and correspondent variance (O-Evar) were calculated for each study and the pooled data odds ratio calculated with approx. 95% confidence intervals. Chi square test for heterogeneity did not reach statistical significance. | Kentala 1972  
Wilhelmsen, 1975  
Kallio 1979  
Shaw 1981  
Carson 1982  
Roman 1983  
Vermeulen 1983  
Marra 1985. | Total mortality – no one trial reached statistical significance. Cardiac mortality – Six of seven trials a reduction in cardiac deaths was found in the intervention group, only one trial reached conventional statistical significance. Non fatal myocardial infarctions – five of eight showed a greater number of non fatal myocardial infarction’s in the intervention groups. | Well-conducted literature search with clear entry criteria. Statistical methodology clear. Characteristics of participants not reflective of cardiac rehabilitation population of today. Length of follow up not reflective of New Zealand situation. SIGN level of evidence 1++. |
### Comprehensive cardiac rehabilitation programmes – Evidence table 4

Oldridge et al, 1988 [269]. Cardiac rehabilitation after myocardial infarction. Combined experience of randomised controlled trials

<table>
<thead>
<tr>
<th>Search</th>
<th>Selection criteria</th>
<th>Data extraction and appraisal</th>
<th>List of studies</th>
<th>Data Synthesis</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>[269 (1+)].</td>
<td>1. Myocardial infarction (at least two or more of the following: Presence of chest pain, elevation of enzyme levels and electrocardiographic changes consistent with acute myocardial infarction). 2. Randomisation. 3. Rehabilitation either risk factor management plus exercise or exercise advice or exercise with some risk factor management lasting 6 weeks. 4. Follow up study ≥ 24 months. 5. Documentation of outcome to include at least two of all causes of death, cardiovascular mortality and nonfatal recurrent myocardial infarction.</td>
<td>Six independent reviewers. Introduction and methods sections of each trial retyped to ensure that the reviewers were blinded to the authors, institutions and results. Reproducibility was quantitated by K statistics. Intervention patients in one trial were only compared with the control subjects in the same trial. Bonferroni correction for the comparisons between the experimental patients and controls. A P value of less than .0125 was interpreted as statistically significant.</td>
<td>Kentala 1972  Wilhelmsen et al, 1975  Kallio et al, 1979  Shaw 1981  Carson et al, 1982  Rechnitzer et al, 1983  Roman et al, 1983  Vermuelen et al, 1983  World Health Organisation 1984 • Brussels • Ghent – Belgium • Bucharest – Romania • Budapest • Rome • Kaunas- USSR • Balatonfured – Hungary • Prague • Warsaw • Tel Aviv- Israel • Dessau – East Germany. Marra et al, 1985.</td>
<td>In all, trials combined those who had rehabilitation experience, lower cardiovascular mortality, P=.006 (% of patients 9.9 vs. 12.6) and lower death from all causes, P= 0.004 (% of patients 12.9 vs. 16.1). Duration of intervention-risk reduction was greater in trials lasting longer than 36 months.</td>
<td>Possible bias from limited search. Test for heterogeneity completed. Study population not comparable with cardiac rehabilitation population of today. Also duration of follow up is something that is not generalisable to the New Zealand situation. SIGN level of evidence 1+.</td>
</tr>
</tbody>
</table>
Comprehensive cardiac rehabilitation programmes – Evidence table 5

Hamalainen et al, 1995 [272]. Reduction in sudden deaths and coronary mortality in myocardial patients after rehabilitation. 15 year follow up study.

<table>
<thead>
<tr>
<th>Author, date, study design, setting</th>
<th>Population</th>
<th>Data extraction</th>
<th>Results</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Hamalainen et al, 1995 cohort [272 (2++)]. Secondary care Finland.</td>
<td>375 consecutive, non-selected patients under 65 years (301 men and 74 women). All patients surviving the hospital period were included. Patients allocated by stratified randomisation by sex and age group. Intervention group - 188 (151 males, mean age 53.4 and 37 females, mean age 58.0). Comparison group - 187 (150 males, mean age 53.0 and 37 females, mean age 58.4).</td>
<td>Primary outcomes measured were mortality, variables associated with mortality. Variables tested univariately for association with early mortality include: age, previous myocardial infarction, NYHA functional class one month prior to hospitalisation, Q vs. non Q wave myocardial infarction, highest value of ASAT, cardiac failure, heart volume, smoking, hypertension, total cholesterol, serum Tgs, BMI, diabetes, systolic BP at end of hospital stay and membership of intervention or control group.</td>
<td>Total mortality nearly equal in both groups - 64.4% vs. 66.8%. Coronary mortality was 47.9% intervention group and 58.4% in controls p= 0.04, due to lower number of sudden deaths in intervention group. Non coronary mortality higher in intervention group due to high number of cancers. Cardiac failure was the best predictor of death during the first 3 years. The relative risk of coronary death was 3.5 times higher in patients with cardiac failure. Membership of the control group was also independently associated with a greater risk of coronary death.</td>
<td>Patients included in this study were from the 1970’s when medical management of the myocardial infarction patients was not so intensive. Only five patients in the intervention group and six in control underwent CABG, no patients had coronary angioplasty. Basic difference between two groups was the intervention - comprehensive cardiac rehabilitation. SIGN level of evidence 2++.</td>
</tr>
</tbody>
</table>
### Comprehensive cardiac rehabilitation programmes – Evidence table 6

Hedback et al, 1993 [271]. Long term reduction of cardiac mortality after myocardial infarction: ten year results of a comprehensive rehabilitation programme

<table>
<thead>
<tr>
<th>Author, date, study design, setting</th>
<th>Sample</th>
<th>Data extraction</th>
<th>Main results</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hedback et al, 1993 cohort [271 (2++)].</td>
<td>Non-selected group of myocardial patients. Intervention group- 147 (124 males, 23 females, mean age 57.3 years). Intervention consisted of a comprehensive cardiac rehabilitation programme comprising education, follow up at post myocardial infarction clinic and regular physical training in outpatient groups and at home. Comparison group-158 (134 males, 24 females, mean age 57.2 years) received standard post myocardial infarction follow up care.</td>
<td>Primary outcomes: - Mortality, cause of death, morbidity, coronary by-pass grafting, return to work. There were no drop outs during follow up.</td>
<td>Mortality: significantly lower in the intervention group ( 42.2 vs 57.6% P&lt; 0.01). This was due to a reduction in cardiac mortality (36.7 vs. 48.1% P&lt; 0.001). Note: mortality occurred predominantly during the last five years of follow up, 12.9 vs. 25.9% P &lt;0.01. Morbidity: 42 patients in the intervention and 63 in the comparison group suffered one or more non-fatal reinfarctions. Return to work: significantly more patients in the intervention group still at work at 5 years post myocardial infarction, 67.8 vs. 33.3% p&lt;0.001.</td>
<td>Unlikely comparison group will have been exposed to the intervention as they were from another hospital. Low numbers of female participants. Participants aged less than 65 years. SIGN level of evidence 2++.</td>
</tr>
</tbody>
</table>
### Information needs – Evidence table 1

Randomised controlled trials of different approaches to information and preparation for patients undergoing coronary artery bypass graft surgery [115]

<table>
<thead>
<tr>
<th>Author, date, study design, setting</th>
<th>Population</th>
<th>Intervention and duration of trial</th>
<th>Outcomes</th>
<th>Results</th>
<th>Comments</th>
</tr>
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<tbody>
<tr>
<td>Mahler 1999 [115 (1++)], Randomised controlled trial. Scripps Memorial Hospital or San Diego Veterans Affairs Medical Centre, La Jolla, California.</td>
<td>186 males, 29 females, first time non-emergency CABG surgery. Predominantly white (83.3%). Age range 41-78 years, mean 61 years. Years of education range 6-25 years, mean 14 years. 82% married. Predominant occupation skilled labour 17.6%</td>
<td>The effect on compliance with recommended lifestyle changes of two video tapes of information designed to prepare post CABG patients for the post hospital recovery period. Three months post discharge.</td>
<td>Level of anxiety. Self efficacy beliefs. Exercise compliance. Diet compliance.</td>
<td>Anxiety No difference between those patients who viewed the tapes and controls. Self efficacy beliefs Patients who viewed either tape reported higher self efficacy scores for adhering to recommended low fat diet at discharge (P=0.055) and at one month (P&lt;0.01). Exercise compliance Patients who viewed the coping tape reported in engaging in more moderate exercise at one month (P&lt;0.01) and they engaged in more strenuous activity at three months (P&lt;0.02). Diet compliance Patients who viewed either tape had significantly lower cholesterol and saturated fat consumption at one month follow up (P&lt;0.05).</td>
<td>Small female sample. High percentage of the group were married which might have limited the effect of the tapes. High follow up rate at one month (92%) and three months (91%). SIGN level of evidence 1+.</td>
</tr>
<tr>
<td>Author, date, study design, setting</td>
<td>Population</td>
<td>Intervention and duration of trial</td>
<td>Outcomes</td>
<td>Results</td>
<td>Comments</td>
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<td>Mahler 1998 [291 (1-)]. Randomised controlled trial. Scripps Memorial Hospital and the San Diego Veterans Affairs Medical Centre, La Jolla, California.</td>
<td>268 males who had non-emergency CABG surgery, free of other medical conditions and who spoke English. Predominantly white (84.6%). Age range 40-80 years, mean 62 years. 75% married. Education range 5-22 years, mean 13 years.</td>
<td>Three videotapes that involved different approaches for preparing CABG patients for surgery and the in-hospital recovery period.</td>
<td>Perceived preparedness. Self-efficacy beliefs. Post-operative ambulation. Incentive spirometer use.</td>
<td>Patients who viewed any of the three videos felt significantly better informed and prepared for the recovery period than did the control patients (P&lt;0.001).</td>
<td>Only male patients were included. Predominantly white. Short follow up period. No repeated measures. SIGN level of evidence 1-.</td>
</tr>
<tr>
<td>Arthur 2000 [292 (1+)]. Randomised controlled trial. A regional cardiovascu-lar surgery centre in a tertiary care hospital south western Ontario, Canada.</td>
<td>249 patients on a waiting list for elective CABG (Surgery scheduled for a minimum of 10 weeks from the recruitment time).</td>
<td>During the waiting time, the treatment group received exercise training for twice a week, education and reinforcement and a monthly nurse initiated telephone call. Post surgery cardiac rehabilitation was offered to all patients.</td>
<td>Primary outcome: postoperative length of stay.</td>
<td>Patients who received the preoperative intervention spent 1 less day (95% CI, 0.0 to 1.0 day) in the hospital overall (P=0.002).</td>
<td>Study sample contained low risk patients. Patients’ physicians were blinded to their group assignment. Persons offering the intervention were not blinded to the assignment but had no role in determining the patients readiness for discharge, therefore they were unable to directly affect the primary outcome. SIGN level of evidence 1+.</td>
</tr>
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</table>
## Settings – Evidence table 1

Randomised controlled trial of general practice follow up (Jolly 1999 [299])

<table>
<thead>
<tr>
<th>Author, date, study design, setting</th>
<th>Population</th>
<th>Intervention and duration of trial</th>
<th>Outcomes</th>
<th>Results: intervention vs. control group</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jolly K, et al, 1999 [299 (1+)]. RCT; stratified random allocation of practices to intervention and control groups. All 67 practices in Southampton and south west Hampshire, England.</td>
<td>597 adult patients (422 with myocardial infarction and 175 with a new diagnosis of angina).</td>
<td>Programme to co-ordinate preventive care led by specialist liaison nurses which sought to improve communication between hospital and general practice and to encourage general practice nurses to provide structured follow up. One year duration. Repeated measurements.</td>
<td>Primary outcomes: serum total cholesterol, blood pressure, distance walked in 6 minutes, confirmed smoking cessation and BMI at one year follow up. Secondary outcomes: prescribed drugs, attendance at cardiac rehabilitation, use of health services, symptom control levels of anxiety and depression and quality of life.</td>
<td>Cotinine validated quit rate 19 vs. 20%-ns. Serum total cholesterol 5.80 vs. 5.93 mmol/l ns. Diastolic blood pressure 84 vs. 85mm Hg ns. Distance walked in six minutes 443 vs. 433m ns. Body mass slightly lower in the intervention group, 27.4 vs. 28.2, P=0.08. Antihypertensive therapy 80% vs. 77% Lipid lowering therapy 30% vs. 29% Patients with a cholesterol ≥5.5 mmol/l but not receiving treatment 38% vs. 41% ACE inhibition 36% vs. 31%. Aspirin 87% vs. 85%. Patients attending at least one session of rehabilitation 42% vs. 24%. Practice attendance with practice nurse 0.7 vs. 0.3. Practice attendance with GP 1.1 vs. 0.9. Percentage of patients reporting angina 53% vs. 52%. Percentage of patients reporting shortness of breath 69% vs. 68%. Anxiety % scoring &gt;10(HAD)* 24% vs. 21%. Depression % scoring &gt;10(HAD)* depression 11 vs. 7. EuroQol score 66.9% vs. 68.4%.</td>
<td>Loss to follow up was 10% for both the intervention and control groups. Clinical examination at one year follow-up was by a nurse not involved in delivering the intervention. There was a possibility of the nurse becoming aware of which group the patients practice was in. SIGN level of evidence 1+</td>
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</tbody>
</table>
### Specific populations – Evidence table 1

**Coronary Risk Factor Modification in Women after CABG Surgery [325]**

<table>
<thead>
<tr>
<th>Author, date, study design, setting</th>
<th>Population</th>
<th>Intervention and duration of trial</th>
<th>Outcomes</th>
<th>Results</th>
<th>Comments</th>
</tr>
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<tbody>
<tr>
<td>Allen J, 1996 [325]. Randomised control trial. Home based.</td>
<td>Inclusion criteria: patients had to live within a 50 mile radius of the institution and be undergoing a first time CABG. Of 174 eligible women, 138 consented. 116 completed the 12 month follow up.</td>
<td>Special intervention (SI) was a behavioural programme based on self efficacy theory in the home 2 weeks after discharge with regular follow up. Trial lasted one year.</td>
<td>Smoking cessation. Dietary changes. Body composition. Physical Activity.</td>
<td>Smoking cessation rate in those smoking at baseline was 64% SI and 55% UC. Dietary changes SI group decreased total fat intake from a mean of 38% of total calories to 35% at one year. UC increased their intake from 36% to 38%. At baseline, both groups had small proportion of women who consumed ≥ 20 grams fibre daily. At one year SI group had increased 12% to 14% and UC group had decreased 23% to 12%. No differences were found in BMI. Slightly higher proportion of SI women reported participating in regular exercise at one year 54% vs. 51%.</td>
<td>Author comments on differences between those who consented to participate and those who did not as well as reasons for drop out at 12 months – results compared 84% of originally enrolled participants. SIGN level of evidence 1+.</td>
</tr>
</tbody>
</table>
Absolute risk: The observed or calculated probability of an event in the population under study.


Adherence: The continued maintenance of a prescribed or recommended behaviour regime or medication.

Aerobic exercise: Exercise in which there is repetitive movement of large muscle groups. This exercise leads to increase in the uptake of oxygen. Hence in the term “aerobic”. The term in the past has been applied to high intensity exercise but it has now been broadened to include exercise that leads to increased oxygen uptake.

Amino acids: An organic compound containing an amino group and a carboxyl group. Amino acids are fundamental constituents of all proteins.

Angina pectoris: Heaviness or tightness in the chest which may spread to the arms, neck, jaw, face or back due to the inadequate blood supply to meet the demands of the heart muscle commonly during effort or emotion and which is eased by rest or use of glycerin trinitrate.

Angiogram: An x-ray picture of the blood vessels which shows where the arteries are narrowed and how narrow they have become.

Antioxidants: Any substance that prevents or delays damage of cells or genetic material by free radicals such as reactive oxygen and reactive nitrogen compounds. Vegetables, fruits, nuts and oilseeds are high in the antioxidant vitamins C and E and betacarotene, Phytochemicals found in foods, such as the catechins in tea or the phenols in wine also act as antioxidants.

Arrhythmias: Abnormal heart rhythm which may be permanent, intermittent or transient.

Atherosclerosis: The condition in which plaques containing cholesterol and other materials form in the inner linings of large and medium sized arteries leading to localised thickening.

Behavioural intervention: Systematic instruction and learning of techniques and methods to modify health related behaviours.

Behavioural modification: The use of methods of behaviourist psychology to alter peoples behaviour. It can be used in situations when an individual is not ill, for example, education.

Beta blocker: A drug which antagonises the effects of the sympathetic stimulation, thereby producing a slower heart rate, lower blood pressure and reduced heart muscle contraction leading to lessened oxygen demands of the heart muscle and hence decreasing angina pectoris.

Blood pressure: Pressure generated in the arterial system when the blood is driven by force form the main pumping chamber of the heart (the ventricle). The systolic blood pressure is the highest pressure at the peak of ventricular contraction. The diastolic blood pressure is the lowest pressure when the ventricular muscle is most relaxed prior to the next contraction.

Borg Scale: A scale for rating perceived exertion developed by Gunnar Borg in which the number 6 is associated with no exertion and the number 20 with maximal exertion. For practical purposes ratings of perceived exertion measured on the Borg scale are considered a reliable and valid estimate of effort. The modified Borg scale utilises a scale of 0-10.
**CABG:** Coronary artery bypass graft.

**Carbohydrate:** Anyone of a large group of compounds, including sugars and starch that contain carbon, hydrogen and oxygen and have the general formula $C_x(H_2O)_y$. Carbohydrates are an important source of energy.

**Cardiac club/heart support group:** A group which can offer the chance to meet and talk to people who have gone through similar experiences. Groups may meet weekly, fortnightly or monthly. Some hold exercise sessions, invite speakers to talk on medical as well as general topics and they try and promote a social atmosphere. To find out about the cardiac clubs nationally look at the Heart Foundation web site: www.heartfoundation.org.nz or phone (09) 571 9191.

**Cardioprotective dietary pattern:** A pattern of many different foods leading to a specific combination of nutrients and non-nutrient food factors that have been proven to be protective against cardiovascular disease. Dietary patterns evolve from a wide range of environmental, traditional, cultural, social and intellectual influences.

**Cardiovascular disease:** An all encompassing term used to describe all diseases and conditions involving the heart and blood vessels.

**Cholesterol:** A white tasteless fat like substance normally present in the blood which plays an important role in many bodily functions such as producing hormones, insulating nerve fibres and forming bile acids. A high level of blood cholesterol is one of the risk factors for heart disease.

**Co-morbidity:** Coexistence of a disease or diseases in a study participant in addition to the index condition that is the subject of study.

**Contraindications:** Any factor in a patient’s condition that makes it unwise to pursue a certain line of treatment.

**Coronary heart disease:** Heart disease resulting from the atherosclerotic narrowings of coronary artery disease.

**Dose-response relationship:** A relationship in which change in amount, intensity, or duration of exposure is associated with a change, either an increase or decrease, in risk of a specified outcome.

**Dyspnoea:** Awareness of difficulty in breathing or shortness of breath.

**Education:** Systematic instruction. This maybe by free discussion, by structured interactive group work, by lecture or by visualisation or reading the information.

**Energy expenditure:** The sum of total energy required in basal and resting metabolism, thermogenic influences (especially the thermic effect of food), and the energy generated in physical activity.

**Erectile dysfunction:** The inability to achieve or sustain an erection.

**Extrapolation:** Refers to the application of results to a wider population and means to infer, predict, extend or project the results beyond that which was recorded, observed or experienced.

**Fatty acids:** Building blocks of fat molecules. They can be saturated, monounsaturated or polyunsaturated.

**Fibre:** The part of the food that cannot be digested and absorbed to produce energy.

**Folate:** A B-vitamin, also known as folic acid, folacin, or pteroylglutamic acid (PGA).

**Folic acid:** A B vitamin that is important in the synthesis of nucleic acids.

**Glycolated Haemoglobin HbA1c:** A measure of the mean blood glucose level over the previous 2-3 months and particularly the previous four weeks. It provides the essential baseline measure of glycaemic control in a person living with diabetes.

**HADS:** Hospital Anxiety and Depression score.

**HDL cholesterol:** High-density lipoprotein cholesterol. Also known as the good cholesterol, as it has a protective effect against heart disease.

**Homocysteine:** Is an amino acid. At high concentrations it has been associated with an increased risk of coronary heart disease and stroke.

**Ischaemia:** A low oxygen state usually due to obstruction of the arterial blood supply leading to lack of oxygen (hypoxia) in any tissue.
LDL cholesterol: Low-density cholesterol. Also known as the bad cholesterol as high levels in the blood can promote the formation of plaques.

Legumes: Dried beans and peas, also known as pulses. Raw legumes may contain substances that are difficult to digest or are toxic. However, these substances are destroyed by heat, so cooking is essential for improving their nutritional value and digestibility. Soaking is required to soften legumes and reduce their cooking time. It also helps to reduce the levels of substances in legumes that cause flatulence. Examples of legumes include baked beans, broad beans, soya beans, bean sprouts, chickpeas, butter beans, kidney beans and lentils.

Lipids: General terms embracing all fats, oils, and waxy substances that are insoluble in water. In medical terms blood lipids refer to triglycerides and cholesterol.

Maintenance programme: A programme which provides long-term support from the time of discharge from an ambulatory programme or home-based programme. Maintenance programme is preferable to the term “Phase III” programme.

Māori: The indigenous peoples of Aotearoa.

Maximal oxygen uptake (VO2 max): The maximal capacity for oxygen consumption by the body during maximal exertion.

Medications: A substance administered by mouth, applied to the body or introduced into the body for the purpose of treatment.

MET: A MET or metabolic equivalent is a way of expressing the rate of energy expenditure from a given physical activity. 1 MET equals oxygen consumption at rest which is about 3.5 millilitres per kg of body weight per minute. An individual exercising at 2 METS is consuming oxygen at twice the resting rate.

Meta-analysis: Results from several studies, identified in a systematic review, are combined and summarised quantitatively.

Monounsaturated fat: Refers to the bond in a carbon chain of a fatty acid. There is one bond between individual carbon atoms, and this is a double bond. Foods with a high content of monounsaturated fatty acids include olive oil, canola oil, canola margarines, most nuts and avocados.

Morbidity: The state of being diseased.

Multidisciplinary team: The application of or pertaining to or arising through many professional disciplines.

Myocardial infarction: The process of death or damage to heart muscle, arising through coronary artery occlusion.

Obesity: The condition in which excess fat has accumulated in the body mostly in the subcutaneous tissues. For New Zealand European people those with a BMI 25-30 are considered overweight, and those whose BMI is greater than 30 are considered obese. For Māori and Pacific peoples a BMI of 26-32 is considered overweight and a BMI greater than 32 obese.

Omega 3’s: Types of polyunsaturated fatty acids, such as linoleic acid which are the main components of common oils (safflower, safflower, maize, cottonseed) and polyunsaturated margarines.

Polyunsaturated fat: Refers to the bonds in a carbon chain of a fatty acid. Polyunsaturated fatty acids have two or more bonds between individual carbon atoms. Can be further classified into omega 3 and omega 6 fatty acids. Foods with a high content of polyunsaturated fatty acids include safflower oil, sunflower oil, polyunsaturated margarines, walnuts, wheatgerm and most seeds.

PTCA: Percutaneous transluminal coronary angioplasty.

Risk factors: Patient characteristics of factors associated with an increased probability of developing a condition or disease in the first place.

Saturated fat: Refers to the bonds in a carbon chain of a fatty acid. The bonds between individual carbon atoms of a saturated fat hold as many hydrogen atoms as possible. Foods with a high content of saturated fatty acids include butter, cream, fat on meat, coconut oil and palm oil.

Self-efficacy: Self confidence or a belief that one is competent and able to achieve a desired goal.

Smoking cessation: The permanent termination of smoking cigarettes, cigars or a pipe.

Statins: A drug used to reduce cholesterol levels.
**Tachycardia:** Rapid heart action. This may be regular and normal (sinus tachycardia), arising from the atrium (atrial tachycardia, flutter or fibrillation), from the conduction system (supraventricular tachycardia) or from the ventricles (ventricular tachycardia).

**Triglycerides:** A form of fat in food and the body consisting of glycerol plus three fatty acids. A high level of blood triglycerides is a risk factor for heart disease and stroke and is usually raised by being overweight and by excess alcohol.

**Type II diabetes:** A disorder of carbohydrate metabolism in which sugars in the body are not oxidised to produce energy due to the lack of the pancreatic hormone insulin. Type II diabetes mellitus usually occurs after the age of 40, the pancreas retains some ability to produce insulin but this is inadequate for the body’s needs.

**Unstable angina:** Chest pain which occurs at rest, is prolonged or appears abruptly for the first time, but which does not include acute myocardial infarction.

**Whānau:** The extended family

**Wholegrains:** Grains which are eaten along with their germ and bran. Wholegrain products have more dietary fibre as well as a higher level of minerals and vitamins.

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**METHODODOLOGY TERMS**

**Absolute risk reduction:** The effect of a treatment can be expressed as the difference between relevant outcomes in the treatment and control groups by subtracting one rate (given by the proportion who experienced the event of interest) from the other. The reciprocal is the number needed to treat (NNT).

**Accuracy** *(see also validity):* The degree to which a measurement represents the true value of the variable that is being measured.

**Adverse event:** A non-beneficial outcome measured in a study of an intervention that may or may not have been caused by the intervention.

**Adverse reaction:** Any undesirable or unwanted consequence of a preventive, diagnostic or therapeutic procedure.

**Allocation (or assignment to groups in a study):** The way that subjects are assigned to the different groups in a study (eg, drug treatment/placebo, usual treatment/no treatment). This may be by a random method *(see RCT)* or a nonrandom method *(see pseudo-randomized controlled study)*.

**Applicability** *(see also external validity, generalisability):* Encompasses the application of results in both individual and groups. This is the preferred term as it includes the idea of particularising or individualising treatment and is closest to the general aim of clinical practice. It addresses whether a particular treatment that showed an overall benefit in a study can be expected to convey the same benefit to an individual person.

**Baseline risk:** An estimate of an individual’s (untreated) risk of an outcome.

**Bias:** Bias is a systematic deviation of a measurement from the ‘true’ value leading to either an over or underestimation of the treatment effect. Bias can originate from many different sources, such as allocation of participants, measurement, interpretation, publication and review of data.

**Blinding:** Blinding or masking is the process used in epidemiological studies and clinical trials in which the observers and the subjects have no knowledge as to which treatment groups subjects are assigned. It is undertaken in order to minimise bias occurring in participant’s response and outcome measurement. In single-blind studies only the subjects are blind to their allocations, whilst in double-blind studies both observers and subjects are ignorant of the treatment allocations.

**Case-control study:** Participants with a certain outcome or disease and an appropriate group of controls without the outcome or disease are selected (usually with careful consideration of appropriate choice of controls, matching, etc.) and then information is obtained on whether the subjects have been exposed to the factor under investigation.

**Case series:** The intervention has been used in a series of participants (this may or may not be consecutive series) and the results reported. There is no separate control group for comparison.
Clinical outcome: An outcome for a study that is defined on the basis of the clinical outcome being studied (e.g., fracture in osteoporosis, peptic ulcer healing and relapse rates).

Clinically important effect (see also statistically significant effect): An outcome that improves the clinical outlook for the participant. The recommendations made in clinical practice guidelines should be both highly statistically significant and clinically important (so that the 95% CI includes clinically important effects).

Cochrane Collaboration: The Cochrane Collaboration is an international network that aims to prepare, maintain and disseminate high quality systematic reviews based on RCTs and when RCTs are not available, the best available evidence from other sources. It promotes the use of explicit methods to minimise bias, and rigorous peer review.

Cohort study: Data are obtained from groups who have been exposed, or not exposed, to the new technology or factor of interest (e.g., from databases). Careful consideration is usually given to participant selection, choice of outcomes, appropriate controls, matching, etc. However, data on outcomes may be limited.

Comparative study: A study including a comparison or control group.

Confidence interval (CI): An interval within which the population parameter (the ‘true’ value) is expected to lie with a given degree of certainty (e.g., 95%).

Confounding: The measure of a treatment effect is distorted because of differences in variables between the treatment and control groups that are also related to the outcome. For example, if the treatment (or new intervention) is trialed in younger participants then it may appear to be more effective than the comparator, not because it is better, but because the younger participants had better outcomes.

Cross-sectional study: A study that examines the relationship between diseases (or other health-related characteristics) and other variables of interest as they exist in a defined population at one particular time (i.e., exposure and outcomes are both measured at the same time).

Double-blind study (see blinding).

Effectiveness: The extent to which an intervention produces favourable outcomes under usual or everyday conditions.

Efficacy: The extent to which an intervention produces favourable outcomes under ideally controlled conditions such as in a RCT.

Evidence: Data about the effectiveness of a new treatment or intervention derived from studies comparing it with an appropriate alternative. Preferably the evidence is derived from a good quality RCT, but it may not be.

Evidence-based medicine/health care: The process of finding relevant information in the medical literature to address a specific clinical problem. Patient care should be based on evidence derived from the best available studies.

External validity (see also generalisability, applicability): Also called generalisability, external validity is the degree to which the results of a study can be applied to situations other than those under consideration by the study, for example, for routine clinical practice.

Extrapolation: Refers to the application of results to a wider population and means to infer, predict, extend, or project the results beyond that which was recorded, observed or experienced.

Generalisability (see also external validity, applicability): Refers to the extent to which a study’s results provide a correct basis for generalisation beyond the setting of the study and the particular people studied. It implies the application of the results of a study to a group or population.

Gold standard: A method, procedure or measurement that is widely regarded or accepted as being the best available. Often used to compare with new methods.

Heterogeneity: Refers to the differences in treatment effect between studies contributing to a meta-analysis. If there is significant heterogeneity, this suggests that the trials are not estimating a single common treatment effect.

Historical controls: Data from either a previously published series or previously treated patients at an institution that are used for comparison with a prospectively collected group of patients exposed to the technology or intervention of interest at the same institution.

Incidence: The number of new events (new cases of a disease) in a defined population, within a specified period of time.
Intention to treat (ITT): An analysis of a clinical trial where participants are analysed according to the group to which they were initially randomly allocated, regardless of whether or not they dropped out, fully complied with the treatment, or crossed over and received the other treatment. By preserving the original groups one can be more confident that they are comparable.

Interaction: The relationship between a single variable (or covariate) and the treatment effect.

Intermediate outcomes: A true clinical endpoint that is not the ultimate endpoint of the disease but occurs quite late in the causal chain and represents manifestation of disease.

Intervention: An intervention will generally be a therapeutic procedure such as treatment with a pharmaceutical agent, surgery, a dietary supplement, a dietary change or psychotherapy. Some other interventions are less obvious, such as early detection (screening), educational materials for participants, or legislation. The key characteristic is that a person or their environment is manipulated in order to benefit that person.

Level of evidence: A hierarchy of study evidence that indicates the degree to which bias has been eliminated in the study design.

Meta-analysis: Results from several studies, identified in a systematic review, are combined and summarised quantitatively.

Non-randomized crossover design: Participants in a trial are measured before and after introduction or withdrawal of the intervention. The order of introduction and withdrawal is not randomised.

Null hypothesis: The hypothesis that states that there is no difference between two or more interventions or two or more groups (e.g., males and females). The null hypothesis states that the results observed in a study (e.g., the apparent beneficial effects of the intervention) are no different from what might have occurred as a result of the operation of chance alone.

Number needed to harm (NNH) (see also number needed to treat): When the treatment increases the risk of the outcome, then the inverse of the absolute risk reduction is called the number needed to harm.

Number needed to treat (NNT) (see also number needed to harm): When the treatment reduces the risk of specified adverse outcomes of a condition, NNT is the number of participants with a particular condition who must receive a treatment for a prescribed period in order to prevent the occurrence of the adverse outcomes. This number is the inverse of the absolute risk reduction.

Observational studies: Also known as epidemiological studies, these are usually undertaken by investigators who are not involved in the clinical care of the participants being studied, and who are not using the technology under investigation in this group of participants.

Odds ratio (OR): Ratio of the odds of the outcome in the treatment group to the corresponding odds in the control group.

Patient expected event rate (PEER): The probability that a patient will experience a particular event (e.g., a stroke or myocardial infarction) if left untreated. Also known as baseline risk.

Patient-relevant outcome: Any health outcome that is meaningful to the patient. It can be the best surrogate outcome, resources provided as part of treatment, impact on productivity (indirect) or one that cannot be measured (e.g., pain, suffering). Common examples include: primary clinical outcomes, quality of life and economic outcomes.

Precision: A measure of how close the estimate is to the true value. It is defined as the inverse of the variance of a measurement or estimate. It is related to the P-value (the smaller the P-value, the greater the precision). Also called statistical precision.

Prevalence: Prevalence is a measure of the proportion of people in a population who have some attribute or disease at a given point in time or during some time period.

Primary prevention: Strategies undertaken to limit the incidence of disease by controlling causes and risk factors.

Pseudo-randomized controlled study: An experimental comparison study in which subjects are allocated to treatment/intervention or control/placebo groups in a non-random way (such as alternate allocation, allocation by day of week, odd-even study numbers, etc.). These groups may therefore differ from each other in ways other than the presence of the intervention being tested. This contrasts to ‘true’ experiments (RCTs) where the outcomes are compared for groups formed by random assignment (and are therefore equivalent to each other in all respects except for the intervention).
Publication bias: Bias caused by the results of a trial being more likely to be published if a statistically significant benefit of treatment is found.

P-value (see also confidence interval, precision, statistically significant effect): The probability (obtained from a statistical test) that the null hypothesis (that there is no treatment effect) is incorrectly rejected.

NOTE: The P-value is often misunderstood. It does not, as commonly believed, represent the probability that the null hypothesis (that there is no treatment effect) is true (a small P-value therefore being desirable). The P-value obtained from a statistical test corresponds to the probability of claiming that there is a treatment effect when in fact there is no real effect.

Quality of evidence (see also strength of evidence): Degree to which bias has been prevented through the design and conduct of research from which evidence is derived.

Quality of life: The degree to which persons perceive themselves able to function physically, emotionally and socially. In a more ‘quantitative’ sense, an estimate of remaining life free of impairment, disability, or handicap as captured by the concept of quality-adjusted life-years (QALYs).

Random error: The portion of variation in a measurement that has no apparent connection to any other measurement or variable, generally regarded as due to chance.

Randomization: A process of allocating participants to treatment or control groups within a controlled trial by using a random mechanism, such as coin toss, random number table, or computer-generated random numbers. Study subjects have an equal chance of being allocated to an intervention or control group, thus the two groups are comparable.

Randomized controlled trial: An experimental comparison study in which participants are allocated to treatment/intervention or control/placebo groups using a random mechanism, such as coin toss, random number table, or computer-generated random numbers. Participants have an equal chance of being allocated to an intervention or control group and therefore allocation bias is eliminated.

Randomised crossover trial: Participants are measured before and after exposure to different technologies (or placebo) which are administered in a random order (and usually blinded).

Relative risk or risk ratio (RR): Ratio of the proportions in the treatment and control groups with the outcome. This expresses the risk of the outcome in the treatment group relative to that in the control group.

Relative risk reduction (RRR): The relative reduction in risk associated with an intervention. This measure is used when the outcome of interest is an adverse event and the intervention reduces the risk. It is calculated as one minus the relative risk, or:

$$ RRR = 1 - \frac{\text{event rate in treatment group}}{\text{event rate in control group}} $$

Relevance: The usefulness of the evidence in clinical practice, particularly the appropriateness of the outcome measures used.

Reliability: Also called consistency or reproducibility. The degree of stability that exists when a measurement is repeatedly made under different conditions or by different observers.

Risk difference (RD): The difference (absolute) in the proportions with the outcome between the treatment and control groups. If the outcome represents an adverse event (such as death) and the risk difference is negative (below 0) this suggests that the treatment reduces the risk – referred to as the absolute risk reduction.

Secondary prevention: Strategies undertaken to cure patients and reduce the more serious consequences of disease through early diagnosis and treatment.

Selection bias: Error due to systematic differences in characteristics between those who are selected for study and those who are not. It invalidates conclusions and generalisations that might otherwise be drawn from such studies.

Size of effect: Refers to the size (or the distance from the null value indicating no treatment effect) of the summary measure (or point estimate) of the treatment effect and the inclusion of only clinically important effects in the 95% confidence interval.

Statistically significant effect (see also clinically important effect): An outcome for which the difference between the intervention and control groups is statistically significant (ie, the P-value is < 0.05). A statistically significant effect is not necessarily clinically important.

Statistical precision (see precision).
**Strength of evidence:** The strength of evidence for an intervention effect includes the level (type of studies), quality (how well the studies were designed and performed to eliminate bias) and statistical precision (P-value and confidence interval).

**Surrogate outcome:** Physiological or biochemical markers that can be relatively quickly and easily measured and that are taken as predictive of important clinical outcomes. They are often used when observation of clinical outcomes requires longer follow-up. Also called intermediate outcome.

**Systematic review:** The process of systematically locating, appraising and synthesizing evidence from scientific studies in order to obtain a reliable overview.

**Type I error:** When the null hypothesis (that there is no treatment effect) is incorrectly rejected.

**Type II error:** When the null hypothesis (that there is no treatment effect) is not rejected, but is actually false.

**Validity:** Of measurement: an expression of the degree to which a measurement measures what it purports to measure; it includes construct and content validity.

Of study: the degree to which the inferences drawn from the study are warranted when account is taken of the study methods, the representativeness of the study sample, and the nature of the population from which it is drawn (internal and external validity, applicability, generalisability).

**Variance:** A measure of the variation shown by a set of observations, defined by the sum of the squares of deviation from the mean, divided by the number of degrees of freedom in the set of observations.
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