Best Practice Guidelines for Cardiac Rehabilitation and Secondary Prevention

Human Services
Victoria

PRODUCED BY THE HEART RESEARCH CENTRE ON
BEHALF OF DEPARTMENT OF HUMAN SERVICES VICTORIA

Background to Heart Research Centre and authors

The Heart Research Centre was established in 1989 with three year seeding funding from the National Heart Foundation of Australia. It became an independent centre in 1993 and is now affiliated with The University of Melbourne and La Trobe University. The Heart Research Centre conducts research into cardiac rehabilitation and the prevention of heart disease, especially their psychological, behavioural and social aspects. The Centre also conducts training programs for health professionals.

Dr Alan Goble is a practising clinical cardiologist, with a longstanding interest in cardiac rehabilitation. He is a member of the Expert Advisory Panel on Cardiovascular Diseases of the World Health Organisation, and a member and past-chairman of the Council on Rehabilitation and Prevention of the World Heart Federation. He is Chairman of the Board of the Heart Research Centre.

Dr Marian Worcester has a doctorate in social and preventive medicine and a Master's degree in criminology. She has a particular interest in psychological responses to acute illness and social support. She has been Director of the Heart Research Centre since its establishment.

Dedication

These Best Practice Guidelines for Cardiac Rehabilitation and Secondary Prevention are dedicated to the late Dr John Shaw, former director of the National Heart Foundation of Australia, for his support of the Heart Research Centre, and to cardiologists, Dr Robert Goodwin and Dr W Anthony Seldon for their contributions to the development of cardiac rehabilitation in Australia.

BEST PRACTICE GUIDELINES FOR CARDIAC REHABILITATION AND SECONDARY PREVENTION

HEART RESEARCH CENTRE

Principal Authors

Alan J Goble, MD, FRCP, FRACP
Marian U C Worcester, PhD, MA

Produced on behalf of Department of Human Services Victoria

Best Practice Guidelines for Cardiac Rehabilitation and Secondary Prevention
Goble AJ & Worcester MUC

Heart Research Centre
ACN 060 479 763
A company limited by guarantee

Lygon Court, 333 Drummond Street, Carlton, Victoria 3053 Australia
PO Box 607, Carlton South, Victoria 3053 Australia
Telephone (613) 9347 5544 Facsimile (613) 9347 6964
Email heart@medicine.unimelb.edu.au Website http://rubens.its.unimelb.edu.au/~heart/

Published by Department of Human Services Victoria
April 1999

ISBN: 0 7311 5258 1

Designed by Outsource Design (03) 9645 5220

CONTENTS

TABLES

FIGURES

FOREWORD

These Best Practice Guidelines for Cardiac Rehabilitation and Secondary Prevention were commissioned by the Department of Human Services Victoria as part of the Victorian Government's Cancer and Heart Offensive. Cardiovascular disease is the most common certified cause of all deaths in Victoria, as in other states of Australia and elsewhere in industrialised countries, ranging around 45% of deaths for both men and women.

Many who suffer from heart attacks or who have surgical or other procedures which are undertaken to reduce symptoms and prolong life, or who have other problems related to cardiovascular disease, have some difficulties during recovery. It is now clear that such physical, psychological and social difficulties can be greatly reduced through rehabilitation programs.

The costs of care after cardiovascular or coronary artery disease events are considerable, both in human and dollar terms. Subsequent episodes of heart attack, heart surgery, heart failure, stroke and other related illnesses may occur months or years later, leading to costly hospital readmissions and significant suffering for patients and families. These may all be reduced, delayed or prevented through the combined approach of medical care and cardiac rehabilitation and secondary prevention programs.

The Victorian Department of Human Services accepts the recommendation of the World Health Organisation and other authoritative bodies that cardiac rehabilitation and secondary prevention programs should be available to all patients with cardiovascular disease. These Guidelines demonstrate how this can and should be achieved in the most effective and simple manner and at low cost. The Guidelines present the scientific basis and reasoning behind the recommended widespread adoption and implementation of such programs.

On behalf of my department and the Victorian Government, I extend our thanks to the authors and to those who have assisted them in the generation of this very considerable and impressive scientific document.

ROB KNOWLES
Minister for Health and Aged Care

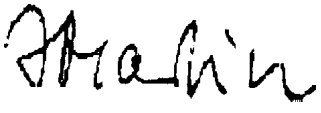
FOREWORD

While the importance of primary prevention of cardiovascular diseases is obvious, the role of *cardiac rehabilitation* as secondary prevention is critical. The cardiac patient who has survived an acute event or suffers from chronic heart disease needs special attention to restore quality of life to the maximum, to improve functional capacity and to lead a normal life; he or she also requires education to help prevent the recurrence of events.

Appropriate cardiac rehabilitation programmes, which include a broad range of secondary prevention measures including education of spouses and families, can help the patient resume a productive life more quickly and function more efficiently. Such programmes can be among the most cost-effective aids that healthcare systems can provide.

Gratitude is expressed to the authors who brought their wisdom, working knowledge, and clinical experience to a unique document on best practice guidelines. The recommendations contained in it are applicable to all countries.

We trust the readers will find the suggestions contained herein to be useful in developing or complementing their own local cardiac rehabilitation programmes.



INGRID MARTIN, MD
Team Coordinator
Cardiovascular Diseases
World Health Organization
Geneva, Switzerland

INTRODUCTION

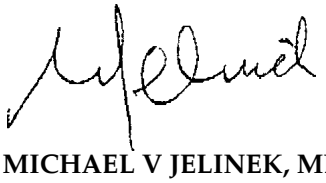
Alan Goble and Marian Worcester have written a classic "Best Practice Guidelines for Cardiac Rehabilitation and Secondary Prevention". The Guidelines come four years after the US Department of Health and Human Services published the first evidence based guidelines on cardiac rehabilitation entitled "Clinical Practice Guideline". Why were these Best Practice Guidelines needed and how do they differ from the US Clinical Practice Guideline?

Firstly, the world has moved on. There is more evidence in some areas and new evidence in other areas. Secondly, these Guidelines also involve greater emphasis on the effectiveness of education, counselling and behavioural intervention on outcomes, as well as on organisational issues and evaluation.

Unlike the Clinical Practice Guidelines from the USA, these Guidelines also involve consensus opinions derived from focus groups with health care providers, a survey of current programs in Victoria, Australia, and a comparative study of four model programs in that State. These have been integrated together with the scientific evidence to produce Best Practice Guidelines which are clear, authoritative and evidence based.

They are of value to the practitioners of cardiac rehabilitation, the payers of health services and to those ultimate sceptics, the medical practitioners, who should recommend these programs to all their patients with cardiovascular disease.

I commend the authors on the clarity and scholarship of the Guidelines. I recommend the Guidelines to all interested parties.



MICHAEL V JELINEK, MD, FRACP, FACC
Associate Professor of Medicine
President, Cardiac Society of Australia and New Zealand

PREFACE

These Best Practice Guidelines for Cardiac Rehabilitation and Secondary Prevention concern exercise training, education, counselling and behavioural interventions, as well as key organisational issues relevant to the delivery and evaluation of services.

The Guidelines provide evidence and consensus based recommendations for best practice programs. The document is not intended to be a practical manual on how to set up and conduct programs.

The Guidelines primarily refer to ambulatory programs conducted during early convalescence, immediately after hospital discharge ("Phase 2" cardiac rehabilitation). However, they also refer to inpatient ("Phase 1" cardiac rehabilitation) and later maintenance ("Phase 3") programs which may best be community-based. All phases of cardiac rehabilitation aim to facilitate recovery (cardiac rehabilitation) and to prevent further cardiac illness ("secondary prevention").

The document will be useful to both purchasers and funders, agency managers, program planners and people wanting guidance on specific elements of cardiac rehabilitation and secondary prevention programs.

The first five introductory chapters deal with the historical background to cardiac rehabilitation and secondary prevention, the importance of cardiovascular disease as a health care burden, and the development of these Guidelines and other published guidelines and policy statements. Chapter 6 presents a condensed review of the only existing clinical practice guideline on cardiac rehabilitation. That Guideline, which was commissioned by the US Public Health Department, produced recommendations based upon a systematic, comprehensive review of the scientific literature.

Chapters 7 to 11 present a further review of evidence regarding the benefits of exercise training and assess evidence concerning the intensity of exercise, the implications arising from that evidence upon risk stratification and upon the conduct of exercise programs, and the exercise requirements of specific groups. Chapter 12 examines evidence regarding the effectiveness of education, counselling and behavioural interventions upon outcomes, both alone and together with exercise programs, thereby introducing some overlapping of evidence and references with those cited in

earlier chapters. Chapters 13 to 17 deal with the content and structure of education and counselling groups, programs for specific groups, team roles and organisational issues, while Chapters 18 and 19 deal with program evaluation and issues of cost. Recommendations for future research are listed in Chapter 20.

Strength of evidence ratings used in making recommendations were based on those devised by the National Health and Medical Research Council (NH&MRC) of Australia.

Whereas recommendations provided in chapters dealing with the benefits of exercise training, education, counselling and behavioural interventions (Chapters 7 to 12) were largely made on the basis of a comprehensive review of the scientific literature, recommendations contained in Chapters 13 to 19 were mostly based upon consensus opinions and accepted practice, supported by available research findings. These chapters deal with structural issues concerning the content, organisation and evaluation of programs. Many of these issues were included in the Guidelines at the request of members of the Consultative Committee and practitioners who participated in the statewide survey and focus groups.

Some material appears in more than one section of this document because some may prefer to read only specific sections of these Guidelines.

Citation

Goble AJ, Worcester MUC. Best Practice Guidelines for Cardiac Rehabilitation and Secondary Prevention. Heart Research Centre. Melbourne, on behalf of Department of Human Services Victoria; 1999.

EXECUTIVE SUMMARY

Cardiovascular disease remains the leading cause of death in Australia. In 1995, it accounted for 46% of all deaths, with 24% being attributed to coronary heart disease. However, while age-adjusted certified deaths from coronary heart disease are falling, increasing numbers of patients are being discharged alive from hospitals after acute cardiac events and interventions. These patients constitute the major pool of those eligible to attend cardiac rehabilitation and secondary prevention programs.

Cardiac rehabilitation programs were originally introduced to facilitate recovery from acute cardiac events. In both the USA and Australia, work classification or cardiac rehabilitation units were set up in the 1950's and 1960's to encourage return to work among those with physical or psychological disabilities. In Australia, hospital-based programs were established in the mid 1970's. Since that time, many programs have been established in metropolitan and rural hospitals throughout Australia, and more recently, in community settings. Australia now has a large network of programs, particularly in Victoria.

As well as facilitating recovery, cardiac rehabilitation programs function as launching pads for secondary prevention of cardiovascular disease. Education, counselling and behavioural interventions to promote lifestyle change and modify risk factors have become an increasingly important part of cardiac rehabilitation programs.

In 1993, the National Heart Foundation of Australia produced a document to establish minimal standards for cardiac rehabilitation to guide health care providers and policy makers. The purpose of these new Best Practice Guidelines is to provide optimal standards for cardiac rehabilitation and secondary prevention programs, particularly those conducted during convalescence. The recommendations contained within these Guidelines apply to cardiac rehabilitation programs not only in Victoria, but also elsewhere in Australia and in other countries.

The Guidelines examine evidence for the effectiveness of exercise training, education, counselling and behavioural interventions upon physical, psychological, social, occupational and behavioural outcomes, risk factors, morbidity and mortality. Recommendations for best practice are based upon a comprehensive review of the scientific literature. However, where scientific evidence from clinical trials and

observational studies is lacking, recommendations are based upon expert opinion and consensus statements derived from surveys and focus groups with practitioners in the field.

These Best Practice Guidelines do not duplicate the contents of the Clinical Practice Guideline of the US Agency for Health Care Policy and Research (AHCPR), which was published in 1995. Whereas the major part of that document deals with evidence concerning exercise training, these Best Practice Guidelines focus equally on education, counselling and behavioural interventions, as well as other aspects of cardiac rehabilitation which were not extensively addressed in the AHCPR Clinical Practice Guideline. Reference is also made to the findings of studies published since the production of the AHCPR Clinical Practice Guideline.

Exercise Training

There has been extensive research into the benefits of exercise training in patients with cardiovascular disease, particularly after acute cardiac events. Physical and functional outcome measures have been well defined and it is clear that exercise training produces definite physical, quality of life and secondary prevention benefits. Available evidence confirms that exercise training produces definite improvements in physical performance (exercise tolerance, muscular strength and symptoms), psychological functioning (anxiety, depression, well-being), and social adaptation and functioning. Further, exercise training produces a demonstrable reduction in mortality, morbidity, recurrent events and hospital readmissions.

In general, psychosocial outcomes have been less well studied than physical and functional effects of exercise training. Conclusions concerning psychosocial benefits, widely claimed by patients and endorsed by practitioners, have been much less well documented scientifically. It is likely that many of the psychosocial benefits of exercise training are attributable to group activities, peer support and access to professional advice rather than to the exercise itself.

It is probable that exercise training has a favourable impact upon other outcomes, including modification of risk factors. These benefits are mostly apparent when exercise is provided as part of a comprehensive program including education, counselling, behavioural interventions and support. Further, evidence indicates that for such beneficial lifestyle changes to be sustained, continued physical activity and support are required.

Studies have now confirmed that high intensity and low intensity exercise programs produce similar benefits. Nevertheless, some patients may prefer high intensity exercise. Those returning to heavy manual jobs may benefit from more intensive exercise training. For the majority of patients, however, low intensity exercise is sufficient. Further, low intensity exercise has some important practical advantages. It

is more suitable for a broader population, including older men and women and patients with functional impairments, and it is more likely to be sustained in the longer term. Because low intensity programs do not require such careful supervision and use less technology and equipment, they can be conducted at low cost. Clinical rather than technological methods can be used for risk stratification, assessment and monitoring, with considerable cost savings. Exercise conducted in groups also significantly reduces costs.

Further research is needed to determine best practice with regard to the frequency of exercise sessions and the duration of exercise programs. On the basis of both evidence and expert opinion, it is apparent that twice weekly group exercise programs are as effective as thrice weekly. While twice weekly group exercise is recommended, there is some evidence that once weekly supervised group exercise may achieve similar benefits to twice weekly group exercise, provided it is accompanied by an additional daily home walking program.

There is no scientific evidence to indicate the preferred duration of exercise cardiac rehabilitation programs. On the basis of expert opinion, most of the aims of ambulatory cardiac rehabilitation programs conducted during convalescence should be achieved with a twice weekly program lasting four to eight weeks.

It should be emphasised that individual patients vary considerably in their need for a group exercise program. Thus, it is essential to provide flexible programs to meet particular needs.

Recommendations

Exercise programs for cardiac patients should:

- be based on low to moderate intensity exercise
- be suitable for a broad population
- be tailored to individual needs while being conducted in groups
- be preferably conducted twice per week
- be accompanied by a home walking program
- be continued for four to eight weeks
- have a ratio of no more than 10 patients to one staff member
- be designed by a physiotherapist or exercise specialist
- be conducted by a physiotherapist, exercise specialist or an additionally trained nurse or occupational therapist

Education, Counselling and Behavioural Interventions

Scientific evidence concerning the benefits of education, counselling and behavioural interventions is less conclusive than that concerning exercise training. Much of the research in these areas has been poorly designed. Further, the evidence base is confounded by markedly differing interventions, duration of programs and outcome

measures. In some areas, evidence is nonexistent or scanty. For example, the application of behavioural approaches to modify risk factors has not been extensively tested to date in cardiac rehabilitation.

Despite these qualifications, there is now some good evidence to support the effectiveness of education, counselling and behavioural interventions in cardiac rehabilitation, whether combined with, or provided independently of, an exercise program. Available evidence confirms that education, counselling and behavioural interventions increase patient knowledge and enhance psychosocial functioning. Further, favourable effects have been demonstrated upon reduction of smoking, lipid levels and stress. However, increases in knowledge do not necessarily lead to improved health behaviours. More emphasis upon teaching patients the necessary skills for making lifestyle changes is required. Further research is needed to develop interventions which produce measurable improvements in health behaviours and modification of risk factors.

Recommendations

Education and counselling for cardiac patients should:

- be conducted in groups
- be preferably conducted twice per week
- be conducted over four to eight weeks
- be supplemented by individual counselling as required
- follow adult learning principles and encourage interactive discussion
- apply behavioural principles, including goal setting and monitoring, to promote lifestyle changes
- involve psychologists and other appropriately trained specialists to teach patients skills for making lifestyle changes
- provide information relevant to the needs of particular patients or groups of patients
- provide scientifically accurate information
- be delivered by a multidisciplinary team of appropriately trained facilitators

Psychosocial Interventions

Cardiac patients and spouses commonly experience psychological distress following an acute cardiac event. Unfortunately, there appears to be less emphasis upon psychosocial than physical and functional aspects of cardiac rehabilitation. Participation in group exercise and education programs enhances psychological functioning. Such groups also provide social support. Cardiac rehabilitation programs conducted in groups have significant advantages over individually based programs (such as home programs) in these important respects. Stress management programs, relaxation therapy, psychosocial counselling groups and spouse groups can also facilitate psychosocial recovery. Evidence from well designed studies to support the

value of such interventions is generally lacking, although a few recent studies have shown favourable effects from stress management and relaxation therapy. Individual counselling of patients and spouses has also been shown to be effective.

Recommendations

Psychosocial rehabilitation should offer:

- brief screening to detect patients and spouses requiring special assistance
- individual counselling by a social worker, psychologist, or other trained counsellor, if required
- participation in a group to provide social support
- additional modules, such as stress management or relaxation therapy, if required

Vocational Rehabilitation

There is limited evidence demonstrating that cardiac rehabilitation, as currently practised, has a favourable impact upon occupational outcomes. One possible explanation for this lack may be that resumption of work appears to have been set aside or forgotten as a major aim of cardiac rehabilitation in recent years. Further studies are required to test strategies to increase rates of return to work and to promote better occupational adjustment among those who successfully resume work.

Recommendations

Vocational rehabilitation should include:

- supervision by the occupational therapist
- discussion at entry assessment of employment plans and development of appropriate vocational goals
- identification of any physical and psychological barriers to resumption of work
- modules offering tailored vocational programs, including work hardening and simulated work testing
- adequate liaison between patient, doctor and employer

Organisational Issues

There is considerable evidence to support the need for improved referral procedures, discharge planning and liaison between health care providers so that greater participation in cardiac rehabilitation programs can be achieved. Attention to such process issues has been inadequate in the past and now requires a greater focus. Assistance with transport and the provision of more locally based programs are also recommended.

The practice of automatic referral to programs is strongly recommended. If medical contraindications exist in individual cases, the doctor should indicate in the patient's hospital record that the patient should not be referred to a program.

The delivery of a structured cardiac rehabilitation program involves the need for multiple skills. Such expertise is usually beyond the capacity of one or few health professionals and in several areas, specific training is required. Thus, a multidisciplinary team is recommended. A designated co-ordinator is essential. Any team member with adequate organisational and interpersonal skills and sufficient time may fulfil this role. An important function of the program co-ordinator is to ensure adequate communication between different team members, and especially with general practitioners. One health professional may suffice for small programs in poorly resourced rural or local communities, provided there is adequate back-up support.

A key principle of contemporary cardiac rehabilitation programs is flexibility. Thus, while nearly all patients should be encouraged to attend exercise and education groups, the duration of their attendance and the nature and amount of rehabilitation required will vary considerably, according to individual need.

Some patients will require slow progress and support through a gradual program of increasing activity, while others with little impairment of cardiac function or fitness may progress rapidly. Psychological and social support may also vary markedly in degree. While some patients may have a good understanding of their illness or procedure and have clearly defined goals for achievement in a cardiac rehabilitation program, others may have little idea of the nature of their condition or of what may be achieved or desirable from such a program. It is therefore essential that the individual needs of each patient are understood and discussed between the patient and program staff. Patients should be able to see that their particular needs are being addressed at all times in the program.

A rehabilitation plan devised to suit the individual patient needs to be agreed upon at the entry assessment. Specific individual behavioural goals should also be decided so that progress can be monitored. For best practice, a variety of program components or modules should be available to patients. It is now apparent that certain patient groups, such as those who have undergone coronary angioplasty, require different kinds of programs. Some patient groups, such as those of aboriginal background, have rarely attended cardiac rehabilitation programs. Moreover, very little research has been conducted to identify their specific needs. Tailored programs for different patient populations need to be devised and evaluated.

The need for flexibility in the provision and delivery of services also arises from recommendations that programs should be offered to a broad range of patients, including those with considerable physical and functional limitations. It is further advocated that family members should also attend cardiac rehabilitation programs which can offer them an opportunity for primary prevention of cardiovascular disease.

Recommendations

Cardiac rehabilitation and secondary prevention programs should:

- develop efficient referral procedures
- develop effective strategies to maximise program attendance and completion
- offer programs which are accessible
- provide flexible, multifactorial programs consisting of several modules
- offer programs which suit a broad range of patient groups as well as family members
- be delivered by a multidisciplinary team with a designated co-ordinator
- ensure adequate communication between hospital staff, program staff and general practitioners

Evaluation

Evaluation is becoming an increasingly important aspect of cardiac rehabilitation and secondary prevention programs. There are some suitable measures available to assess functional, quality of life and behavioural outcomes. However, there is a definite need for further research to test the applicability of some generic tools to cardiac rehabilitation and to devise more sensitive measures. Outcome indicators have been included in the Best Practice Guidelines because it is difficult to monitor a number of outcomes which require longterm follow-up. Further testing of the recommended process and outcome indicators is required to identify suitable benchmarks. More detailed costings of best practice model programs are also required. Qualitative research is required to obtain a better understanding of patient attitudes and responses in areas which are less well understood.

It should be emphasised that multifactorial, comprehensive cardiac rehabilitation programs combining exercise training with education, counselling and behavioural interventions produce significantly greater benefits to patients than programs providing either exercise or education alone. Many of the studies reviewed contain education, counselling or behavioural interventions as well as exercise training and demonstrated favourable outcomes. However, it is difficult to determine which ingredients of multifactorial programs produce these benefits.

Recommendations

All programs should:

- undergo outcome evaluation to determine their effectiveness upon patient outcomes
- undergo process evaluation to identify inadequacies, to assure program quality and to improve program delivery
- be evaluated following professional advice regarding appropriate evaluation methods

Cost, Cost Saving and Cost Effectiveness

There is marked variation in the cost of programs throughout the world. Costs depend largely on the program duration, frequency of attendance and the intensity of rehabilitation exercise. Low cost programs are feasible provided that high intensity exercise is avoided, thereby obviating the need for technology in risk stratification and monitoring. The major cost is then related to the salaries of program staff. With a well attended program, approaching optimal size for exercise and education groups and for both group and individual counselling and support, it appears that the aims of the program may be generally achieved with twice weekly (possibly once weekly) sessions of group work lasting two hours per session over a period of six weeks. This type of twice weekly program can be reasonably conducted at a mean cost of approximately $40 per session per patient and a total cost of $480 per patient completing the program. The cost of a once weekly program would probably approach $300 per patient.

There is now evidence that significant cost saving may be achieved through cardiac rehabilitation and secondary prevention programs. These savings are largely from reduced subsequent hospital admissions and reduced costs of medical care. There are additional savings that arise through pension, retirement and sickness benefits, provided that work resumption and remaining in work is achieved. These cost savings may be very large in an ageing population prone to development of preventable heart failure.

While cost benefit and effectiveness studies are so far not widely reported, it is apparent that cardiac rehabilitation programs have benefits and effectiveness similar to other successful interventions in the treatment of cardiac and vascular disease.

Recommendations

Cardiac rehabilitation and secondary prevention programs should:

- Avoid high intensity exercise to assure low cost
- Assure educational and behavioural contents are sufficient for secondary prevention, thereby reducing future medical and hospital costs
- Encourage continuation in gainful employment, thereby reducing pension, retirement and social security costs
- Be directed to assure the above and, further, to improve other patient outcomes, including longer life expectancy and improved quality of life such that the gains are apparent relative to the cost.

Although the primary focus of these Best Practice Guidelines has been upon producing recommendations for outpatient programs conducted during convalescence, much of the literature cited in support of recommendations was based upon longterm maintenance programs. It should be emphasised that behaviour change is a process which requires considerable time. Thus, participation in ongoing community based programs is recommended to encourage maintenance of behaviour change and modification of risk factors.

CHAPTER 1
DEVELOPMENT OF THE BEST PRACTICE GUIDELINES

Introduction

Best practice concerns outcomes, processes and structures. The achievement of better health outcomes requires effective and efficient processes for delivering health care services, as well as appropriate organisational structures. Whereas minimal standards provide recommendations for the basic requirements of a service, best practice guidelines provide recommendations for optimal standards. They aim to achieve better health outcomes by contributing to the education of health professionals and improving their practices. Best practice guidelines also identify benchmarks for providing optimal health services, thus contributing to quality assurance. Implicit in the concept of best practice is the requirement that the recommended practices should be cost effective.

Traditionally, guidelines have been based upon a consensus of expert opinion. However, expert opinion does not always reflect the current state of medical knowledge. According to the Australian National Health and Medical Research Council (NH&MRC), guideline recommendations should be evidence based, that is, they should be derived from a systematic identification and synthesis of the best available scientific evidence. While these Best Practice Guidelines for Cardiac Rehabilitation and Secondary Prevention are largely based upon scientific evidence, they also reflect expert opinion and consumer input, especially in areas where little or no scientific evidence exists.

The Best Practice Guidelines have been produced for ambulatory cardiac rehabilitation and secondary prevention programs conducted during early convalescence after hospital discharge (hereafter referred to as ambulatory cardiac rehabilitation programs). They apply to any hospital catering for cardiac patients, as well as to community health centres or similar venues where programs may be conducted.

These Guidelines provide the basis for recommending low cost, low technology, multifactorial programs of exercise, education and support, conducted by trained health care providers, whether working with or without close medical support, as recommended in the Report of the World Health Organisation (WHO) Expert Committee on Rehabilitation after Cardiovascular Diseases[1].

The reviewed scientific evidence and authoritative opinions contained within these Best Practice Guidelines are consistent with the recommendations of the above WHO Report[1], which support the types of programs most widely available in Australia and in several other countries. While commissioned by the Victorian Department of Human Services, the recommendations of the Best Practice Guidelines should apply throughout Australia. Further, they should generally apply to any country or community throughout the world.

The recommendations concerning the benefits of cardiac rehabilitation contained in the Clinical Practice Guideline No 17: Cardiac Rehabilitation, published by the United States Department of Health and Human Services through the Agency for Health Care Policy and Research (AHCPR)[2] are endorsed. However, many of the recommendations contained in these Best Practice Guidelines regarding the implementation of programs are very different from current practices in the United States of America. The Best Practice Guidelines present scientific evidence to support simpler, less costly programs involving less supervision, testing and technology than those still advocated and offered in the United States of America. Such low cost programs can be readily implemented anywhere.

Widespread availability of such programs is becoming increasingly important. In eastern European countries, there is already an epidemic of cardiovascular disease. It is now appearing in developing and transitional countries. The increasing burden of disability from this non-communicable disease in an ageing population can be ameliorated by providing suitable, low cost rehabilitation programs directed towards secondary prevention. These health issues facing all countries have been highlighted in the 1997 WHO World Health Report[3] and the publication entitled Global Burden of Disease, produced in 1996 by WHO, the World Bank and Harvard School of Public Health[4]. They are further discussed in Chapter 4.

Terms of reference

The Cancer and Heart Offensive was initiated by the Victorian Government in 1993 to strengthen and co-ordinate efforts to reduce the incidence and impact of cancer and heart disease. An important goal of the Offensive was to identify key issues for action and to enhance current service delivery through the fostering of best practice and improved linkages between services. These Best Practice Guidelines for Cardiac Rehabilitation and Secondary Prevention were produced as part of the Victorian Cancer and Heart Offensive. The terms of reference for this project were as follows:

> To develop effective models and best practice guidelines for quality and cost effective cardiac rehabilitation and secondary prevention programs for Australia, particularly Victoria, across a range of sectors, which will be of practical value to service planners and staff working in programs and provide an important basis for informed purchasing of health services.

Production of the Guidelines involved a review of the scientific literature, previous guidelines, policy statements and other publications. A Consultative Committee of experts in the field was established to assist in the development of the Guidelines. In addition, input from health care providers was obtained from a statewide survey of current services[5] and from focus groups[6]. Finally, a pilot study was carried out to compare outcomes of patients attending four different model programs and to explore their attitudes towards cardiac rehabilitation[7].

Clinical Practice Guideline of the United States Agency for Health Care Policy and Research

In Chapter 5, recent guidelines and policy statements are summarised. The only comprehensive scientific review to date remains the AHCPR Clinical Practice Guideline[2*]. This scientific review merits considerable credit. The Panel which produced the AHCPR Clinical Practice Guideline researched and reviewed the available literature regarding each of the major aspects of cardiac rehabilitation. It mainly concentrated on the benefits of exercise, strongly endorsing those benefits. It further endorsed the benefits of patient education, counselling and behavioural interventions. The Clinical Practice Guideline also addressed some organisational issues. The Panel concluded that the substantial benefits of formal comprehensive ambulatory cardiac rehabilitation programs included:

- improvement in exercise tolerance
- improvement in symptoms
- improvement in blood lipid levels
- reduction in cigarette smoking
- improvement in psychosocial well being and reduction of stress
- reduction in mortality.

Development of the Best Practice Guidelines

In producing these present Best Practice Guidelines, each of the recommendations of the AHCPR Clinical Practice Guideline has been reviewed in the light of the 334 references cited by the Panel. The Best Practice Guidelines do not attempt to repeat a review of the contents of each of those references. However, many references cited in the Best Practice Guidelines are the same as those included in the AHCPR Guideline.

The Heart Research Centre decided that it was unnecessary to repeat a scientific literature review as extensive as that undertaken for the AHCPR Clinical Practice Guideline. Further, to do so would be contrary to the recommended procedures for producing guidelines laid down by the NH&MRC, which stated that if the same work had been undertaken by others, it should not be repeated[8]. Nevertheless, it was necessary to undertake a careful review of the literature in several areas which were

**Single copies of the Clinical Practice Guideline may be purchased from the Government Printing Office, Superintendent of Documents, Washington DC. 20402 USA*

addressed only briefly in, or omitted from, the AHCPR Clinical Practice Guideline. These areas include the following:

- the nature and amount of exercise
- the nature and amount of prior testing
- the nature and amount of monitoring
- the content and structure of education and counselling group programs
- the impact of education and counselling upon knowledge
- programs for special groups
- team roles and program co-ordination
- organisational issues, such as referral procedures
- program evaluation
- relative costs and cost benefits related to outcomes

The data sources used for the review for these Best Practice Guidelines were Medline, Psychlit, Cinahl, Eric and other publications not indexed in these databases.

All the recommendations of the AHCPR Clinical Practice Guideline are referred to in the following chapters. However, these Best Practice Guidelines include recommendations which differ slightly from those of the Clinical Practice Guideline of the AHCPR because additional evidence, much of it unavailable in 1995, has been considered which has changed some strength of evidence ratings.

Comment

The AHCPR Clinical Practice Guideline concentrated upon the benefits of exercise training in patients with cardiovascular disease, largely because it is in this area that there has been much research. Thus, clearly defined physical outcome differences are apparent in clinical trials. The degree of exercise conducted in a class can be finitely measured, because it has been carefully prescribed. The interpretations of outcomes from educational, psychological and behavioural interventions in cardiac rehabilitation are more difficult because their ingredients are hard to define. Further, outcomes in these areas are difficult to quantify. Human variability in many parameters makes the formation of clear conclusions difficult. Hence, clear recommendations concerning best practice in these areas are difficult to make. It is in such areas that evidence for benefit is insecure, as reported in the scientific literature. However, the balance of evidence and expert opinion from many sources is quite definite about the benefits of educational, psychological and behavioural interventions. Further, such interventions are generally within the framework of explanation, reassurance and support which is considered to be the right of all patients, facilitating recovery, promoting understanding of illness, allaying anxiety and minimising possible disability. Information, explanation and support are provided to help patients accommodate to the illness or, more importantly, to lead to changes in behaviours to prevent the occurrence of further events. Thus, although the

body of evidence concerning the benefits of exercise training by any rating is greater than the amount of evidence for the benefit from education, counselling and behavioural interventions, the strength of opinion regarding the need for supportive interventions is as great as the endorsement of exercise programs. Most past research concerning exercise has been undertaken into relatively high intensity exercise. The intensity of exercise is now being questioned, even in those places where it has been most strongly supported. Such questioning applies to physical activity levels both for the population at large and prescribed exercise training for cardiac patients.

Evidence from meta-analyses

The Panel for the AHCPR Clinical Practice Guideline[2] recognised difficulties in using data from meta-analyses to support recommended practice because of the significant variability in methods used in the different randomised controlled clinical trials incorporated into the meta analyses. The Panel also recognised that evidence from more than a decade previously may or may not necessarily apply to current medical practice in the light of changes in technology and interventions. We support these views and consider that some interpretations and conclusions from the meta-analyses are open to question. Nevertheless, we agree that reported meta-analyses should be addressed.

Strength of evidence rating systems

In the review of the scientific literature, the AHCPR Clinical Practice Guideline[2] followed a strength of evidence rating system based upon three grades of evidence. However, these 1998 Best Practice Guidelines have applied four levels of evidence, following the recommendations contained in the Guidelines for the Development and Implementation of Clinical Practice Guideline[8] of Australia's NH&MRC. The NH&MRC strength of evidence ratings are based upon a number rating designating the strength of the scientific evidence. These number ratings are somewhat different from the letter grading used by the AHCPR. Both ratings systems reflect the quality of the studies, including methodology and study design, and the consistency of the results reported in the scientific literature. Each strength of evidence rating cannot be regarded as absolute and may change over time. It is necessary to update such recommendations every few years in the light of accumulated evidence. Each rating system is set out below:

United States Agency for Health Care Policy and Research[2]

A Scientific evidence provided by well designed, well conducted, controlled trials (randomised and nonrandomised) with statistically significant results that consistently support the guideline recommendations.

B Scientific evidence provided by observational studies or by controlled trials with less consistent results to support the guideline recommendation.

C Expert opinion that supports the guideline recommendation because the available scientific evidence did not present consistent results, or controlled trials were lacking.

National Health and Medical Research Council of Australia[8]

1 Scientific evidence based upon systematic review of well designed, well conducted, randomised controlled trials.

2 Evidence obtained from at least one properly designed randomised trial

3.1 Scientific evidence obtained from nonrandomised controlled experiments with statistically significant results supporting the guideline recommendations

3.2 Scientific evidence from well designed cohort or case control studies from more than one centre or research group.

3.3 Scientific evidence based upon observational studies with time series with or without the intervention or supported by observational studies which have sufficiently consistent results to support the recommended guideline.

4 In the absence of scientific evidence sufficient to support a recommendation under Category 1, 2 or 3, consensus expert opinion has been used to form the basis of the guideline recommendation.

The NH&MRC rating presents a significant difficulty where there are several properly designed randomised clinical trials with inconsistent outcomes, but favouring the intervention. Systematic review may lead to acceptance on balance as indicating level of evidence = 1. To submit these trials to meta-analysis, however, would be inappropriate because of the disparate methodologies employed in the studies. Where the majority of trials or larger trials support the effectiveness of the intervention, we have elected to allocate level of evidence = 2, because there is "evidence from at least one properly designed randomised trial". Where the evidence for benefit is equalled by failure to demonstrate benefit, a strength of evidence rating = 4 has been given. Where the evidence from randomised controlled trials is balanced, but there is

significant evidence from controlled studies, we have given a strength of evidence rating = 3. Such inconsistency in outcomes from several trials presents no difficulty in the AHCPR rating system where, when positive on balance, the strength of evidence rating = B.

In some instances, there is evidence to support strength of evidence ratings from two or three of sub-categories 3.1, 3.2 and 3.3. These three sub-categories were therefore reduced in the Best Practice Guidelines into a single Strength of Evidence Rating 3.

These guidelines were developed with a view to presenting sound recommendations for the care of patients with cardiovascular disease, based upon a comprehensive literature review. Recommendations are based, where available, on published scientific literature. In those areas where the scientific literature was inconsistent or incomplete, the recommendations reflect consensus statements assessed by Consultative Committee members and consultants. In some areas it was necessary to step outside the cardiological and rehabilitation literature and to accept expert opinion or evidence from other fields such as education or behavioural psychology.

Consultative Committee

All professions involved in cardiac rehabilitation programs were represented on the multidisciplinary Consultative Committee, including the following: cardiology, rehabilitation medicine, general practice, nursing, physiotherapy, exercise physiology, occupational therapy, social work, dietetics, psychology and pharmacy. Also represented were rural health professionals and agencies such as the National Heart Foundation of Australia, the Victorian Association of Cardiac Rehabilitation and the Australian Cardiac Rehabilitation Association. In addition, consumer representatives (who had themselves had coronary artery bypass surgery or myocardial infarction) from Heartbeat Victoria and Heart Support Australia were invited to join the Committee. Members of this committee are listed in the Acknowledgements. The roles of the Committee were to provide expert advice regarding the content of the Guidelines, to facilitate the conduct of additional surveys and focus groups and to give feedback on the recommendations contained in the Guidelines. Sections of this report were submitted for review by small groups before finalising the guidelines. The complete document was then reviewed by all Consultative Committee members. During the development of the Guidelines, the Committee met on five occasions.

Survey of current programs in Victoria

During 1996, a survey was undertaken to document currently available cardiac rehabilitation services in hospitals and community health centres throughout Victoria[5]. All hospitals with monitoring facilities admitting acute cardiac patients were eligible for inclusion in the survey. Investigation of community health centres was confined to those centres which had already established ambulatory cardiac rehabilitation programs. The survey was conducted by telephone interview. Most respondents were program co-ordinators. In smaller hospitals where there were no formal programs, interviews were carried out with directors of nursing or other personnel. Services for both inpatients and outpatients were investigated and views were sought regarding perceived deficiencies in current services. Material from this survey is incorporated into discussions of current practice in later chapters.

Focus groups with health care providers

In order to identify pertinent issues for service providers, 10 focus groups were held[6]. Discussions lasting about one hour took place, guided by an experienced facilitator, with each of the following groups: nurses, physiotherapists, occupational therapists, dietitians, social workers, cardiologists, general practitioners, rural health workers, health insurance bodies and health fund users. These focus groups aimed to explore perceptions of cardiac rehabilitation and its aims and to uncover major areas of concern for those delivering cardiac rehabilitation services. Expectations regarding the Best Practice Guidelines were also explored and views elicited about what should be included in the Guidelines. Findings from these focus groups are referred to throughout the Guidelines.

Comparative study of four model programs

A small pilot study was conducted of 168 patients, who were consecutively enrolled into four model cardiac rehabilitation programs in Melbourne[7]. Three public hospitals and one private hospital were included in the study. The frequency of sessions at these hospitals varied from once per week in one hospital, twice per week in two hospitals and three or more times per week in the fourth hospital. Health attitudes and behaviours were investigated before program entry and after discharge from the programs which lasted between six and eight weeks. Patients' perceptions of the rehabilitation programs were explored. Data were collected via self-report questionnaires. Reference to the findings of this study is made in several chapters.

CHAPTER 2
CARDIAC REHABILITATION AND SECONDARY PREVENTION: DEFINITIONS

The traditional ingredients of formal cardiac rehabilitation programs in Australia include exercise, education, and psychological and social support. Inpatient rehabilitation is mostly undertaken on an individual basis, whereas ambulatory rehabilitation programs after discharge from hospital are usually conducted with groups of patients. Such group programs have generally been conducted in a suitable outpatient area of the treating hospital. More recently, some programs have been established in community health centres and other sites. Best practice ambulatory programs are conducted by a multidisciplinary team. However, it is recognised that a cardiac rehabilitation program can be conducted by one appropriately trained health professional, provided there is adequate external medical and other support.

Many aspects of cardiac rehabilitation and secondary prevention are addressed through medical practice on a one to one basis between patients and medical practitioners. Cardiac rehabilitation and secondary prevention programs refer to structured programs of exercise, education and support additional to usual medical care. As described in later chapters, the benefits of such programs have been demonstrated through comparing the outcomes of patients enrolled in programs after an acute cardiac event with those exposed to usual medical care alone. Cardiac rehabilitation and secondary prevention programs are thus important adjuncts to the treatment of individual patients by medical practitioners.

Cardiac rehabilitation

Cardiac rehabilitation has been defined as

> The sum of activities required to ensure cardiac patients the best possible physical, mental and social conditions so that they may, by their own efforts, resume and maintain as normal a place as possible in the community[9].

Cardiac rehabilitation has also been described as

> The combined and coordinated use of medical, psychosocial, educational, vocational and physical measures to facilitate return to an active and satisfying lifestyle[10].

A somewhat different definition of cardiac rehabilitation was produced by the United States Public Health Service in 1988[11].

> Cardiac rehabilitation services are comprehensive, long term programs involving medical evaluation, prescribed exercise, cardiac risk factor modification, education and counselling. These programs are designed to limit the physiological and psychological effect of cardiac illness, reduce the risk of sudden death or reinfarction, control cardiac symptoms, stabilise or reverse the atherosclerotic process, and enhance the psychosocial and vocational status of selected patients. Cardiac rehabilitation services are prescribed for patients who have had a myocardial infarction, have had coronary bypass surgery, or have chronic stable angina pectoris.

It is now recognised that cardiac rehabilitation programs, in certain circumstances, may also be delivered to those at high risk of coronary heart disease, including those with other evidence of vascular disease or who are at high risk of vascular disease, or indeed any other form of cardiac disease. To encompass this broader definition, the Cardiac Rehabilitation Working Group of the European Society of Cardiology (ESC)[12] has modified the definition of cardiac rehabilitation to be more inclusive, as follows:

> The sum of interventions required to ensure the best physical, psychological and social conditions so that patients with chronic or post acute cardiac disease may, by their own efforts, preserve or assume their proper place in society.

The words "chronic" and "preserve" were added to the previous definition of the World Health Organisation (WHO) in order to stress the concept of the importance of rehabilitation in the long term care of patients with chronic disease, including those who had not had recent acute events.

Secondary prevention

For many years, cardiac rehabilitation programs have included an educational and supportive element to facilitate lifestyle change, adherence to advice and long term maintenance of change in order to promote secondary prevention of cardiovascular disease. Many studies have now demonstrated that ambulatory cardiac rehabilitation programs can be effective launching pads for secondary prevention.

While the definitions of the US Public Health Service[11] embraced the concept of secondary prevention, those of WHO[9] and ESC[12] failed to do so adequately. The US Public Health Service definition is somewhat restrictive regarding patient entry characteristics, while the other definitions favour enrolment of all patients with cardiovascular disease. A broader definition should embrace those of the WHO and ESC and include the intentions of the US Public Health Service, as follows:

> Cardiac rehabilitation is the co-ordinated 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.

A similar definition containing the same ingredients has been generated by a European WHO working group[13].

Phases of cardiac rehabilitation

There are three recognised phases of cardiac rehabilitation.

Inpatient rehabilitation (Phase 1)

Rehabilitation begins in hospital and consists of early mobilisation and education. It is delivered on an individual basis and, additionally, in some hospitals, to groups of patients. The degree of structure of inpatient programs varies from one hospital to another. The shorter hospital stay (now commonly four to six days after acute myocardial infarction, five to seven days after coronary bypass surgery, and one day after coronary angioplasty) makes it extremely difficult to conduct formal inpatient education programs. Further, inpatients commonly undergo time consuming comprehensive investigations. Thus, inpatient cardiac rehabilitation programs are now much more limited in scope than in the past. Moreover, it is recognised that inpatient education may be ineffective because of the psychological state and concerns of patients soon after their acute event.

Inpatient rehabilitation is now mostly limited to early mobilisation, so that self care is possible by discharge, and brief counselling to explain the nature of the illness or intervention, to increase the patient's awareness of his or her risk factors and to reassure the patient about future progress and follow-up. A discharge plan usually incorporates a discharge letter to the general practitioner and/or cardiologist or cardiac surgeon and assurance that the patient is aware of the need for continued medication. Appointments are usually made for follow-up review and, ideally, referral to a formal outpatient cardiac rehabilitation program. The effects of such restricted inpatient programs upon patient outcomes have been little studied.

Ambulatory outpatient rehabilitation (Phase 2)

Most cardiac rehabilitation is based upon supervised ambulatory outpatient programs conducted during convalescence. Attendance begins soon after discharge from hospital, ideally within the first few days. In Australia and elsewhere, ambulatory cardiac rehabilitation programs usually end within two to three months of the acute event.

Formal outpatient cardiac rehabilitation programs vary widely in content. Almost all contain an element of group exercise which is conducted by allied health professionals. Therefore, an educational and supportive element is inevitably delivered together with the exercise.

The duration of ambulatory exercise programs during convalescence also varies. In the United States of America, funding is available for exercise classes conducted three times per week for 12 weeks for those who are covered by health insurance, Medicare or Medicaid. In Australia and Canada, the usual duration of programs is six to eight weeks, although in some places it may be as short as four weeks. A brief intensive program is common in Europe, particularly in Germany, where three or four week residential programs are offered.

Sessions may be offered once, twice or occasionally three times per week in Australia. Programs in the United States and Continental Europe usually offer exercise of a moderate or high intensity level, whereas most exercise programs in Australia and New Zealand are of low or moderate intensity. The pattern of exercise programs in the United Kingdom is now changing from a few programs of high or moderate intensity exercise (following the practice in the United States) to widespread programs with lower levels of intensity (as practised in Australia).

Most programs in Australia include group education, but the content and method of the delivery of such education programs varies greatly. Different facilitators in the one program also vary considerably in their approach to running group discussions.

Psychological and social support may be given on an individual basis, as required, or may be provided to groups of patients and family members.

Maintenance (Phase 3)

A lifetime, maintenance stage follows the ambulatory program in which physical fitness and risk factor control are supported in a minimally supervised or unsupervised setting.

Maintenance programs are even more varied in content and structure than ambulatory programs. The exact content of maintenance programs is often not clearly defined. They may consist of regular recall and review by physician[14] or nurse[15]. Patients may receive additional medication, further education, social support, exercise classes and behavioural intervention, as required[14–17]. Some patients may be enrolled in special groups for specific reasons (for example, diabetes, obesity, smoking, lipid disorder, hypertension, heart failure) if clinics are established for the management of these particular risk factors or conditions. In other programs, patients may be enrolled in an ongoing exercise class[18,19].

Relatively few maintenance programs have been established or adequately evaluated. Most of the evidence for improved prognosis is derived from combined ambulatory and maintenance programs which have been hospital-based. Individual studies and meta-analyses have reported benefits in terms of reduced mortality, recurrent events and readmissions.

CHAPTER 3
CARDIAC REHABILITATION AND SECONDARY PREVENTION: HISTORICAL BACKGROUND

The welfare of patients with heart disease, particularly those who became unemployed as a consequence of their illness, has been a concern of medical and other health professionals throughout the twentieth century. However, during the past 50 years, it was gradually recognised that disability could be controlled or avoided, that retirement was often unnecessary and that patients could live for many years after their acute events. A distinct change in attitude developed with the introduction of formal programs of cardiac rehabilitation to facilitate and support recovery of patients and to prevent further episodes.

United States of America

Cardiac rehabilitation as a systematic discipline was initially developed in the early 1940s in the United States of America. At that time, there was an acute manpower shortage and the possibility of returning unemployed or retired men to the work force was considered. It was recognised that there were many men capable of work who had been prematurely retired because of coronary heart disease. In 1941, the first Work Evaluation Unit was established in New York under the auspices of the American Heart Association[20]. Many people with coronary heart disease were medically reviewed and their capacity for work evaluated. The majority returned to work and were found to make satisfactory employees in occupations similar to those which they had previously enjoyed[21].

The success of this pilot unit led to many such units being established throughout the United States. These produced a gradual change in the attitude toward medically recommended early retirement following heart attack[22]. Simultaneously, there occurred a slow change in medical opinion regarding mobilisation and resumption of normal activities. Whereas in the 1940s an episode of acute myocardial infarction was likely to result in some weeks of absolute bed rest and possibly three months of hospitalisation[23] or rest at home, it was later recognised that early mobilisation produced beneficial effects[24].

In the 1960s, progressively early mobilisation occurred amongst patients admitted with myocardial infarction. A more optimistic approach toward the future welfare of

the patients entered into medical thinking and practice. Return to work became a significant aim of cardiac rehabilitation programs. Psychosocial recovery was recognised to accompany physical recovery[25].

The accepted physical and psychological benefits of early mobilisation and supervised exercise training led to the introduction of exercise training programs during convalescence[26–31]. Confirmation that early exercise testing and training could start within two to three weeks of a myocardial infarction[32–33] led to exercise training starting immediately after discharge from hospital. However, because the exercise was of relatively high intensity, careful monitoring was necessary. These programs usually lasted up to twelve weeks and patients attended three times per week during that period[29–33]. Some education was delivered during these programs, partly through the natural exposure to interested health professionals who could supply requested information to patients during supervised exercise sessions. Gradually it was recognised that more formal patient education was desirable. Therefore, group education was later grafted on to many of the group exercise programs.

Australia

In 1961 the National Heart Foundation of Australia established Cardiac Rehabilitation Units in major capital cities. Patients were referred to these centres with occupational, social or psychological problems which were causing unnecessary disability or unemployment. Patients attending the cardiac rehabilitation units received guidance and support, exercise and education, both individually and in groups. The majority returned to jobs (usually new employment) suitable to their physical capacity and their training[34–37].

These Cardiac Rehabilitation Centres (or Work Assessment Centres) contributed significantly to a change in the pattern of medical management of patients with cardiovascular disease. Progressively earlier mobilisation occurred with progressively shorter hospital stay. It became recognised that it should be possible to prevent patients from requiring such late rehabilitation services if one could intervene at an early stage. Thus, in the 1970s “preventive” rehabilitation programs for patients following acute myocardial infarction were started in a number of hospitals. Initially patients were referred to these outpatient programs four weeks or more after discharge from hospital. Later, it was accepted that exercise programs could start earlier after discharge from hospital[38]. Thus, the pattern of outpatient ambulatory cardiac rehabilitation programs in Australia evolved. Increasingly, patients were referred to a rehabilitation program, usually based on group education and relatively light or moderate group exercise with minimal equipment and testing and limited monitoring[39]. These programs lasted for six to eight weeks with once or twice weekly attendance. Family members were encouraged to participate.

This pattern is typical of most current cardiac rehabilitation programs in Australia, although several are now shorter (4–8 weeks). A few programs, particularly in New South Wales and Queensland, use higher levels of exercise and consequently require more technology in assessment and monitoring.

Results of recent surveys show a rapid growth in the number of cardiac rehabilitation programs in Australia, and especially in Victoria[5,40–41]. A survey conducted in Victoria in 1996 showed that 67 outpatient group exercise and education programs and 23 inpatient group programs were available[5]. All major hospitals in metropolitan Melbourne and country Victoria now provide ambulatory group programs.

Europe

Support for multiple benefits arising from exercise training of patients after myocardial infarction has also been reported from studies in Europe[42–46]. Most of these studies were based on hospital outpatient programs. In Central Europe some residential rehabilitation centres became cardiac rehabilitation hospitals and eventually developed into regional cardiological centres for the inpatient assessment, management, education and training of patients. Patients were referred to these centres directly from the hospital to which they had been admitted for the acute event or were called to the cardiac rehabilitation hospital some weeks after discharge from the acute hospital[47–48].

United Kingdom

Rehabilitation programs in the United Kingdom have developed rapidly in recent years. The structure of the rehabilitation program is described as "fairly consistent and follows the low level program advocated by Goble et al from Melbourne, rather than the high intensity programs seen in North America"[49].

Asia

Cardiac rehabilitation programs have recently been established in several Asian countries, supported in some places by the World Heart Federation (formerly International Society and Federation of Cardiology)[50]. The programs follow WHO recommendations[1] and are based upon programs of low intensity exercise and group education which is the model for the great majority of programs currently available in Australia[41]. However, there are a few programs in private hospitals based upon the US model of high intensity exercise training, delivered to those who can afford to pay. The introduction of cardiac rehabilitation programs in Asian countries has been facilitated by the Heart Research Centre, which has developed and conducted training programs in Melbourne and elsewhere in Australia[50–51]. Health professionals from Hong Kong, Malaysia, India, Pakistan, Philippines, Indonesia and Thailand have attended these training programs and observed cardiac rehabilitation programs in

Australia. They have then established similar programs in their own countries. Over the past five years, training programs modified to suit local needs have been conducted in these Asian countries, in conjunction with the Heart Research Centre and sponsored by the World Heart Federation.

Participation in programs

The gradual acceptance of cardiac rehabilitation as an important adjunct to medical care and an important need for patients has received support from the World Health Organisation, health departments and professional societies throughout the world. However, participation in cardiac rehabilitation programs has been relatively low in all countries[52–56]. The challenge now is to increase participation rates, as discussed in Chapter 17.

CHAPTER 4
THE BURDEN OF CARDIOVASCULAR DISEASE

According to the 1997 World Health Report, circulatory diseases such as heart attacks and stroke kill more people than any other disease, accounting for at least 15 million deaths, or 30% of the annual total, every year[3]. In developing countries these diseases also account for about 25% of all deaths. In 1996, coronary heart disease accounted for more than 7 million deaths worldwide and was responsible for about one-third of all deaths in industrialised countries. In 1994 cardiovascular disease (CVD) was certified to be the primary cause of death in 43.33% of all deaths in Australia and 41.97% in Victoria (39.2% in males, 44.9% in females)[57]. The majority of these deaths were from coronary heart disease (CHD), also referred to as ischaemic heart disease (IHD) (Table 1). The proportion of deaths from CHD/IHD in the State of Victoria (23.0%) is similar to that of Australia generally (24.1%). It is also similar to that reported in the 'The Global Burden of Disease 1996"[4], with CHD/IHD constituting 24.7% of all certified deaths in developed regions in 1990.

Table 1: Deaths from CVD (1994)

	Australia		Victoria	
	n	%	n	%
Estimated population	17,844,449		4,477,419	
Total deaths	126,683		32,353	
CVD deaths	54,886	43.33	13,577	41.97
CHD/IHD	30,573	24.13	7,448	23.02
Stroke	12,838	10.13	3,127	9.67
Other	11,475	9.06	3,002	9.28

Source: Australian Bureau of Statistics 1996[57]

The majority of patients who die from CHD already have a past diagnosis of CHD and many have had one or more admissions to hospital. The Victorian Inpatient Minimum Database for the 12 month periods to June 1995 and to June 1996 highlights the rapid increase in the number of patients admitted to hospital with CHD and also discharged alive with a primary diagnosis of CHD (Table 2)[58]. In addition, there has been a rapid increase in the number of major interventions in the treatment of CHD, both coronary artery bypass graft surgery (CABGS) and percutaneous transluminal coronary angioplasty (PTCA) (Table 2).

Table 2: Hospital separations: number of patients with a diagnosis of CHD (Victoria)

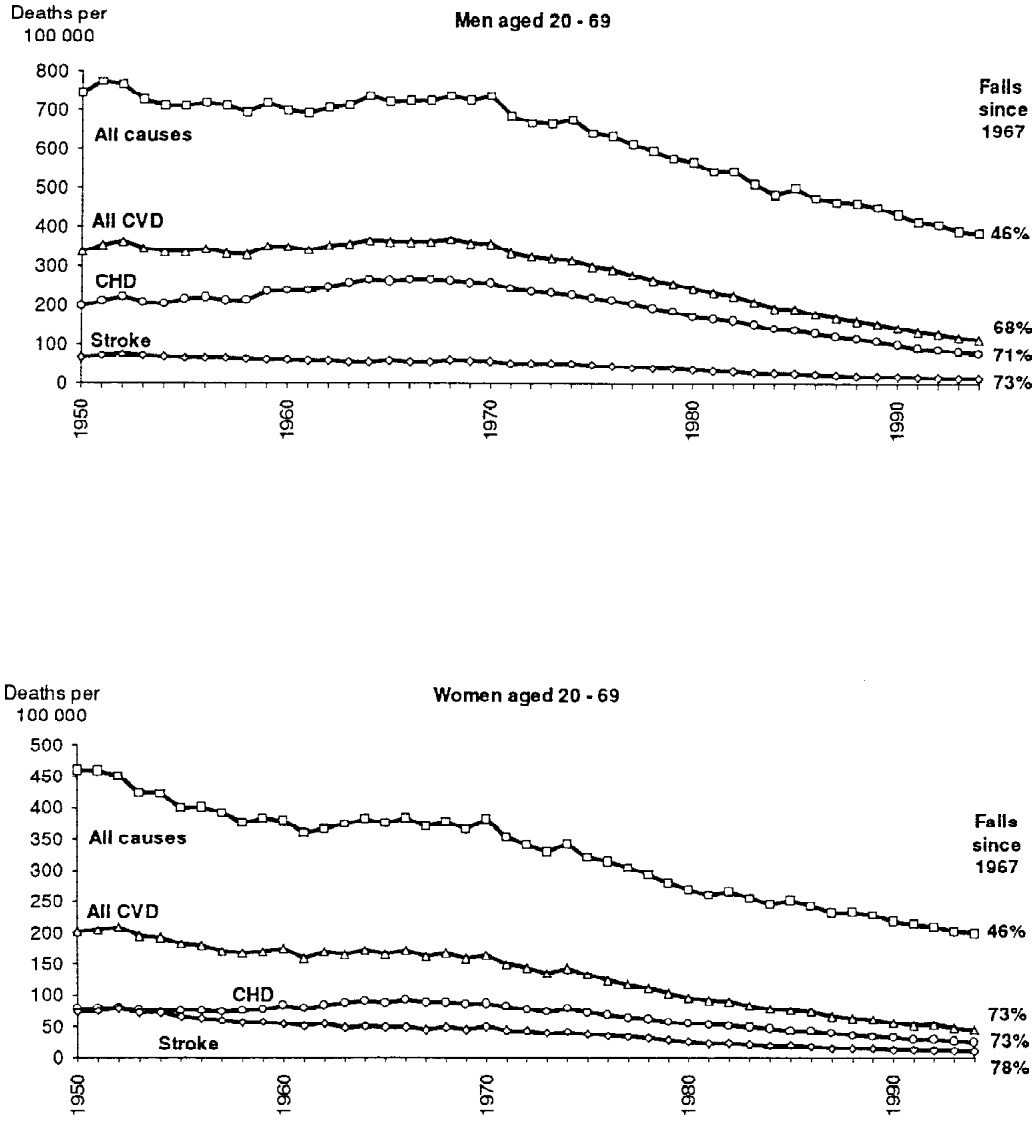
Year to June	1995	1996
Myocardial infarction (ICD9 410)	7,956	8,456
Angina pectoris (ICD9 413)	5,633	8,918
Coronary bypass surgery (ICD9 36.10 - 36.19)	3,972	4,439
Coronary angioplasty (ICD9 36.01, 36.02, 36.05)	2,622	3,463
(Coronary stent) (ICD9 36.06)	(198)	(817)

Source: Victorian Inpatient Minimum Database[58]

The increased number of hospital admissions and separations for angina pectoris may be partly accounted for by increased admissions for coronary angiography to determine suitability for CABGS or PTCA. The number of stents inserted concurrently with PTCA has also rapidly increased, which may explain the increasing number of PTCA procedures performed. This rise in the number of admissions and successful (living) hospital separations is occurring in the face of a falling death rate from CVD, both in Australia generally (Figure 1)[59] as well as in Victoria (Figure 2)[60], for both men and women. Similar patterns prevail in many industrialised countries.

In Eastern Europe there is a rapidly rising prevalence of CVD with a rising death rate in all socioeconomic groups. Death rates from CVD in most Eastern European countries now far exceed those of Western Europe, USA, Australia and New Zealand[61]. In Asia there is a rapidly rising prevalence of CVD, particularly among the growing professional, managerial, business and factory supervising groups[62–64].

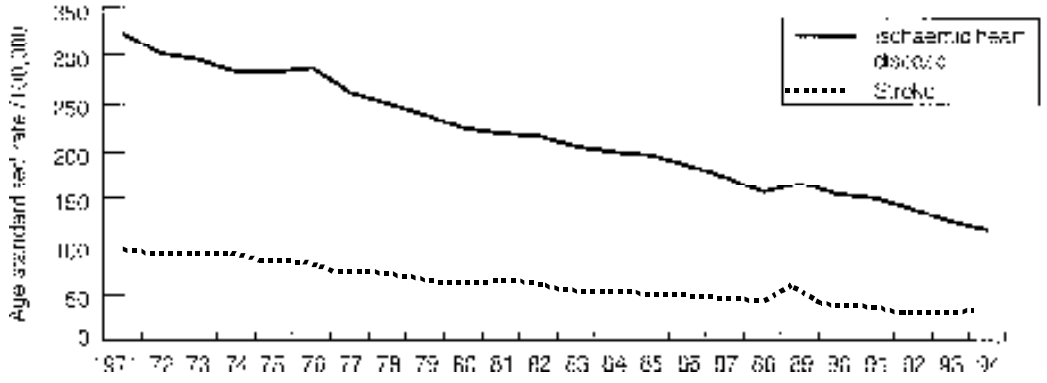
Figure 1: Age-adjusted death rates 1950–1994, and falls since 1967



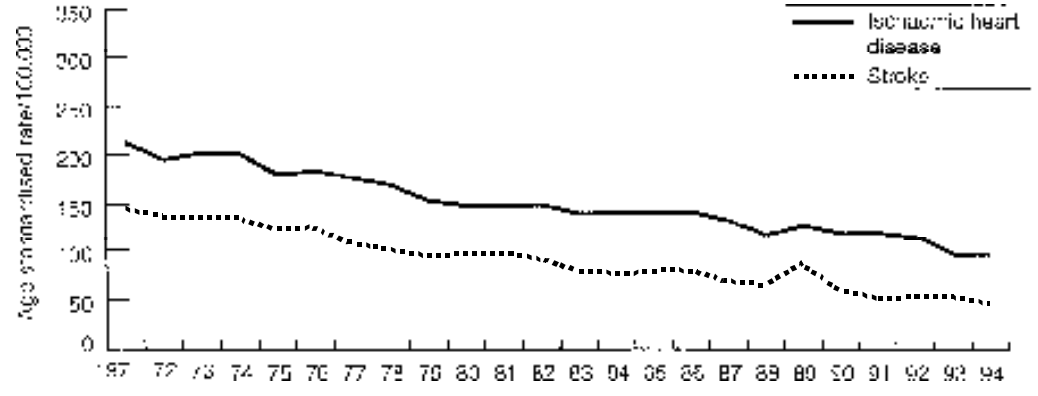
Source: Heart and Stroke Facts, National Heart Foundation of Australia 1996[59]

Figure 2: Trends in cardiovascular death rates in males and females, Victoria

Males



Females



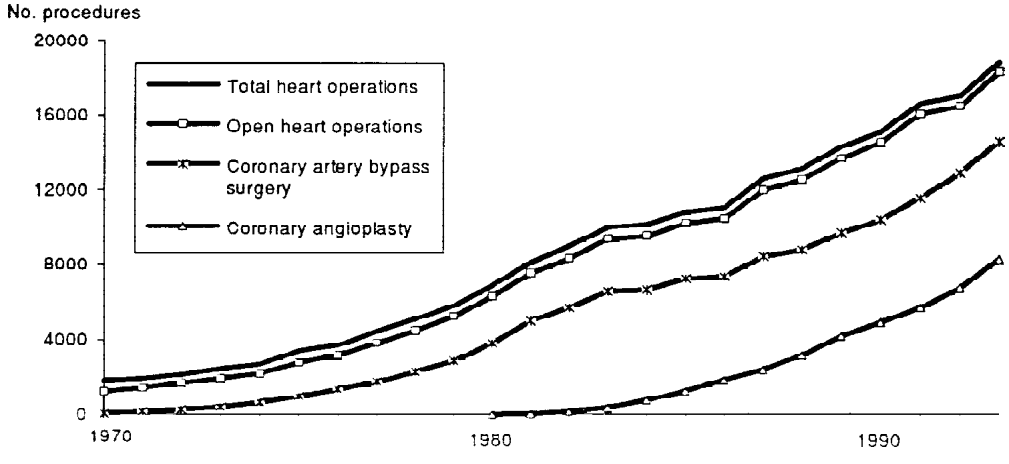
Source: Health Indicators: Victorian Department of Human Services, 1996[60]

In Australia, the falling death rate from CVD, particularly CHD, is leading to overall falling death rates at all ages, and consequently a progressive increase in overall life expectancy. The increase of five years' life expectancy to 75 years in men and to 81 years in women during the past 20 years is very largely due to reduced premature deaths from CVD[65]. While certified death rates from CHD, both total and age adjusted, in men and in women are falling, there is an increasing survival of persons with CHD. Modern medical and surgical treatments for acute myocardial infarction, angina pectoris, stroke and other manifestations of CVD have contributed greatly to this falling annual death rate. In addition, changes in population and patient behaviours have led to a delay in the appearance of CVD and CHD, less severity of CVD and CHD and increasing chance of survival after the disease becomes symptomatic.

Thus, we have an increasing survival rate in an increasingly ageing population. It is possible that while death rates are falling, the actual prevalence of the disease is not. The ageing population means that those presenting with CHD are more likely to suffer comorbidity (for example, osteoporosis, arthritis) and to have increased chance of death from other illness (for example, cancer, respiratory disease).

The development of effective but costly interventions continues to increase rapidly in Australia (Figure 3), including Victoria[59]. Thus, there are increasing numbers of patients discharged alive from hospital after acute episodes of CHD and also after acute interventions. These patients constitute the major pool of those eligible to attend ambulatory cardiac rehabilitation programs. Apart from the benefits to individual patients and their families, these programs should also aim to reduce recurrent events, including avoidance of subsequent interventions, and to reduce health costs by delaying or preventing dependency, disability and hospital readmissions. These are the aims of secondary prevention of cardiovascular disease.

Figure 3: Cardiovascular procedures in Australia, 1970–93



Source: Heart and Stroke Facts, National Heart Foundation of Australia 1996[59]

Another group of persons who may benefit from cardiac rehabilitation programs includes those who are at high risk of CVD who commonly have multiple risk factors. This group may need support additional to that obtained from usual medical care. In this regard, cardiac rehabilitation programs may well be a suitable means of encouraging healthier behaviours and compliance. This may apply particularly to those of high risk declared by a positive family history[66]. Motivation to change lifestyle may be heightened if a family member suffers an acute cardiovascular illness. The potential pool of patients with diagnoses of CHD in Victoria could be up to 20,000 new patients per year and in Australia up to 80,000 new patients per year. The possible numbers of high risk patients could be much greater.

The magnitude of the burden of CHD in Australia is one reason for delivering cardiac rehabilitation and secondary prevention to patients in groups. Such group programs can be delivered at low cost, reducing the cost burden of CVD. In Australia in the year 1989–1990, the total direct costs for CVD were calculated by the Australian Institute of Health and Welfare to have been $2.2 billion and indirect costs $1.3 billion[65].

CHAPTER 5
RECENT PRACTICE GUIDELINES AND POLICY STATEMENTS

Several bodies have produced guidelines and policy statements regarding cardiac rehabilitation. Only one of these is a scientific review of the available evidence in the literature. The remainder are guidelines for practitioners, policy statements, position statements or non-systematic reviews.

Scientific review

United States Agency for Health Care Policy and Research

An extensive scientific review of the available literature was undertaken in 1995 by NK Wenger, ES Froelicher, CK Smith et al entitled "Clinical Practice Guideline No 17: Cardiac Rehabilitation". It was published by the US Department of Health and Human Services, Public Health Service, Agency for Health Care Policy and Research (AHCPR) and The National Heart, Lung, and Blood Institute[2]. "A Quick Reference Guide for Clinicians" entitled "Cardiac Rehabilitation as Secondary Prevention"[67] was also produced, which summarised the review of the literature and the conclusions and recommendations arising from the review. However, the US guidelines did not address several important issues relating to program content and other aspects of cardiac rehabilitation. Moreover, publications since 1995 have modified some of their recommendations. A review of the US recommendations is provided in Chapter 6.

Other guidelines and statements

American Association of Cardiovascular and Pulmonary Rehabilitation

The American Association of Cardiovascular and Pulmonary Rehabilitation produced "Guidelines for Cardiac Rehabilitation Programs" (first edition in 1991[68]; second edition in 1995[69]). These are well referenced text books for health professionals working in the field.

British Association of Cardiac Rehabilitation

The British Association of Cardiac Rehabilitation published "Guidelines for Cardiac Rehabilitation" in 1995[70]. The British guidelines are somewhat more clinically oriented than the AHCPR Clinical Practice Guidelines.

American College of Sports Medicine

The American College of Sports Medicine produced "Guidelines for Exercise Testing and Prescription" (5th edition) in 1995[71]. This also is not a scientific review guideline: it is a referenced instruction manual for those exercise physiologists and others who co-ordinate or participate in exercise training programs. It follows the preferred high intensity exercise programs in the USA.

British Cardiac Society

A working party of the British Cardiac Society produced a "Working Party report on Cardiac Rehabilitation" in 1992[72].

Another working party in the United Kingdom produced "Cardiac rehabilitation in the United Kingdom: guidelines and audit standards" in 1996[73].

American Heart Association

The American Heart Association (AHA) produced a Position Statement "Cardiac Rehabilitation Programs: A Statement for Healthcare Professionals from the American Heart Association" in 1994[74]. The AHA also produced a "Consensus Panel Statement: Preventing Heart Attack and Death in Patients with Coronary Disease" in 1995[75]. The statement has been endorsed by the Board of Trustees of the American College of Cardiology.

American College of Physicians

The Health and Public Policy Committee of the American College of Physicians produced a report "Efficacy of Cardiac Rehabilitation Services" in 1988[76].

Rehabilitation Systems in Europe

An independent review from Europe entitled "Cardiac rehabilitation today: programs, their effects and practical guidelines" was published in 1992[77].

The residential option for rehabilitation, common in Central Europe, is presented in a paper entitled "Cardiac rehabilitation in the Federal Republic of Germany: Klinik Roderbirken" by Jette et al in 1988[47]. Such costly residential rehabilitation programs appear to confer questionable benefit to patients[48,78].

European Society of Cardiology

The Working Group on Cardiac Rehabilitation of the European Society of Cardiology produced "Cardiac Rehabilitation: Definitions and Goals" in 1992[12].

Comment

While none of the above guidelines and policy statements represents a scientific literature review comparable to that contained in the AHCPR Clinical Practice Guideline[2], their recommendations are generally consistent with the AHCPR

Guideline. They are also consistent with the following recommendations of the National Heart Foundation of Australia published in 1994 and of the World Health Organisation Expert Committee in 1993.

National Heart Foundation of Australia

In 1994, the National Heart Foundation of Australia published a Policy Statement on Cardiac Rehabilitation, which states:

> Secondary prevention programs, including outpatient cardiac rehabilitation, should be available to all patients in Australia who have had acute myocardial infarction, coronary artery bypass grafts, coronary angioplasty or other cardiovascular disease. Unless contraindicated, these patients should be routinely referred to hospital or community based outpatient programs[79].

World Health Organisation

The World Health Organisation Expert Committee report "Rehabilitation after Cardiovascular Diseases, wit h Special Emphasis on Developing Countries" of 1993[1] made the following recommendations:

1 Cardiac rehabilitation should be an integral component of the long-term, comprehensive care of cardiac patients.

2 Cardiac rehabilitation programs or services should be available to all patients with cardiovascular disease, both children and adults.

3 Rehabilitation services should be provided by any trained health professional caring for cardiac patients, since no sophisticated equipment or facilities are required. Both patients and their families should participate.

4 Rehabilitation programs should be integrated into the existing health care system; this can be done at modest cost. The major requirement is for health professionals to be trained in prescribing appropriate exercise and providing health education and vocational guidance.

5 Responsibility for the implementation of cardiac rehabilitation should be given to a designated health professional at the local level, trained as a coordinator. This individual should, in turn, be responsible to an appropriate physician or to a department, hospital, or other health care facility, which may operate under the auspices of the government or a nongovernmental organisation or other agency.

6 All plans for the implementation of rehabilitative programs should include provision for evaluating the efficacy of the programs.

Comment

The conclusion from all of the above guidelines and policy statements is that cardiac rehabilitation services should be available to all patients with cardiac and vascular disease. There is uniformity of opinion to support the view that cardiac rehabilitation should include exercise, education, social support, behavioural change, follow-up of patients and program evaluation. However, there are significant differences between regions regarding specific aspects of the content of these programs; that is "how much of what and for whom?" and in methods of delivering programs.

CHAPTER 6

REVIEW OF CLINICAL PRACTICE GUIDELINE NO 17 "CARDIAC REHABILITATION" (1995)

US Agency for Health Care Policy and Research

The extensive scientific review undertaken in 1995 to produce the Clinical Practice Guideline on Cardiac Rehabilitation for the US Agency for Health Care Policy and Research (AHCPR)[2] generated a series of recommendations based upon consideration of evidence of over 900 reports, a review of over 400 scientific papers and analysis of 334 of these papers. The Clinical Practice Guideline consists of the following:

1 Overview
2 Effects of cardiac rehabilitation exercise training
3 Effects of cardiac rehabilitation education, counselling and behavioural interventions
4 Organisational issues.

The overall conclusion of the scientific review is that

> Cardiac rehabilitation based upon exercise, education, counselling and behavioural interventions should be incorporated into programs of management for all patients with cardiovascular disease.

This is consistent with the recommendations of the WHO Expert Committee of 1993)[1].

This chapter summarises the strength of evidence ratings and the number of references reviewed for each recommendation of the AHCPR Clinical Practice Guideline. Table 3 presents the strength of evidence ratings derived from the scientific review applicable to a series of outcome measures. The evidence for the benefits of exercise training is sufficient to be absolute for some outcome measures (such as the vast amount of evidence that exercise tolerance is increased by exercise training). The evidence is sufficient to make fairly strong statements in other areas (for example, psychological functioning is likely to be improved by exercise training alone and it is definitely improved by exercise training together with educational support and other measures). Although the evidence is not absolute in some areas, it is reasonable to conclude that some outcomes are neither affected by exercise training nor by comprehensive cardiac rehabilitation (for example, collateral coronary circulation and myocardial function are not improved by exercise training, while

peripheral muscle efficiency is clearly improved). It is also highly likely that in many areas, a comprehensive cardiac rehabilitation program produces beneficial effects additional to exercise training alone.

Table 3: Strength of evidence ratings for benefit (AHCPR 1995)

	Strength of evidence (A, B, C)		
	Exercise alone	**Comprehensive rehabilitation**	**Maintenance programs**
Outcomes—Physical			
Functional effect			
Improved exercise tolerance	A		
Increased muscular strength	B	-	-
Disease progression			
Symptoms reduced	B	B	-
Morbidity reduced	A	A	A
Mortality reduced	B	B	B
Atherosclerosis slowed	-	B	B
Cardiac status			
Myocardial perfusion (reduced ischaemia)	B	-	-
Collateral circulation (no effect)	B	-	-
Myocardial function (no effect)	B	-	-
Arrhythmias (no effect)	B	-	-
Risk factors			
Smoking reduced	-	B	B
Lipids improved	-	B	B
Weight controlled	-	B	B
Blood pressure improved	-	B	B
Exercise habits improved	B	B	B
Safety of exercise training	A		
Outcomes—Psychosocial			
Psychological wellbeing improved	B	A	-
Social functioning improved	B	A	-
Return to work increased	-	C	-
Outcomes—Special Cases			
Heart failure			
Improved symptoms & exercise tolerance	A	-	-
Transplantation			
Improved symptoms & exercise tolerance	B	-	-
Elderly			
As for younger patients	B	B	B

Footnote: In Table 3, no evidence or insufficient evidence is indicated by a dash (-). The alphabetical letters (A, B, C) are those used in the AHCPR Clinical Practice Guideline, as set out in Chapter 1. Morbidity includes both recurrent events and hospital readmissions.

Exercise training

Table 4 sets out the number of studies related to exercise training in cardiac patients from which the strength of evidence is derived. In some areas, the evidence is considerable and consistent. In others, it is slight or equivocal (for example, the effect of exercise training upon arrhythmias).

Table 4: Number of exercise studies reviewed (AHCPR 1995)
Scientific basis for recommendations: exercise training

Outcome	Randomised trials	Non-randomised trials	Observational studies
Exercise tolerance	46	25	43
Muscle strength	4	3	0
Symptoms	12	7	7
Morbidity	15	14	13
Mortality	17	8	6
Atherosclerosis	5	1	3
Myocardial perfusion/ischaemia	6	2	3
Collateral circulation	0	0	5
Myocardial function	9	5	8
Arrhythmias	4	0	1
Smoking	12	8	4
Lipids	18	6	13
Weight	11	7	16
Blood pressure	9	6	3
Exercise habits	10	2	3
Psychological status	9	8	3
Social functioning	2	2	2
Return to work	10	9	9
Heart failure	5	3	4
Transplantation	0	1	4
Elderly	0	1	6

Education, counselling and behavioural interventions

Table 5 sets out the number of studies from which the recommendations and strength of evidence ratings were derived for education, counselling and behavioural interventions in cardiac rehabilitation. The evidence is small compared with that concerning exercise, but is sufficient to demonstrate that interventions additional to, or independent of, exercise training contribute to favourable outcomes in several areas, particularly those concerning risk factors and psychological wellbeing. Hence, such interventions should either directly or indirectly affect morbidity and mortality. Rather than attempting to dissect out the benefits of interventions additional to exercise, they are included in Table 3 in the framework of "comprehensive cardiac rehabilitation". Some incremental benefits to outcomes, apparent from exercise training alone, become more apparent when exercise training is combined with education, counselling and behavioural interventions. Some reports suggest, further, that benefits may arise from education, counselling and behavioural interventions independently of exercise training.

Table 5: Number of studies reviewed reporting education, counselling and behavioural interventions (AHCPR 1995)

Outcome	Randomised trials	Non-randomised trials	Observational studies
Smoking	5	1	1
Lipids	12	3	3
Weight	3	1	1
Blood pressure	0	2	0
Exercise tolerance (without exercise training)	1	1	1
Symptoms	2	1	1
Return to work	2	0	1
Psychological wellbeing	7	5	2
Morbidity	3	0	0
Mortality	8	0	0

Organisational issues

In the final section, the Clinical Practice Guideline addresses organisational issues, which include intake assessment, risk stratification, alternate approaches such as home-based cardiac rehabilitation, strategies for encouraging adherence to programs, and a brief discussion about the cost and benefit of cardiac rehabilitation. They also make recommendations for additional research.

CHAPTER 7
EXERCISE TRAINING IN CARDIAC REHABILITATION

This chapter reviews the scientific evidence for benefits from exercise training, both as the sole intervention and as a part of comprehensive cardiac rehabilitation. The term "exercise training" applies to a program of repeated exercise undertaken at a guided or prescribed intensity and frequency over a period of time, usually several weeks. The exercise training is based upon so-called aerobic or dynamic exercise, designed to improve physical performance at both maximal and submaximal levels. Such exercise may be of low, moderate or high intensity, as discussed in Chapter 8. Exercise training may also include resistance training involving the use of muscular effort against resistance, with the aim of increasing muscular strength

Meta-analyses

Reported randomised clinical trials involving exercise training in cardiac patients have been collected and submitted to meta-analyses with death as the major outcome measure[80,81]. These aggregations include trials which have been limited to convalescence (eight to 12 weeks) and continuing programs with follow-up support extending for three, five or even 10 years. In these meta-analyses, positive outcomes have been essentially attributed to exercise rather than to the comprehensive process of cardiac rehabilitation. Several of the trials in the meta-analyses have clearly been multifactorial interventions. These meta-analyses have shown benefit from exercise programs in terms of longterm mortality. The benefit is a mortality reduction of between 20% and 25%.

Dissection of the major studies included in the meta-analysis by O'Connor et al[81] reveals such disparate research designs that submitting them to meta-analysis is questionable. The meta-analysis has concentrated on longterm mortality reduction. Mortality reduction of statistical significance has been demonstrated in a few of the longer term trials standing alone[14,17]. The study from Finland[14], which achieved a statistically significant effect on mortality, was included in the WHO Europe Study[17].

Aggregation of disparate studies and other problems have led some to regard meta-analysis as potentially misleading[82–84], particularly in the light of insecurity regarding methodology and outcome measures in some non-blinded randomised clinical trials[85–87].

The trials included in the meta-analyses by O'Connor et al[81] fall into four groups:

1 Ambulatory (convalescent) cardiac rehabilitation trials

Most programs were of short duration (12 weeks) or less with insufficient longterm intervention or attention to follow-up to contribute to longterm mortality studies.

2 Longterm exercise studies where exercise training alone is compared with standard medical care

In those studies in which exercise training was apparently the sole intervention, there may have been a statistically significant difference demonstrable by meta-analysis[18,43–45,88–90]. However, these exercise trials are included with, and much influenced by, the definite mortality differences reported in some long-term multifactorial interventions.

3 Longterm multifactorial interventions compared with standard medical care

Reduction in mortality, recurrent events, hospital readmissions and risk factors has been demonstrated in randomised trials from the 1970s and 1980s[14,17]. The results of these trials are supported by a well designed, controlled experiment from Sweden[16,91] which produced similar results but which, not being a randomised trial, is not included in the meta-analyses. The Stanford Coronary Risk Intervention Program (SCRIP), also not included in the meta-analyses because of its recent publication date[15], was more a clinical trial of continued "shared care" than strictly of cardiac rehabilitation.

4 Comparisons of high and low intensity exercise training

In one randomised controlled trial extending over four years[19,92], outcomes of recurrent myocardial infarction and death were followed in patients randomly allocated to low or high intensity exercise programs. Each group was exposed to health professionals, but without specific additional intervention other than advice to individual patients. Here no difference in events was observed over three years. In the other study included in the meta-analysis, patients were followed for one year after programs of eight weeks of high or low intensity exercise[94]. Here again, no difference in events was apparent at follow-up.

There are two randomised controlled trials comparing other effects of high versus low intensity exercise with up to 12 month follow-up. These showed a minor difference only[94] or no difference in physical performance[93]. Both failed to show statistically significant differences between groups in psychological, social, occupational or other outcomes[95,96]. Another study[97] showed only trivial physical differences between groups. Psychosocial outcomes are not yet reported from this study.

Comment

It appears likely that exercise intensity, frequency and duration may not necessarily be the keys to better survival, fewer events, fewer hospital admissions and improved risk factors. Such benefits may well arise from the multifactorial nature of interventions (either intended or accidental) offered in cardiac rehabilitation programs, including exercise. This possibility was raised by Stern in 1981 and 1983[98,99]. A similar conclusion concerning the limitations of meta-analyses was presented in a review by Kellermann[100].

The benefits of exercise training

There are several clearly defined benefits from exercise training of cardiac patients. Other claimed benefits are less securely based. Some may be due to aspects of cardiac rehabilitation other than the exercise component itself.

Physical performance

Recommendation

Exercise training is recommended to improve physical performance (exercise tolerance, muscular strength and symptoms)

Strength of evidence = 1

Exercise tolerance

The physical benefits of exercise training in patients after acute myocardial infarction (AMI) have been extensively studied. Randomised clinical trials have repeatedly shown that functional capacity improves through exercise training, whether directly measured by maximal oxygen uptake or indirectly measured from nomograms based upon maximal treadmill exercise tests or in Watts by cycle ergometry[15,17,26,42–46,101–123].

Similar benefits from exercise training have been demonstrated in randomised clinical trials involving patients who have had coronary artery bypass graft surgery (CABGS)[118,123–129]. Improvement in exercise tolerance continues for up to 8 or 12 weeks and possibly beyond. Most randomised trials of exercise in cardiac patients have been based upon exercise training at a heart rate of between 70 and 85% of the maximal heart rate determined by symptom limited maximal exercise testing. Most trials have been limited to "low risk or moderate risk" patients. The process of "risk stratification"[130] has led to exclusion of so-called "high risk" patients, such as those with heart failure, significant impairment of left ventricular function or arrhythmias. Patients with "residual ischaemia", being those with angina or abnormal ST segment depression in the electrocardiogram at an exercise test or on 24 hour ECG monitoring, have also been commonly excluded from these trials. Patients in this last group have

been classified as being at "moderate or high risk". It now appears from the literature that most of the risk in patients with residual ischaemia is a subsequent need for revascularisation rather than a significantly greater chance of death or reinfarction. Risk stratification methods and significance are discussed in Chapter 9.

Widely accepted recommendations regarding exercise training have come from many authoritative sources based upon literature review and consensus[1,2,12,31,68–77,79]. It is also well recognised that physical performance spontaneously recovers through resumption of normal activities after a period of physical inactivity following AMI or other illnesses[131]. However, trials have demonstrated that exercise training produces a significantly more rapid recovery of physical function.

Muscular strength

There have now been several reports, including randomised trials[132–137] and observational studies[138–142] in which patients with impaired left ventricular function or heart failure have been trained in exercise of multiple muscle groups successively, with flexion and extension against resistance. All have demonstrated increased muscular strength. These findings are important because most activities of daily living involve movement against resistance or movement of objects requiring some strength. Although previously thought to have been hazardous, progressive resistive exercise training is now recommended, particularly for those who have become inactive and weakened by muscle wasting.

Symptoms

Some patients may be limited by dyspnoea or by angina. It has been demonstrated that patients with left ventricular failure enrolled in exercise training experienced less dyspnoea at the same level of exercise than did patients receiving usual care[102,106,107,111,112].

In randomised trials in patients with angina, exercise training has also been demonstrated to raise the threshold of activity at which symptoms appear[17,88,114,143–145]. The improvement is attributed to less cardiac work being required to deliver blood and oxygen to the exercising muscles at any given level of activity. However, no significant reduction of angina was reported in four other randomised clinical trials[14,43,108,146].

In one report of a comprehensive cardiac rehabilitation program, including exercise, half of the patients with angina awaiting elective coronary artery bypass graft surgery were removed from the waiting list following abatement of their angina[147].

Comment

There is no doubt that dynamic (aerobic) exercise training improves functional capacity. Although less studied, it is also definite that strength training, through resistive exercise, increases muscular strength. Both types of exercise training appear to lead to reduction in symptoms of dyspnoea and of angina.

Psychological functioning

Recommendation

Exercise training is recommended to improve psychological functioning (anxiety, depression, well-being)

Strength of evidence = 2

There are two randomised clinical trials demonstrating improvement in psychological functioning (anxiety, depression and other measures) from exercise training alone, compared with standard medical care[110,148]. The benefit is more apparent with multifactorial rehabilitation[92,121,148–150]. One randomised trial failed to demonstrate benefit[146]. The evidence for benefit from exercise training in randomised trials is supported by non-randomised studies[98,151–156].

Comment

While spontaneous recovery of psychological functioning occurs over many months following major illness or surgery, it is apparent that enrolment in a group exercise training program accelerates psychological recovery. Reviews and consensus statements support this benefit from exercise training. Benefits in psychological functioning are apparently greater in multifactorial rehabilitation.

Social adaptation and functioning

Recommendation

Exercise training is recommended to improve social adaptation and functioning

Strength of evidence = 2

The effects of exercise training on social functioning are less well defined than those assessing other aspects of recovery. Outcome studies include social adjustment, marital adjustment, sexual recovery and occupational adjustment. Positive outcomes have been reported from two randomised clinical trials[149,157]. Three observational studies produced statistically significant improvement in social functioning[98,128,158], while one controlled study showed no significant difference between groups[159].

Comment

While the attribution of better social recovery to the exercise training is generally accepted, uncertainty remains as to whether it is the exercise itself or interaction with health professionals and other patients which produces the benefit. Benefits in social functioning are more apparent with multifactorial rehabilitation.

Return to work

Recommendation

Return to work should be a specific goal of cardiac rehabilitation programs. Comprehensive rehabilitation, including education, counselling and vocational rehabilitation, is recommended. Exercise training as the sole intervention has not been shown to increase the rate of return to work.

Strength of evidence = 3

There is no convincing evidence from controlled trials that exercise training alone favourably affects the rate of return to work. There is evidence that comprehensive cardiac rehabilitation is effective but that benefit appears only to be achieved when return to work is considered an important outcome measure of cardiac rehabilitation.

Of three randomised controlled trials of exercise training alone, compared with usual care, none demonstrated an increased rate of return to work[43,44,90]. Where education and counselling were included in the rehabilitation program, additional to the exercise, three studies reported positive results[17,155,160], while eight showed no significant increase in return to work[32,45,46,108,146,157,161,162]. None of the reported interventions in these studies specifically included vocational rehabilitation. Several controlled nonrandomised and observational studies, where return to work was a major aim of the rehabilitation program, showed significant benefit in return to work (see Chapters 12 and 15).

Comment

While exercise programs may improve levels of fitness for work and enhance self efficacy and psychological functioning, they may not be enough to prove effective in increasing return to work. Education and psychosocial support may have some additional effect, but can be ineffective unless return to work is a formal aim of cardiac rehabilitation. These issues are discussed in Chapters 12 and 15.

Major risk factors

Recommendation

Exercise training alone may possibly lead to improvement of risk factors (lipid profile, smoking, weight control, blood pressure control). However, the improvement is not apparent in the absence of a comprehensive rehabilitation program. Education, counselling and support are additionally recommended to improve risk factors.

The strength of evidence is different for each risk factor. However, as indicated below, it is difficult to attribute reported improvement in risk factors to exercise alone, as many studies were of multifactorial interventions, with exercise as a major component.

Lipids

Strength of evidence = 3

A beneficial effect upon lipid levels has not been clearly demonstrated from exercise training alone in randomised trials. One showed statistically significant total cholesterol lowering in the exercise group[88], while three did not[17,43,163]. This may be partly due to the relatively short period of the exercise training.

Beneficial differences in lipid profiles have been demonstrated in randomised multifactorial trials of cardiac rehabilitation during convalescence, where exercise is one ingredient of the program and attention is also paid to nutritional and behavioural advice and support[14,15,104,105,116,143,144,164–166]. However, in others, no statistically significant benefit has been demonstrated using the same outcome measure[109,167].

Favourable increases in HDL cholesterol levels have not been reported in randomised clinical trials of exercise training in cardiac patients. Two observational studies[168,169] showed a rise in HDL cholesterol during exercise training lasting six months and five years respectively. In a randomised trial of exercise training in sedentary men and women aged 50–65 years, HDL cholesterol rose in those enrolled in exercise training of moderate intensity over a two year period[170]. These time frames make it unlikely that improvement (increase) in HDL cholesterol can be achieved through exercise training in ambulatory rehabilitation programs of up to three months duration.

Smoking habit

Strength of evidence = 3

Three randomised controlled trials have shown no benefit in terms of reduction in the rate of return to smoking through exercise training alone[88,90,146]. Those randomised trials in which improved smoking habit has been demonstrated have included patient

education, support and attention to behavioural change and maintenance of change, in addition to exercise training[104,118]. However, four multifactorial trials showed no difference[14,143,164,171]. Non-randomised trials have shown improved smoking habits in the multifactorial intervention group[16,152,172–174] and others have produced no significant difference between groups[138,175,176]. Observational studies have shown reduced smoking habits at the end of cardiac rehabilitation programs[177–180].

Body weight

Strength of Evidence = 4

One randomised controlled trial of exercise training alone compared with standard medical care documented lower body weight in the intervention group[43]. Another failed to demonstrate significant intergroup differences[90]. In randomised multifactorial cardiac rehabilitation programs, five studies reported statistically significant lower weight in the intervention group[14,15,105,144,164]. Four found no difference[44,118,143,171]. Non-randomised controlled studies and observational studies are similarly divided between demonstration of benefit and no benefit[2].

While it may be reasonable to assume that aerobic exercise training, without increased caloric intake, should result in lower body weight, the above studies failed to show that exercise training alone is effective in reducing body weight. Further, even combined with other measures, body weight may be resistant to change. It is possible that overweight non-smokers may lose weight through exercise training and cardiac rehabilitation, but that those who cease smoking following a cardiac event may increase in weight. Thus, the group mean weight and body mass index may not change. Further, those who adhere to an increased level of activity may increase their caloric intake.

Expert opinion that weight loss should be achieved by exercise training is not well supported by scientific evidence.

Blood pressure

Strength of evidence = 4

Two randomised trials of exercise training alone resulted in no significant difference in blood pressure between groups[106,143]. Three randomised controlled trials have demonstrated better blood pressure control through comprehensive cardiac rehabilitation including exercise training[14,15,43], while three showed no difference between groups[118,144,165]. Some non-randomised cardiac rehabilitation programs including exercise training have produced evidence of greater reduction of blood pressure than amongst controls[16,152,181–183] while one reported no intergroup difference[175].

It is not possible to attribute better blood pressure control to exercise training alone in these studies, because blood pressure control may well be affected by greater

prescribing of medication for those noted to have raised blood pressure in rehabilitation classes. Further, the level of adherence to medication may be affected by other factors.

Nevertheless, based upon expert opinion, comprehensive cardiac rehabilitation is recommended as a means of favourably influencing blood pressure.

Comment

The effects of exercise training alone on major risk factors (lipid profile, smoking habit, weight control, blood pressure) appear to be statistically slight, insignificant or absent. Those studies producing favourable results have usually been multifactorial management programs, extending over months or years and including specific attention to risk factors. They have usually consisted of combined medical and other health professional care in special management clinics. This degree of intervention is beyond the scope of usual ambulatory cardiac rehabilitation programs conducted during convalescence. However, modification of risk factors is of critical importance in reduction of recurrent events, morbidity and mortality. A convalescent ambulatory cardiac rehabilitation program, including group exercise, education and support, may be regarded as a "launching pad" for secondary prevention. To achieve this aim, however, closer linkage with medical care is required.

Subsequent exercise habits

Recommendation

Exercise training is recommended to improve subsequent exercise habits. However, programs should be followed by longterm availability of support and facilities for maintenance of activity.

Strength of evidence = 3

The positive effect of exercise training on exercise habits has usually been limited to the period during which patients are enrolled in the exercise training program. Return to prior levels of activity or inactivity commonly occurs after discharge from the program. In randomised controlled trials of exercise training, significant improvement in subsequent exercise habits has been reported in six trials[88,105,144–146,184] but no difference in four trials[28,44,160,185]. Some observational studies have demonstrated better exercise habits following a period of exercise training[174,186,187]. Maintenance (phase 3) programs with continued availability of group exercise classes, support groups and clinical review providing advice and encouragement are likely to be required for maintenance of activity levels.

Comment

The majority of studies concerning exercise habits involved men under 65 years of age following myocardial infarction. It is important to recognise that exercise in most of these studies was high intensity aerobic exercise training which is not embraced by the great majority of people over the age of 50 years[188–191]. Hence, abandonment of high intensity exercise is almost inevitable. It may well be that, with lower levels of exercise, an established pattern of regular walking or other increased levels of activity could be achieved. This possibility requires further study.

Morbidity, recurrent events, hospital readmissions and mortality

Recommendation

Exercise training extending beyond convalescence, with a maintenance or follow-up (phase 3) program is recommended to reduce morbidity, recurrent events, hospital readmissions and mortality.

Strength of evidence = 2

The evidence for these claims for secondary prevention comes from a few studies with longterm follow-up support[14,17,185] and from meta-analyses[80,81]. As suggested earlier in this chapter, it may be that some benefits arise not from the exercise training itself, but from the comprehensive nature of the interventions. The reduction of mortality is largely demonstrated in randomised trials conducted in Finland, Britain and Continental Europe in the 1970s and 80s. Longterm follow-up programs in these trials was made possible by the nature of the health care systems in the countries in which the studies were undertaken. Similar positive outcomes have been reported in the controlled study from Sweden with reports of five and 10 year follow-up[16,91].

Both the Finnish[14,185] and the Swedish[16,91] studies showed improved risk factor profiles in the multifactorial intervention groups, compared with the controls, during the first three and five years respectively. The SCRIP trial from the USA showed benefits through intensive application of nurse-managed shared care[15]. While not as yet showing a significant mortality difference, significant differences in risk factor profiles have already been demonstrated between the treatment and control groups in this study. Reduced progression of coronary artery disease has also been shown in this study by quantitative angiography.

Comment

Exercise training alone may account, in part, for better outcomes if it leads to improved habits and risk factors in the longterm. However, it is clear that major benefits are more apparent from long term multifactorial interventions. These outcomes include morbidity, recurrent events, hospital readmissions and mortality.

Conclusions

A comprehensive review of the scientific literature shows that physical outcomes in cardiac patients are definitely improved by exercise training. The evidence for improved psychological and social functioning is favourable, while the evidence for improvement in risk factors, behaviours and resumption of work is equivocal. The addition of education, counselling and behavioural interventions to an exercise training program produces demonstrable benefit in all outcome measures.

The greater increment in maximal oxygen uptake, strength and physical functioning is directly attributable to the exercise itself. The other benefits of exercise training may possibly be attributable in part to the exercise. However, they are more likely to be due to the effects of group interaction, the availability of health professional advice and peer support.

The difficulty of separating the effects of exercise from the psychosocial benefits of group activity, patient interaction and access to health professionals is a further argument for approaching cardiac rehabilitation as a comprehensive program. The major portion of a benefit may be attributable to any part of the program or to the program in its entirety. The addition of a new or modified component may produce changes in few patients, not reflected in the psychological, social or even physical outcome measures in the group as a whole. Further, any group program may have favourable effects which cannot be demonstrated by intergroup outcome measures. This could be the case, even if all patients consider the new added intervention or support to be beneficial.

Many patients are fearful of possible adverse effects of various physical activities or of any form of exercise. Demonstration of the capacity to be active with safety, initially with supervision and subsequently without supervision, facilitates recovery of morale. This in turn may lead to other beneficial effects. Nearly all patients claim that they are greatly assisted, physically and psychologically, by participating in an exercise program. However, this common claim has proved difficult to demonstrate in randomised controlled trials where the primary emphasis has been upon physical measurement. Psychological and social outcomes are more difficult to measure, as discussed in Chapters 13 and 18.

CHAPTER 8
THE AMOUNT OF EXERCISE TRAINING

In Chapter 7 the demonstrated benefits of exercise training were reviewed. In this chapter major issues are explored relating to:

- the intensity of exercise training
- the determination of "training heart rate" and "rate of perceived exertion"
- the frequency, number and duration of exercise classes
- home exercise programs
- continuing exercise and levels of physical activity
- eligibility for and exclusions from exercise training.

Intensity of exercise training

Recommendation

Low to moderate intensity exercise training is recommended for all cardiac rehabilitation programs. Exercise training at low to moderate intensity has effects similar to those of moderate to high intensity exercise training.

Strength of evidence = 2

While most exercise training programs in the USA (and many in Europe) are based upon high intensity exercise, most in Australia (and the United Kingdom) are based upon low intensity exercise. As previously stated, nearly all past studies investigating the effectiveness of exercise have compared high intensity exercise training plus standard medical care with medical care alone. Further, most of these studies did not include high risk groups. However, there are now four randomised clinical trials which have compared the effects of high and low intensity exercise training upon multiple outcomes.

Rechnitzer et al[19] compared two groups of low risk men randomly allocated to high intensity exercise (n=390) twice weekly or to low intensity exercise (n=371) once weekly for eight weeks, with continued similar exercise thereafter. There was no difference between groups in deaths or reinfarction during the four years of follow-up.

Blumenthal et al[93,95] recruited 70 male patients up to six months after acute myocardial infarction. No differences were found in any physical, psychological or social outcomes between the two groups of low risk patients at follow-up three months after enrolment in programs of high or low intensity exercise.

Worcester et al[94,96] studied 337 consecutive patients with acute myocardial infarction admitted to a single coronary care unit. Patients were randomly allocated to either a high intensity program (70–85% of maximal heart rate) thrice weekly or to a low intensity exercise program (less than 65% of maximal heart rate or less than 20 beats per minute over resting heart rate) twice weekly. Each group was encouraged to walk each day for at least half an hour. The study included high risk patients. Physical working capacity improved in both groups. After eight weeks the high intensity exercise training group had a greater physical working capacity (10.6METs) compared with the lower intensity exercise group (9.6METs). This 10% difference at the end of the eight week exercise program had disappeared at 12 months when both groups had the same physical working capacity (10.6METs). More importantly, there was no significant difference between groups in several measures of quality of life at entry to the study or at four and 12 months after the myocardial infarction.

Oberman et al[97] have reported only trivial differences in maximal oxygen uptake and rest to maximal exercise ejection fraction in patients randomly allocated to high intensity (n=111) or low intensity (n=89) exercise over a period of one year. Possible differences in risk factors and psychosocial adjustments between the two groups have not yet been reported.

From these trials, it appears that a higher level of supervised exercise training has a small, positive relationship to maximal physical working capacity at the completion of the exercise program, but no significant difference is achieved in the long term. Thus, while the process of reconditioning appears to be accelerated through high intensity exercise, it is not associated with any recognisable or demonstrable other benefit. It is therefore reasonable to conclude that low to moderate intensity exercise is, with the single exception of physical working capacity, as effective as high intensity exercise, provided that home activity (particularly walking) is encouraged and undertaken. Moderate to high intensity exercise training may be of additional benefit to those whose work is physically demanding.

Lower levels of exercise training (heart rate less than 70% of maximal heart rate or an awareness of slight breathlessness) are considered safe and require lesser supervision than higher levels of exercise training (greater than 70% of maximal heart rate). Although ventricular fibrillation is infrequent and death rare in high intensity exercise programs[192,193], the consensus view remains that high intensity exercise training requires prior risk stratification with a symptom limited exercise test, specific monitoring for high risk patients or exclusion from exercise training of such high risk patients[68,69,71,74,130,194]. Thus, high intensity exercise programs are usually preceded by

risk stratification by technological methods. A symptom limited exercise test is performed to determine training heart rate. Electrocardiographic monitoring during the period of medically supervised exercise training is also recommended. There is a significant increase in costs because of such testing and monitoring.

Categorisation of exercise intensity

Categorisation of exercise intensity (low, moderate, high) may be by symptoms, perceived exertion by Borg's scale[195], or by heart rate. Categorisation should not be by correlating levels of various activities with METs (metabolic equivalents), without due allowance for age and CVD status of each patient.

1 MET is the oxygen consumption at rest, measured as 3.5ml O_2/Kg/min. 2 METs would be equivalent to strolling at about 3kms/hour for a healthy person. 3.5 METs should be equivalent to walking at about 5kms/hour (the usual walking pace for a middle-aged male). One could therefore suggest that 3.5 METs is light exercise. That would be so for a healthy male. It may well be a high level of activity for an elderly woman, for a patient with controlled or compensated heart failure or for a patient deconditioned by a long period of immobilisation in hospital.

Exercise three times per week for 20–30 minutes, which leads to breathlessness and sweating, is performed by 2% of men and 1% of women aged 60 to 69 years in Australia[188]. Activity at this level, performed less frequently, is undertaken by 10% of men and 8% of women of the same age. The proportions are only 3% and 18% for men and 2% and 14% for women aged 50 to 59 years. Walking for exercise is undertaken by 65% of men and 57% of women in these age groups[188]. Similar attitudes and sedentariness have been noted in the USA[189–191] and elsewhere. As one of the aims of reconditioning through exercise training is to lead to a more active longterm lifestyle, it is preferable that the activity is enjoyable or acceptable. Prescribed high intensity exercise training involving attention to clothing, weather conditions and adherence to a regular thrice weekly time slot is likely to lead to abandonment of the physical training program. In the study by Oberman et al[97], the dropout rate from high intensity exercise was twice that from low intensity exercise. This difference, however, was less apparent in the study by Rechnitzer of low risk, somewhat younger men[19,92].

Low intensity exercise

Low intensity exercise (see Table 6) is acceptable to almost all patients. It can be managed by the elderly and by patients with incipient or actual heart failure. It is associated with little risk and requires little supervision. However, some monitoring is needed for the disabled and those with congestive heart failure. Examples of low intensity exercise programs are given in Annex 1 and 2 of the Report of the WHO Expert Committee[1].

Moderate intensity exercise

Moderate intensity exercise (see Table 6) is acceptable to many patients. It may prove difficult to incorporate into daily living activities on a long term basis and can lead to musculoskeletal injury in the elderly. It may not initially be within the capacity of many older patients and probably should not be attempted by those with heart failure except with careful supervision.

High intensity exercise

High intensity exercise (see Table 6) is embraced by only a small minority of patients. It is a barrier to participation in cardiac rehabilitation for the elderly, the obese and for most middle aged or older women. It is beyond the capacity of those with heart failure or significantly impaired left ventricular function and requires prior testing for safety and determination of a training heart rate. High intensity exercise requires monitoring. Further, it is unlikely to be subsequently incorporated into the life activities of most patients. For some patients, however, high intensity exercise training is a desired level of activity, particularly for younger males who are usually of higher socioeconomic status and who are in a position to continue such activity in a social or gymnasium environment. It may also be desirable for rapid reconditioning of those in physically demanding work.

The need for high intensity exercise has now been questioned in the USA[97,196] and many programs now offer moderate intensity exercise training. While high intensity exercise represents the quickest method of achieving or regaining fitness, it is the most demanding on resources and costs. Further, it delivers a program with limited appeal and with poor equity of access.

Comment

Low to moderate levels of physical exercise training, coupled with regular physical activity at home, approaches that of high intensity exercise training as a mode of enhancing physical working capacity. High intensity and low intensity exercise training appear to be equally effective in accelerating psychosocial recovery. Thus, low to moderate intensity exercise is recommended as best practice for cardiac rehabilitation programs. As well as producing comparable physical benefits to those achieved through high intensity exercise, it is acceptable to a larger proportion of the population with greater safety. Further, because of the reduced need for technology and medical supervision, low to moderate intensity exercise training programs can be delivered at low cost.

Measuring exercise intensity

Heart rate

Moderate or high intensity exercise is commonly monitored by heart rate, aiming at a specified training (or target) heart rate. The training heart rate during exercise is usually based upon a prior symptom limited exercise test. Some have suggested that the training heart rate may be calculated from a simple formula.

Recommendation

Training heart rates for moderate to high intensity exercise should be based upon actual measurements of individual patients' maximal heart rates from a maximal stress test. They should not be based upon calculations of heart rates from formulae devised for healthy adults.

Strength of evidence = 3

Determination of training heart rate from exercise stress test

For high intensity exercise it is usual to perform a symptom-limited maximal stress test to determine what is the maximal heart rate that can be achieved by an individual at the time when it is no longer possible to continue the test. The peak heart rate achieved is that patient's maximal heart rate. From that may be determined the percentage of the maximal heart rate at which patients exercise. With high intensity exercise this is usually between 70%–85% of the achieved maximal heart rate from a maximal stress test. Low intensity exercise is usually in the range of 50%–65% of the achieved maximal heart rate. Moderate exercise lies in the band of about 60%–75% of achieved maximal heart rate. Thus, there is a correlation between low, moderate and high intensities of exercise training and the percent of maximal heart rate.

The scale devised by Borg[195] also correlates reasonably well (see Table 6 and later section in this chapter entitled "Perceived exertion"). A rating of perceived exertion of 10–12 ("Light") corresponds with low intensity exercise training. A rating of 12–14 ("Somewhat hard") corresponds with a moderate exercise training level and a rating of 14–16 ("Hard") corresponds with high intensity exercise training. These correlations are set out in Table 6. However, the correlations constitute a guide only and represent approximations.

Table 6: Correlation with exercise training levels (approximate)

Exercise training level	Rate of perceived exertion (Borg)		% of maximal heart rate on test	Increment over resting heart rate
	Very, very light	6		
		7		
		8		
	Very light	9		
		10		
LOW	Light	11	50–65	10–25
		12		
MODERATE	Somewhat hard	13	60–75	20–35
		14		
HIGH	Hard (heavy)	15	70–85	30–55
		16		
	Very hard	17		
		18		
	Very, very hard	19		
		20		

Note: Chronotropic dysfunction (refer below), present in many cardiac patients, may result in a lower maximal heart rate, thereby permitting a higher percentage of maximal heart rate at any given workload. Further, the possible blunting of heart rate response in some patients generates a wide range of increment over resting heart rate. In addition, the different levels of exercise training and of perceived exertion may be accompanied by significant overlapping of percentage of maximal heart rate and increment over resting heart rate.

Determination of training heart rate from formula

There are some who consider that the formula 220 minus years of age is a suitable method of calculating the maximal heart rate for cardiac patients. This could expose individual patients to unnecessary risks. This risk applies whether the training heart rate is based upon a calculated percentage of the maximal heart rate, or upon a calculated percentage of heart rate reserve.

Following acute myocardial infarction, coronary artery bypass graft surgery, or other acute cardiac illness, heart rate response to exercise may be affected by chronotropic dysfunction of variable degree[197–199], possibly further modified by medication. Thus, the normal increment in heart rate at increasing levels of exercise may not be followed. Further, the maximal heart rate achieved by a symptom limited maximal exercise test may fall far below that expected from any formula devised for normal subjects.

Formula-based percentage of maximal heart rate

Example
Consider the case of a 52 year old male three weeks after AMI. From the formula (220 - age), the maximal heart rate (HR max) is 220 - 52 = 168 beats per minute.

A calculated training heart rate of 70% of HR max (70% of 168) = 118 beats per minute

A calculated heart rate of 85% (85% of 168) = 143 beats per minute.

In one series of 238 male patients at mean age of 52 years, who underwent symptom limited maximal treadmill testing three weeks after acute myocardial infarction[94], the achieved HR max was 147 (± 20 SD) beats per minute. Only 12% of these patients were taking a beta blocker and 15% were taking a calcium blocker. In this group of patients the calculated 70% of HR max (118 beats per minute by formula) would actually be 80% of the achieved HR max on treadmill test. The calculated 85% of HR max (143 bpm by formula) would actually be 97% of achieved HR max from a maximal stress test. Fortunately, most patients cannot achieve such a level of activity, being limited by breathlessness, fatigue or profound distress. This level of activity, if attempted, could prove fatal. Further, it must be noted that individual variation is great (for example, SD ± 20 beats per minute).

Formula based percentage of heart rate reserve

The other manner in which the formula has been used is to determine the training heart rate based upon a percentage of "heart rate reserve" as suggested by Karvonen[200], say 65% of the difference between resting heart rate (measured) and the HR max (calculated from the formula).

Example
Consider the case of a 52 years old man three weeks after AMI. The formula based maximal HR max of 220 - 52 = 168 beats per minute.

Assume a resting heart rate of 83 beats per minute (the mean resting heart rate of the above group of 238 patients with mean age of 52 years). The heart rate reserve would therefore be, calculated from the formula, 168 - 83 = 85 beats per minute.

65% of heart rate reserve (65% of 85 beats per minute) = 55 beats per minute.

This would give a training heart rate (resting heart rate 84 + 55) = 139 beats per minute

139 beats per minute is estimated to be 95% of the HR max determined by test - a dangerous level of exercise.

The concept of using a formula to obtain maximal heart rate based upon 220 less the patient's age in years should not be considered as having a place in exercise programs in cardiac rehabilitation.

Perceived exertion

Studies conducted by Borg[195] have resulted in a scale of rates of perceived exertion. The scale ranges from "no exertion at all" or "very, very light" exertion at one end to "very, very hard" or "maximal" exertion at the other end of the scale (see Table 6). These rates of perceived exertion have been correlated with heart rate, presented as the percentage of the maximal heart rate determined by a symptom limited maximal exercise test. Based upon this correlation, it has become common practice for patients to exercise at a given rate of perceived exertion, which correlates with their advised or prescribed training heart rate. This correlation may also be applied to the increment in heart rate over the resting heart rate. Thus, it is possible for patients to monitor their own exercise levels, based either upon heart rate or rate of perceived exertion (see Table 6). One should refer to the note at the foot of Table 6 which highlights and explains the greater range of heart rates amongst cardiac patients than amongst normal subjects.

Frequency of exercise sessions and duration of program

Currently, most authorities and consensus statements in the United States of America still recommend supervised exercise of high or moderate intensity three times weekly (preferably not on consecutive days) for 12 weeks[69,71,74]. This is based upon acceptance that improvement in physical working capacity tends to plateau from 10 to 21 weeks in such programs[113,201].

It has been accepted that if high intensity exercise training lasts for longer than half an hour, the chance of musculo-skeletal injury is increased. Further, it has also been confirmed that the risk of injury is greater if exercise training occurs more frequently than on alternate days[202,203].

The concept of exercising three times per week for 12 weeks (36 training sessions), with electrocardiographic monitoring, either with telemetry or other methods (limited leads or defibrillator paddles), has been the basis for funding of programs throughout the United States. It is recognised that this requirement needs to be changed (for example, there has been no defined insurance funding for non-ECG monitored programs, nor for education programs or psychosocial support of individual patients who may well require additional personal attention).

Frequency of sessions

Recommendation

Supervised twice weekly group exercise programs are recommended during convalescence as they achieve similar benefits to group exercise training conducted three times per week.

Supervised once weekly group exercise training may possibly be similarly effective. Supervised exercise should be coupled with a home activity/exercise program.

Strength of evidence = 2

Similar increments in physical working capacity have been reported in exercise training programs where patients attend thrice or twice weekly for supervised exercise[2].

The study by Worcester et al[96], comparing high and low intensity exercise, also included a comparison of thrice weekly (high intensity exercise) versus twice weekly (low intensity exercise). In view of the absence of significant differences between the two groups in all measures other than physical working capacity (attributed to the higher level of training in the high intensity exercise training group), it is reasonable to conclude that twice weekly group supervised exercise is almost as efficient in achieving desired outcomes as is three times per week during convalescence. This appears to have been accepted in some Canadian exercise rehabilitation programs where funding is not the basis for the structure of the program[19,121]. In the Swedish controlled study, which demonstrated considerable benefits from a comprehensive rehabilitation and follow-up program after acute myocardial infarction, group exercise was also conducted twice weekly[16].

One randomised clinical trial specifically investigated the relative benefits of frequency of supervised exercise sessions less than thrice weekly[204]. The increment in maximal physical working capacity, estimated by treadmill testing, was equal in those randomised to two or three training sessions per week. One training session per week resulted in increased treadmill time compared with the control group but less than was found in those who attended two or three sessions per week.

In another randomised trial, thrice weekly hospital based exercise training was compared with once weekly hospital based exercise training, coupled with two equivalent home based exercise sessions, and further compared with an unsupervised home activity program[205]. Physical performance increased in each of the supervised programs, with little difference between them. All three were superior to the totally unsupervised home program. There was little relationship between levels of depression at entry and on completion of each of the four programs. In the groups

with home walking (rather than home cycling), anxiety was less. This study suggests once weekly supervised activity, coupled with home walking, may be as effective as more demanding and costly thrice weekly hospital based supervised exercise programs.

Thus, while it is probable that one supervised group exercise session per week is beneficial, it has not been adequately demonstrated to be as effective as two supervised exercise sessions per week. However, coupled with home exercise (as it should be), it may prove equally effective. Patients commonly report considerable satisfaction with their exercise programs, irrespective of the number of sessions they attend each week[7].

Duration of program

Recommendation

It is recommended that most patients should attend a twice weekly program for six to eight weeks (a total of 12 to 16 sessions) and a minimum of six to eight group discussions.

Strength of evidence = 4

The basis of 12 weeks of exercise training is as set out earlier in this chapter. This duration of supervised exercise training is not universally accepted. In studies in Canada[19,121] and Australia[94,96], an initial eight week program was considered sufficient.

Six to eight weeks has also been considered adequate in most other Australian programs[5–7,10,39–41]. In these programs, the exercise training component is usually perceived by patients as an important part of their convalescent care. The educational and support aspects of the program are commonly perceived by staff as of equal or greater importance. Hence, the duration of the program may be more likely determined by the educational and behavioural needs of patients. It is considered that a longer program may delay return to work and possible loss of work in consequence. These issues have not been adequately studied. It is not known for how long a regular supervised group exercise program should continue. The consensus in Australia would suggest that eight, six or even four weeks may be enough to facilitate recovery from an acute cardiac event and to initiate behavioural change. The Minimal Standards document of the National Heart Foundation is in line with this consensus[79].

Comment

It is important to recognise that there is no mean or average patient. Some patients require little support, education or advice about activity. Some may have only one or few questions about activity, health behaviours or other matters which they seek to gain from a program. Such matters may well be asked and resolved during exercise

classes. On the other hand, there are some patients whose needs appear to be impossible to meet. They are frequently seeking additional advice, often on matters upon which they have already been advised. In terms of best practice guidelines, one seeks to find a reasonable mean for the duration of programs with the recognition that some patients will require less, others will require more, but the majority will be satisfied and will have achieved the aims of the ambulatory program within a defined period of time.

Patients who are unfit, frail, elderly or who have heart failure need continued, longterm support with both dynamic and resistive exercises (including in groups) to encourage and help the maintenance of muscle strength and fitness. For these patients, longterm community-based activity programs are therefore required. Such programs are not perceived as standard ambulatory cardiac rehabilitation during convalescence, but the linkage is apparent between cardiac rehabilitation and supportive care for the aged and infirm.

Home exercise programs

Recommendation

A home exercise program is recommended for those patients who are unable to attend a group exercise program. A daily home walking program is recommended as a supplementary activity for all patients enrolled in a group program.

Strength of evidence = 2

Trials conducted in the USA have compared home versus hospital ambulatory group exercise[206,207]. These have shown benefits in physical working capacity and psychosocial outcomes approaching those achieved by patients randomly allocated to a hospital based group program. While home-based programs reduce patient travelling time, patients who undertake exercise training at home may still require careful assessment before an exercise prescription is offered them, if they are to undertake moderate or high intensity exercise. Further, in the reported trials, patients had a cycle ergometer at home for their prescribed exercise session, telephone communication with the nurse program co-ordinator and facilities for telephone electrocardiographic transmission during exercise. While this extends the opportunities for individual patients to participate in supervised high or moderate intensity exercise, it is not of low cost. Further, it could be irrelevant. If lower levels of exercise are accepted, telephonic monitoring would become unnecessary for the great majority of patients.

It may not be possible for all patients to attend a group cardiac rehabilitation program. Such patients require guidance regarding exercise, education and behaviour

change, as well as support. Simple verbal and written instructions to such patients are required, together with discussion about activity and behaviour while in hospital (inpatient rehabilitation) and as part of discharge planning. Follow-up by telephone may be possible[208]. General practitioner follow-up should be assured.

Ideally, patients receiving a home-based program should attend at least one group exercise session for guidance regarding home exercise and to learn the level of exercise recommended for them. They should learn self monitoring based upon observation of heart rate during activities or recognition of symptoms to the level of awareness of breathing (Borg scale 10–12: Table 6)[195]. They should be advised to continue activity at that level on a daily basis, preferably for half an hour each day.

Home exercise programs generally involve daily walking at a low or moderate intensity (ref 205), as well as other physical activities with gradual progression to achieve an increase in muscular strength for activities of daily living.

Patients who are enrolled in a group exercise program should also follow a home activity program, accumulating at least 30 minutes of activity daily at a similar level of perceived exertion or heart rate.

Continued exercise beyond convalescence

Recommendation

Following ambulatory rehabilitation, a multifactorial program of longterm follow-up should be offered to all patients as a part of their continuing management. All patients should maintain a continuing level of activity, including 30 minutes of walking or its equivalent each day, and should maintain muscular strength to manage all activities of daily living.

Strength of evidence = 1

For a low or moderate activity exercise program, half an hour per day of activity at a level of awareness of breathing is sufficient to achieve progressive improvement in physical functioning and is sufficient to achieve psychological benefits similar to those claimed to be achieved by high intensity exercise training three times per week[93–97].

Randomised and controlled trials have shown that multifactorial cardiac rehabilitation programs (including exercise, education, support, behavioural change and review) induce a wide range of benefits if continued over several months or extending out to a few years[14–16,91,209]. These trials indicate the desirability of continued support, as required or on a regular basis, until the changed behaviours have become part of the patient's lifetime pattern. Such trials have demonstrated major benefits

through improvement in risk factors, fewer recurrent episodes, fewer readmissions to hospital, fewer myocardial infarctions and fewer deaths. Further, one trial has demonstrated, through multifactorial programs of this type on a continuing basis, slowing or reversal of coronary artery lesions[15]. While another trial of a comprehensive program successfully demonstrating lesion reversal, the intervention was extremely time consuming and costly and required considerable dedication of both patients and staff[144]. It is therefore unlikely that such an intervention would be acceptable to many patients. More trials are required to define the ingredients and duration of effective programs to encourage maintenance of regular physical activity.

One longer term study has shown that, in a multifactorial rehabilitation program, increased physical activity up to a total caloric utilisation of 1500 kilocalories (during training and leisure time) results in slowing of lesion progression, while physical activity at a level of 2200 kilocalories per week leads to reversal of lesions[105]. This raises the possibility that the more leisure time physical activity undertaken by patients, the better. This suggestion is similar to that which has been recommended by some, based upon epidemiological and observational studies in normal subjects[210,211] but which is not supported by others[212–214], who appear to have demonstrated that most of the benefits of physical activity are achievable by moderate levels of exercise and fitness.

It is possible to achieve a level of 2200 kilocalories per week through moderate intensity exercise such as walking, with awareness of increased breathing, for a period of one hour each day of the week, either singly or in broken periods. Further, it may not be necessary that the physical activity be evenly divided throughout the week. Additional research is required in this area. However, it is important to recognise that the majority of middle aged or older people are not prepared to exercise regularly at a higher level[188–191].

A further issue is whether exercise training will raise HDL cholesterol as an additional protective factor in lipid profiles. There is little evidence for this but one study showed that regular moderate daily activity extending over many months led to a gradual increase in HDL cholesterol[170].

Eligibility for exercise programs

Recommendation

Group cardiac rehabilitation, including exercise, should be offered to all patients with cardiovascular disease (with the proviso that some may be incapable of participation in group activity and should be offered individual assistance). Cardiovascular disease includes special groups of patients described in Chapter 11.

Strength of evidence = 1

Until recently, it was recommended that high risk patients should not be enrolled in exercise training programs (based upon moderate to high intensity exercise). Several trials and observational studies have now shown, however, that low levels of exercise lead to improvement in physical functioning and quality of life. This applies to patients with impaired ventricular function, with controlled cardiac failure and with symptomatic or asymptomatic residual ischaemia[1,2,215–217].

According to one report, patients with heart failure awaiting transplantation who followed a program of low intensity exercise were removed from the transplantation waiting list because they achieved improvement in their physical functioning[218]. It has been demonstrated that improvement in physical functioning usually occurs without any demonstrable improvement in cardiac function; that is, there is no significant change in ejection fraction or wall movement abnormalities. The improvement lies in peripheral muscle efficiency with greater extraction of oxygen, increased peripheral muscle strength and improved muscular efficiency, so that patients may function at the same level of physical activity, but with lesser cardiac work (lower systolic pressure, lower heart rate, lower rate/pressure product)[219–225].

Thus, it has now been confirmed that patients who were previously excluded from programs can be enrolled and do improve with graded low intensity exercise, with slow progression. Therefore, there should be few exclusions on physical grounds from cardiac rehabilitation programs. Physical problems are no longer a barrier to participation. However, those who require significant attention may be better supported and encouraged on an individual basis rather than in a group.

Exclusion from exercise training

A sizeable list of exclusions from exercise training in cardiac patients has been prepared by the American College of Sports Medicine 5th Edition (1995)[71]. Most of these exclusions are reasonable for high intensity exercise and many apply to low intensity exercise.

One exclusion, apparently fit and healthy patients, is meant to indicate that some require no exercise training. However, such patients could well obtain other benefits from undergoing exercise training, including reassurance, psychological support, reinforcement of the need for behaviour change and adherence to regimens, additional education and better understanding of the illness.

Another exclusion from exercise training (unstable angina) is reasonable for high intensity exercise. However, such patients may achieve considerable benefits from light exercise and from education and support.

A third exclusion (no recent exercise test) would apply to those patients who are to be enrolled in a high intensity exercise program, and who, on clinical assessment, are at high risk and for whom a training heart rate prescription has not yet been prepared.

All of the other exclusions are serious conditions requiring attention before exercise is commenced. These are:

- Significant hypertension or hypotension
- Severe aortic stenosis
- Uncontrolled arrhythmias
- Uncontrolled congestive heart failure
- Uncontrolled diabetes or metabolic disturbance
- High grade atrioventricular block without a pacemaker
- Current pericarditis or myocarditis
- Recent pulmonary or other embolism
- Recent stroke or transient ischaemic attack
- Recent major surgery
- Terminal illness or severe disabling concurrent illness
- Acute febrile or systemic illness
- Physical or psychological disability preventing participation

An additional reason for exclusion is physician or patient refusal.

CHAPTER 9
RISK STRATIFICATION

The concept of risk stratification in cardiac rehabilitation is related to the possible hazards of exercise in cardiac rehabilitation programs. Risk stratification as a guide to level of exercise becomes relatively unimportant if the exercise training component of the cardiac rehabilitation program is conducted at low or moderate intensity.

High risk groups

It is recognised that during high intensity exercise there is an increased chance of sudden death through ventricular fibrillation[226] and possibly myocardial infarction[227]. However, available evidence shows that overall, those who are active are less likely to die than those who are physically inactive[210–214]. Thus, it is desirable that patients should be active and that they should acquire some fitness[228], but without exercising at a level at which ventricular fibrillation could occur[226]. Risk of ventricular fibrillation is greatest in those who have significantly impaired left ventricular function, namely, those who have had large myocardial infarction, past multiple myocardial infarctions or impairment of ventricular function from other causes. These other causes include valvular heart disease, cardiomyopathy, myocarditis and hypertension.

Recommendation

Clinical risk stratification based upon history, examination and resting electrocardiogram is usually sufficient. Technological investigation of patients should be limited to specific tests to answer specific clinical questions applicable to individuals.

Strength of evidence = 3

If a patient is to be enrolled in a high intensity exercise program, then risk stratification is necessary[74,130]. High intensity exercise may be regarded as exercise at a level which is greater than 75% of the maximal heart rate (HR max) which the patient can achieve either on a treadmill or a cycle ergometer. HR max is variable between patients. As death is a possible outcome from high intensity exercise, calculation of maximal heart rate from tables related to age and sex is not adequate. Further, it could be misleading and dangerous. Thus, a symptom limited maximal exercise stress test is

required from which to calculate the target training heart rate. These issues are discussed in Chapter 8.

While poor ventricular function is the major marker of risk of death[229–232], there are other markers, including myocardial ischaemia and the occurrence of arrhythmias[233]. Myocardial ischaemia may be demonstrated by the production of angina during a stress test or may be inferred from the degree of ST segment depression which occurs during a stress test even in the absence of pain (so-called silent ischaemia). The possible production of arrhythmias, particularly ventricular tachycardia (which could be subsequently associated with ventricular fibrillation), may also be provoked by a stress test[234]. A 24 hour ambulatory electrocardiogram may also reveal arrhythmias or reveal ST-T wave abnormality, indicating a tendency to arrhythmia or ischaemia[235,236]. It appears, however, that induction of arrhythmia during a stress test, when it occurs as a single phenomenon, does not herald the likelihood of fatal ventricular fibrillation[237]. It further appears that angina or ST-T wave abnormality during a stress test does not herald risk of death[230,238,239]. It heralds angina during exertion of normal daily activity or of exceptional activity and, in consequence, foreshadows likely coronary angiography and coronary revascularisation[240].

Technological assessment of risk

The major value of a treadmill test in assessing risk is to determine the level of physical activity which the patient can accomplish before cessation of the test. The greatest risk is to those who are considered clinically unfit to undergo the test[241]. The next level of risk is those who perform poorly on the test. Those who perform well on the test can be considered as having tolerable or good left ventricular function and therefore are of relatively low risk during high intensity exercise.

Technological risk assessment was developed in the 1980s as investigative technology progressively improved. Some still recommend that patients entering an exercise rehabilitation program should undergo investigations including a symptom limited maximal exercise test and an assessment of the left ventricular ejection fraction, both for risk assessment within the program and for overall prognostication[242]. The ejection fraction could be determined from radionuclide left ventriculography, from two dimensional echocardiography or from angiographic left ventriculography, depending on circumstances . However, ejection fraction and exercise capacity need not correlate well in individual patients. Ambulatory Holter monitoring has recently been considered of doubtful additional prognostic value[243–246].

Clinical assessment of risk

Prior to the development of the technologies, clinical correlates of risk were well recognised, including clinical evidence of past heart failure complicating myocardial infarction or occurring at other times, shortness of breath and fatigue on exertion, the

reporting of chest tightness or angina and the recognition of clinical arrhythmias. The site and size of infarction were indicated by both clinical measures and standard electrocardiography[238,247,248]. Abnormalities in the resting electrocardiogram are regarded as a marker of significant myocardial damage. The age of the patient was incorporated into the assessment. Weighted indices were developed which accurately reflected prognosis based upon clinical observation[249–253].

In the 1990s it is accepted that clinical recognition of heart failure is a powerful marker of prognosis, more powerful than the ejection fraction[231,232]. Recent studies have also demonstrated that while the resting electrocardiogram is a good indicator of mortality, stress test ischaemia is not a good indicator of mortality[238–240]. It is an indicator of the possible need for revascularisation.

Conclusions

It is possible for risk stratification to be undertaken by clinical means and this has now been recommended by some bodies[1,238]. It is of some importance to the physician and cardiologist to make an assessment of prognosis. Such assessment can be made on clinical grounds, although technological testing may well be required in specific instances to answer specific questions regarding a particular patient. If a low or moderate intensity exercise program is undertaken rather than a high intensity exercise program, technological risk stratification is not required. Determining the clinical state of the patient in terms of presence or absence of angina, the presence or absence of shortness of breath, the recent presence or absence of heart failure and other clinical indicators of the size of infarction or impairment of ventricular function is sufficient[1,238,248,250,254]. This pattern of risk stratification removes much of the cost applicable to technological investigation without any apparent increase in hazard for the patients. It does, however, necessitate adequate clinical training and retention of clinical skills, which may be deteriorating, as costly testing supplants clinical judgement[255].

A stress test and/or echocardiogram may be undertaken to assess residual ischaemia or ventricular function in individual patients. This is a clinical decision. Such tests are not a necessary part of cardiac rehabilitation. However, if these tests have been performed, it is desirable to forward the results to the cardiac rehabilitation program co-ordinator. In patients who have had myocardial infarction or who have been admitted to hospital with unstable angina, it is now common to perform coronary arteriography with a view to possible early revascularisation. Informing the cardiac rehabilitation co-ordinator of the results of angiography is also desirable, together with a statement regarding whether revascularisation for that patient is planned or is under consideration. Observation of the patient in the cardiac rehabilitation program could prove of value to the cardiologist in reaching a decision. The occurrence of chest pain or of breathlessness during exercise and the level of activity to produce the symptom can be of considerable clinical value.

CHAPTER 10
CONDUCTING EXERCISE PROGRAMS

Many thousands of patients have passed through low to moderate intensity exercise programs in Australia without mishap. The adequacy and safety of such low cost, low equipment programs is accepted in Australia, New Zealand and the United Kingdom[1,5,39,40,41,49,79]. These types of program are recommended by the WHO Expert Advisory Committee for both basic and intermediate cardiac rehabilitation facilities[1]. High intensity exercise training programs are thought best limited to centres where research and development in exercise physiology is being undertaken. Chapter 8 presents evidence which shows a similarity in outcomes from low and high intensity exercise programs. Recommendations in this chapter are based upon observed outcomes from low to moderate intensity exercise programs, giving strength of evidence ratings = 4.

Site of exercise program

Recommendation

Cardiac rehabilitation exercise programs should be established in all sizeable hospitals treating cardiac patients. In addition to these early ambulatory outpatient-based programs, cardiac rehabilitation programs should be established in other appropriate facilities to facilitate patient access.

Strength of evidence = 4

To date, most cardiac rehabilitation exercise programs have been developed in the outpatient areas of hospitals. Referral to such programs should be organised prior to the patient's discharge from hospital. Monitoring of attendance and follow-up should be readily achieved. A further advantage of hospital-based programs is the potential for continued support from the health professionals involved in both inpatient care and ambulatory rehabilitation, with a heightened sense of security for both staff and patients.

A potential disadvantage is the possibility of patients considering that they need to be closely linked to the hospital upon which some may develop a sense of dependence.

Another disadvantage is the centralisation of services at the hospital, with consequent problems for patient attendance, transport and distance. Thus, there is a good case for programs being sited in community centres. This latter case becomes more feasible if the intensity of exercise is at a low to moderate level.

The ideal appears to be the establishment and maintenance of programs inn both hospitals and community centres. This approach has authoritative support[1] and is rapidly being developed in Australia, particularly in Victoria[5,40,41].

Safety protocols

Recommendation

A written emergency protocol is required for all programs, together with ready access to a telephone to summon assistance. Staff require current training in cardiopulmonary rescusitation .

Strength of evidence = 4

With low intensity exercise training programs, risk of a cardiac event is very small. However, it is essential that staff have current training in cardiopulmonary resuscitation. A written emergency protocol is required, together with a telephone accessible to staff to generate assistance if required. Access to medical and pharmaceutical support is dependent upon the availability of either an ambulance or a medical practitioner.

A simple manually controlled ventilator and plastic airways are desirable. Nitroglycerin should be available for patients who may develop chest pain and it is desirable to have oral diuretic (frusemide) on site for patients with heart failure. However, the administration of a diuretic should only be after medical advice. Staff require knowledge of the indications for and use of nitrates for patients with angina and of diuretics for heart failure.

Additional equipment and training are mandatory for high intensity exercise programs. The equipment includes a resuscitation trolley and a defibrillator, which must be regularly maintained and checked. Staff require training in the use of the defibrillator and the contents of the rescusitation trolley. Monitoring may be by heart rate, intermittent rhythm strips by electrocardiography or use of the defibrillator panels. This applies particularly to those assessed as being at high risk. Telemetered electrocardiography may be required for monitoring of the occasional patient who is thought to be subject to serious arrhythmias.

Equipment

Recommendation

Low to moderate intensity exercise training can be undertaken using little equipment and at low cost.

Strength of evidence = 4

It is possible to conduct cardiac rehabilitation exercise programs with little equipment and maintain the principles of best practice at low cost. The decision regarding equipment is partly secondary to the decision regarding the level of exercise training. For low to moderate level exercise, it is necessary to have a stethoscope and sphygmomanometer.

Exercise equipment may be limited to simple items such as buckets, bricks, boxes, baskets, cases or weights. A set of steps to accommodate several patients, or sets of steps to be used by individual patients, can be useful. Treadmills for walking are expensive and unnecessary. Stationary cycles with air or mechanical resistance occupy relatively little space and are not expensive. An indoor walking area is desirable, but outdoor walking, if feasible, may be preferred.

High intensity exercise may be undertaken using similar equipment, but additional safety equipment is required, as noted above.

Content of exercise classes

Recommendation

Low to moderate intensity exercise training is recommended for most patients, with a short warm up, that is, calisthenics and stretching exercise segments. These are followed by either a walking program and/or a light training circuit with rests between. A cool down and rest segment should complete the sessions. Limited patient monitoring by observation, perceived exertion or heart rate is maintained throughout the exercise.

Strength of evidence = 4

Low to moderate intensity exercise may be undertaken without the warm up and cool down periods required for high intensity exercise. However, it is generally desirable, particularly with older, obese or unfit patients who may have reduced flexibility, to start with a warm up period of light calisthenics and stretching of major muscle groups. Stretching may be largely limited to the legs and spine if the activity program is based upon walking, use of steps or stationary cycling. Patients after sternotomy

should include upper body flexibility exercise as a part of their warm-up. It is desirable to take patients through a series of activities before starting dynamic exercise or strength training exercise, particularly if using the arms with cranking, pushing, pulling or lifting.

The program may be largely based upon walking, which may be maintained for 20 to 30 minutes. A circuit of different activities may also be performed at levels short of breathlessness, with monitoring of perceived exertion and/or heart rate after each station where activities may be maintained for up to five minutes at a level acceptable to the patient. Patients should be observed and should also be requested to report any symptoms or difficulties in performance of individual exercises.

Blood pressure should be checked during pauses between exercise in new patients to note possible fall of blood pressure during activity. Blood pressure should also be checked in those patients known to have, or who are found in the class to have, elevated blood pressure. If significant variation of blood pressure is noted, exertion should cease until medical clearance is obtained.

A record of the exercise intensity, duration, heart rate or perceived exertion should be charted for each patient at each attendance. Any problems encountered by patients or staff related to symptoms, abnormal blood pressure or heart rate should be reported to the patient's doctor.

A cool down period with gradually lessening levels of activity, followed by a period of rest, relaxation and breathing exercises, is commonly practised and appreciated by patients.

The total duration of a low to moderate intensity exercise training session should be between 45 to 60 minutes, including rests between activities. For high intensity exercise, usually continuous, the exercise time is usually 20–30 minutes.

Staffing

Recommendation

Exercise training sessions should be conducted by suitably trained health professionals.

Strength of evidence = 4

While education groups may be conducted by a multidisciplinary team of health professionals, exercise classes are best conducted by physiotherapists, exercise physiologists or appropriately trained nurses, occupational therapists or other health professionals. In Victoria, most exercise programs are conducted by nurses and physiotherapists, with the exercise program usually designed by a physiotherapist[5].

Low to moderate intensity exercise programs may be conducted by a single health professional, provided there is another health professional available as back up and provided patients have no medical contraindications to exercise. Such programs are suitable for small communities with a small number of patients. This represents a "basic facility"[1]. The key to such programs is adequate staff training and the development of a support network for the health professional involved. Such supports are most readily available through a community health centre or local hospital.

Staff to patient ratio

Recommendation

The recommended staff to patient ratio is one staff member to 10 patients. As it is desirable to have two health professionals in each exercise session, classes should contain no more than 20 patients per class.

Strength of evidence = 4

The exercise class is usually conducted by two persons who, together, can supervise the activities of up to 20 patients. In addition, about 10 family members commonly attend to observe the class.

While it is desirable to conduct a program for all patients twice weekly (or once weekly), the numbers of patients may be sufficiently large to dictate the need for a second parallel program. This is preferred to having more than 20 patients in a single group and to having a "waiting list" for entry into the program.

Exercise testing before exercise training

Recommendation

An exercise test is not necessary before entry to a low to moderate intensity exercise program. High intensity exercise training necessitates a prior symptom-limited maximal exercise test.

Strength of evidence = 4

In Australia, where the preferred model program of low to moderate intensity exercise training is the norm, a prior exercise test is not performed nor is it needed. In the few programs where high intensity exercise is offered, a symptom limited treadmill or cycle ergometer test is required to determine the training heart rate[74,130] and for risk stratification (see Chapter 9).

Exercise stress testing and other investigations which may reflect prognosis can also reflect the safety of high intensity exercise for an individual patient. However, these tests contribute little to risk stratification not already obtained by simple clinical measures. Such testing may be of value in medical decision making, but is not a pre-requisite for entry into a cardiac rehabilitation program with low to moderate intensity exercise training.

Patient assessment before entry to the program

Recommendation

Before entering the exercise program, each patient should have an assessment of physical and psychological status and of the patient's perceived needs for the rehabilitation program. It is desirable for the patient's spouse to attend the entry assessment.

Strength of evidence = 4

Before patients are enrolled into the program, an interview and assessment are required, either individually or together with another family member (usually the spouse). Approximately 30 minutes are required for assessment of each patient. This enrolment interview can be undertaken by either or both of the health professionals conducting the exercise class. Entry assessment is best supported by a referral note from the patient's medical practitioner, preferably with relevant clinical information. Alternatively, a hospital record should be sought to provide inhospital data including diagnosis, symptoms, medications, advised restrictions and perceived patient difficulties. The entry assessment should address the patient's specific goals regarding resumption of work and activities of daily living, since these may influence the duration and pace of the exercise training. It should also clarify needs for specific muscle strengthening related to work, social or leisure activities. Entry assessment is further discussed in Chapter 17.

Time of starting the exercise program

Recommendation

The optimal time for the patient to begin the ambulatory exercise program is within a week of discharge from hospital.

Strength of evidence = 4

Patients may enter at any point in the program. However, it is desirable for patients attending an ambulatory program to start the exercise and education program as soon as possible after leaving hospital. Ideally, this should be within four to seven days unless ongoing physical symptoms preclude early attendance. The reason for early attendance is to reduce the patient's and family's insecurity and possible depression following the acute event. It is also to start physical reconditioning as soon as possible. Many patients and spouses remain fearful of activity until its safety is demonstrated by participation in a supervised exercise class.

Monitoring during exercise sessions

Recommendation

With low to moderate intensity exercise training, it is recommended that monitoring is by one or more of the following:

- patients' symptoms
- observation of patient's responses
- patient's rate of perceived exertion
- observer measured heart rate
- patient measured heart rate

Strength of evidence = 4

Patient monitoring in programs of high intensity exercise commonly includes at least occasional or intermittent electrocardiographic strips or telemetry. However, because most cardiac rehabilitation programs in Australia offer low to moderate intensity exercise training, it is unnecessary to undertake electrocardiographic monitoring, whether continuously by telemetry or intermittently by use of ECG rhythm strips. Patients are encouraged to be active in the group to a level where they are just aware of breathing (low intensity exercise) or aware of some breathlessness, without sweating (moderate intensity exercise). Patients are observed during group exercise to assure that they do not exceed these limits. They are also warned to cease activity and to advise staff, should unsteadiness, fatigue, muscle strain, significant breathlessness, chest pain or other symptoms develop.

Observation of each patient by the staff and the patient's own perception of the rate of exertion may be coupled with intermittent brief counting of heart rate. In many group programs, this is done by the exercise class leader. In some programs patients are trained to measure the heart rate themselves. There is no evidence as to which is the preferred method of heart rate monitoring. Some patients like to follow their own heart rate. Others prefer to have closer contact with the class leader when the leader palpates the patient's pulse. In low intensity exercise programs, most patients require only occasional heart rate monitoring. Even with moderate to high intensity exercise training, monitoring may not be required for up to 60% of patients (the so called "low risk" patients), with good performance and no abnormality on a maximal symptom limited exercise test performed prior to enrolment in the exercise group[2].

Exercise testing after exercise training

Recommendation

An exercise test (treadmill, cycle ergometer, steps, six or 12 minutes timed walking test) is valuable towards the end of an ambulatory rehabilitation program. The test will demonstrate the level of recovery, fitness and physical capacity to resume work and will usually reassure the patient, family, medical practitioner and, if necessary, employer.

Strength of evidence = 4

A symptom limited exercise test after several weeks in an exercise training program or on completion of the program is valuable as a part of comprehensive patient assessment[39]. It is best coupled with a detailed medical review. This review of the patient's recovery and risk factor status should be undertaken by the patient's physician, cardiologist or other medical officer. Regimens should be clarified and reinforced. Any concerns of the patient should be discussed. An exercise test at this time may reveal impaired physical performance, with shortness of breath and fatigue at a lower than expected exercise workload. It may also possibly indicate residual ischaemia, with development of angina or ST segment change in the ECG. These changes may lead to modification of management. The performance on the treadmill is reassuring for most patients, because performance is commonly greater than expected by the patient and spouse. As the intended test is maximal and symptom limited, the remote chance of cardiac arrest must be recognised; therefore, due safety precautions must be observed[33,74].

Many patients may have already demonstrated significant recovery of fitness and their physical status will be quite clear to both physician and patient without an exercise test. Thus, exercise testing at this stage remains optional. It may be limited to a small proportion of patients to clarify a specific clinical question.

High intensity exercise training

Recommendation

Patients with physically demanding work or leisure time activity may achieve added benefit from high intensity exercise.

Strength of evidence = 4

Some patients seek rapid recovery of high levels of physical functioning. This usually involves a prior symptom limited maximal stress test before entry to the program to determine a training heart rate of 70–85% of HR max, close monitoring of heart rate, consideration of clothing, temperature and of safety protocols and equipment (see other sections of this chapter and also Chapter 8). Further study is required to determine whether selected patients could attend a separate session of high intensity exercise training within a program based on low to moderate exercise or whether a centralised high intensity exercise program should be available to which selected patients may be referred.

CHAPTER 11
EXERCISE PROGRAMS FOR SPECIFIC GROUPS

Patients with heart failure and transplantation

Recommendation

All patients with heart failure should be enrolled in an exercise program as a part of comprehensive rehabilitation, including before and after transplantation.

Strength of evidence = 1

Traditional past management of patients with heart failure included a period of bed rest, which was sometimes prolonged. This led to rapid deconditioning, with muscular wasting, dependency and institutionalisation and probably contributed to early death. It is now recognised that definite benefits can be achieved through early mobilisation and early exercise, both passive and active, which is gradually progressive. Dynamic exercise such as walking and using the arms is recommended to maintain activities of daily living, as well as resistive training to increase muscular strength. Such an exercise program should be gradually introduced and may start in hospital or at any point in the patient's illness. It should lead to significant improvement in physical functioning and increased maximal oxygen uptake[102,106,219–221,225,256,257]. These physiological and functional improvements are coupled with increase in muscle bulk and histological and chemical changes, demonstrable in the skeletal muscle[222–224,258].

Randomised controlled trials, all showing similar benefit, have been accompanied by multiple observational studies. Preliminary findings of meta-analysis of seven published randomised clinical controlled trials of exercise compared with usual care in patients with congestive heart failure have demonstrated a mean 18% increase in physical working capacity[259]. The available evidence significantly strengthens the view that exercise training of low intensity, tailored to each patient's capacity, has a clear benefit with a very low risk. As mentioned in Chapter 10, 31 out of 38 patients on a transplantation waiting list in one study were removed from that waiting list following improved functional capacity, through gentle progressive exercise training[218].

There is no clear demonstrated central effect of exercise on the apparent function of the heart and lungs. The benefits have been demonstrated to be in skeletal muscle function. However, two studies failed to show improvement in a subset of highly disabled patients, with the suggestion that severe cardiac dysfunction may prevent peripheral muscle conditioning[260–261].

Patients with heart failure still have a serious and potentially "malignant" disease and view their future with continued concern. One recent study showed that patients with heart failure have significantly greater levels of depression compared with patients who have had an acute myocardial infarction or who have undergone coronary artery bypass surgery[262]. However, even small increases in exercise capacity have been associated with improvements in well-being and satisfaction with daily life[263,264].

The same principles which apply to patients with heart failure are used in the preparation of patients for transplantation. There is observational evidence that similar benefits from exercise training are achieved by patients who have undergone cardiac trans-plantation[265–270].

Patients with pacemakers and implantable cardioverter defibrillators

Recommendation

Patients with pacemakers and implantable cardioverter defibrillators (ICDs) should be enrolled in a comprehensive program including low to moderate intensity exercise programs.

Strength of evidence = 4

Patients with implanted pacemakers or ICDs are often insecure about the safety of exercise. Depending upon the characteristics of the implanted pacemaker, there may be no increase in heart rate or only a small increase in heart rate with increasing levels of activity. Hence, heart rate may not be a suitable guide for control of exercise levels. In these patients, the rate of perceived exertion (Borg 10 to 12, light exertion; Borg 12 to 14[195], somewhat hard exertion) may be followed (see Table 6). As most patients with implanted pacemakers are elderly and as many patients with ICDs have heart failure or impaired left ventricular function, the lower level of perceived exertion and progress in small increments is usually preferred.

Patients with other forms of heart disease

Recommendation

All patients with heart disease or vascular disease are suitable for enrolment in programs of exercise, education, counselling and behavioural intervention.

Strength of evidence = 4

Patient with other forms of disease include those with cardiomyopathy, those who have had past surgery for congenital heart disease, those with non-surgical and post-surgical rheumatic heart disease and patients with cerebral or peripheral vascular disease. While these groups have not been adequately studied, there is little doubt that they can achieve the same skeletal muscle benefits of exercise training as those with manifestations of coronary heart disease[1]. The educational needs of these groups are discussed in Chapter 15.

Obese patients and diabetic patients

Recommendation

A cardiac rehabilitation program, with exercise, dietary education and behavioural interventions, is effective and essential for all patients with cardiovascular disease who are overweight or obese. These patients may include those with type 2 diabetes.

Strength of evidence = 3

Interventions involving exercise alone or education alone have been reported to be relatively ineffective in achieving and maintaining weight reduction in patients with cardiovascular disease who are significantly overweight or obese, including patients with adult onset (Type II) diabetes. Achievement of mean weight loss has been reported in some randomised trials and not in others (see Chapter 7). Such trials present several difficulties. Most have been trials involving moderate or high intensity exercise, which is generally unacceptable to obese patients. Education and counselling alone may result in some subjects losing weight, but not the majority of patients. Some patients who cease smoking increase in weight. This may obscure the successful weight loss of other patients so that no significant reduction is shown in the mean weight of patients in the intervention group.

Obese patients need careful counselling, understanding and enhancement of self esteem. Limited goals which may change over time should be set for these patients. The usual short-term ambulatory program for cardiac patients is insufficient in duration and intensity to achieve significant weight loss. Longer term, multifactorial

interventions with continued participation in a light to moderate exercise program, together with education and support for behaviour change, have been demonstrated to be effective in some studies[271,272]. Successful weight loss is critically important for the overweight, diabetic patient at high risk of developing cardiovascular disease. Reduction of weight is further discussed in Chapters 12 and 13.

Unfit patients

Recommendation

Exercise training as part of a comprehensive rehabilitation program is indicated for all patients with cardiovascular disease who have become physically deconditioned or who are otherwise unfit.

Strength of evidence = 1

Physical decondition occurs rapidly in many patients where bed rest or limited mobility are enforced through illness. This period of rest may be enforced because of complications following myocardial infarction or coronary bypass surgery, an episode of congestive heart failure or other manifestations of cardiovascular disease. Weakness and unfitness become apparent after a few days of inactivity. They may be recognised by overt muscular weakness, fatigue, unsteadiness or breathlessness with effort. Levels of fitness may be assessed more objectively by exercise stress testing with treadmill, cycle-ergometer, step test, or a six or 12 minute walk test. Performance may be compared to norms from nomograms. It must be recognised, however, that this same measure of unfitness is also a measure of cardiac function which interacts with the muscular deconditioning to determine test performance.

Spontaneous recovery of fitness occurs during the ensuing few weeks following myocardial infarction or coronary bypass surgery through resumption of normal activities of daily living. The recovery may be accelerated and facilitated by graded supervised exercises, starting from a low level, during inpatient mobilisation and continued through convalescence.

For most patients, irrespective of the patient's age or gender, a low level activity program with gradually increasing levels is indicated, within the limits of shortness of breath and fatigue. Patients who are habitually inactive and who are unfit in consequence commonly have reduced muscle mass as well. Slow reconditioning with graded activity leads to progressive increase in fitness in these patients who may be regarded as similar to any other cardiac patient.

Such unfit and deconditioned patients have been included in randomised controlled trials comparing the effects upon exercise performance of exercise training and standard medical care. They are those patients who have lower levels of exercise

tolerance reported on entry to the studies. Patients with relatively reduced functional capacity demonstrated by exercise testing at entry improve in a degree similar to those with higher functional capacity at entry[42–46,101–129,225,257].

Elderly patients

Recommendation

Exercise, as a part of comprehensive cardiac rehabilitation, is indicated for all elderly persons with any form of cardiovascular disease.

Strength of evidence = 2

The benefits of group exercise in elderly patients, both men and women, have been demonstrated in randomised trials and observational studies[273–275]. Older patients have a special need for a cardiac rehabilitation program. They are more likely to have symptoms such as dyspnoea, fatigue or angina. Co-morbidity, especially from arthritis and respiratory disease, is common. Physical strength is less in older patients because of progressive muscle loss with ageing. There is a reduced ability to increase cardiac output, because of a lesser capacity to increase heart rate and stroke volume. There may also be impairment of balance and judgment. Elderly patients are aware of their relative and increasing incapacity to accomplish physical tasks with speed, strength and accuracy. They are also aware of the risks of injury. It has been reported that attempts to induce high levels of exercise (the past traditional 20 to 30 minutes of exercise at greater than 70% of HR max, three times per week) lead to musculo-skeletal injury in the majority of older patients[202,203]. To offer such patients a high intensity exercise program is unwise. This pattern of cardiac rehabilitation exercise may be one reason for nonattendance and early dropout from programs among older patients. Common sense is supported by evidence showing that high intensity exercise is practised by less than 10% of healthy persons over 60 years of age. Moreover, less than 3% are prepared to undertake such activity on a regular basis[188–190].

Cardiac rehabilitation programs for elderly patients need be little different from those offered to younger patients. A program based upon group light exercise and home walking is recommended. Individual patients can set their own pace or be encouraged to increase their level of activity gradually within the group. However, the program should include circuit exercises particularly directed towards retention of muscle strength in the arms for the execution of activities of daily living. High impact activities should be avoided. Daily walking from or at home for a minimum of 30 minutes, either in a single segment or intermittent segments, is the ideal basis for general conditioning and mobility. This is consistent with recent authoritative recommendations of the Centre for Disease Control and Prevention and American

College of Sports Medicine[191] for all Americans and is also applicable to all adults in all communities.

Past studies have shown that older patients, especially older women[276], are significantly less likely to attend cardiac rehabilitation programs than younger patients[277]. However, increasing numbers of patients aged over 65 years of age are now being enrolled in programs, including many in their 70's and some in their 80's. As well as achieving improvements in functional capacity[276], older men and women can also achieve considerable psychosocial and educational benefits from all components of a rehabilitation program. Since many or most older patients are retired, they can usually attend programs over a longer period than younger patients who have work or domestic commitments. However, transport is more likely to be a problem for the elderly and it is therefore desirable to have the cardiac rehabilitation program close to home.

Continued access to group exercise programs is desirable for older patients. This could best be achieved through community exercise and support programs. The integration of cardiac rehabilitation programs into community health centres or other local community activities is therefore recommended. Maintenance of capacity for self care, self respect and independence is critically important for the elderly and their families. It is also important to those responsible for health care planning. The ageing of the population presents an expanding reservoir of patients with cardiovascular disease, ultimately with congestive heart failure (whether controlled or uncontrolled). Physical independence and capacity for self care outside hospitals and nursing homes offer great potential to control health care costs.

Female patients

Recommendation

All women with cardiovascular disease should be referred to a comprehensive cardiac rehabilitation program including exercise training.

Strength of evidence = 2

Most studies in cardiac rehabilitation have been undertaken in middle-aged men. Outcomes in women have not been extensively investigated. However, clinical data indicate that the problems facing women with cardiovascular disease are considerable. In general, women have been shown to have more adverse outcomes than men following an acute cardiac event, including greater morbidity and mortality during the first year of[278,279]. The older age of women at the onset of their first acute cardiac event is coupled with greater degrees of co-morbidity, including osteoporosis and arthritis[280–282]. Nevertheless, improvements in functional capacity and psychological wellbeing amongst women enrolled in cardiac rehabilitation programs

are equivalent to those demonstrated in men, although they have been less well reported[276,283]. Women who do not attend programs have been found to report fewer lifestyle changes and to be less successful in controlling stress[284].

Studies investigating the relationship between gender and attendance at cardiac rehabilitation programs generally report that women are less likely to attend[54,55,276,285,286], and are more likely to drop out from programs early[287]. As previously stated, most women with cardiovascular disease are older than men and hence are usually less mobile. Further, they are more likely to have less access to transport[276,288] and to be widowed. If widowed, they may be more socially isolated and unwilling to seek help with transport. Thus, older women who are socially isolated are more likely to be nonattenders. Gender differences may be less apparent for younger women and women who have adequate social support[289].

However, other motivational and psychosocial factors may also inhibit women from attending programs. As pointed out in Chapter 3, cardiac rehabilitation programs were originally devised for working men. Studies suggest that cardiac rehabilitation needs and preferences of women differ from those of men[280,290]. Currently available programs are unsuitable in many ways for women, especially older women and those from different ethnic backgrounds. Older women dislike higher levels of exercise and hence exercise programs of low to moderate intensity suit them better[290]. Further, one study suggests that women want a range of exercise choices at the program and prefer to participate in goal setting for themselves[290]. In that study, it was also found that women desired more encouragement from team members, more frequent discussion of their progress, more social interaction and more emotional support from staff[290].

Unfortunately, few studies have addressed the rehabilitation needs of women[171,290–292]. Major studies are now in progress to study attendance patterns and attitudes of female patients towards rehabilitation[52,53]. A careful review of programs, especially of the exercise component, is recommended to determine their suitability for women.

Comment

It must not be overlooked that the secondary ("quality of life") benefits of exercise in these special groups of patients may be greatly facilitated by the better understanding and support obtained through the comprehensive nature of the rehabilitation program. While there are special problems associated with specific groups of patients with various forms of heart disease, it is apparent that all can obtain benefits from exercise training. For each of the above special groups, low levels of exercise training are preferred for the reasons given. These reasons, however, also apply to the great majority of patients with cardiovascular disease. There remain a few who prefer to exercise at high levels to achieve high levels of fitness for occupational, sporting or other purposes. High intensity exercise is addressed briefly in Chapter 10. Additional information is available elsewhere[31,69,71,194].

CHAPTER 12
EDUCATION, COUNSELLING AND BEHAVIOURAL INTERVENTIONS

Exercise training has traditionally been the primary focus of cardiac rehabilitation in the USA. However, in Australia, education and counselling have been considered as important as exercise training in facilitating recovery from acute cardiac events and for secondary prevention of cardiovascular disease. Exercise training, education and counselling are now universally recognised as integral components of comprehensive cardiac rehabilitation. More recently, interventions specifically designed to modify behaviours of cardiac patients have been introduced and tested. We embrace the definitions of the Clinical Practice Guideline which states that education is systematic instruction and counselling is the provision of advice, support and consultation. Behavioural interventions consist of systematic instruction in techniques to modify health related behaviours.

To facilitate a return to normal living, patients require guidelines about resuming driving, sexual activity, work and other activities. Information and advice about lifestyle change are necessary for secondary prevention of cardiovascular disease. Motivation to adhere to advice and prescribed medication is strongly influenced by patients' understanding of the disease, the acute event and the need for risk factor modification. Further, discussion and explanation about the recovery process and anticipation of possible psychological problems facilitate psychosocial adaptation.

Education and counselling of inpatients is undertaken on an individual basis and, at some hospitals, in groups as well[5,40,41]. However, because of shortened hospital stays, inpatient education is now less comprehensive than in the past[293]. Education is addressed in greater detail during ambulatory cardiac rehabilitation programs. Most ambulatory group programs in Australia, and all in Victoria, include education groups[5,41].

Behavioural and psychosocial counselling may be delivered effectively in group settings. However, specific instruction regarding behaviour change should also be offered on an individual basis so that interventions can be tailored to the specific needs of each patient. Similarly, individual psychosocial counselling may be required for some patients.

While there is a vast amount of literature demonstrating benefit from exercise training in cardiac rehabilitation, evidence from controlled trials to confirm the effectiveness of education, counselling and behavioural interventions is less conclusive. However, some well designed controlled studies, observational studies, expert opinion and patient perceptions confirm the benefits of providing education, counselling and behavioural interventions as essential ingredients of comprehensive cardiac rehabilitation programs. This chapter discusses the available evidence concerning the impact of education, counselling and behavioural interventions upon knowledge, health behaviours and risk factors, psychosocial well-being and return to work. In Chapters 13 and 14, recommendations are made regarding the content and structure of programs, including methods of conducting group sessions. Chapter 15 describes additional interventions for specific groups.

Knowledge

Recommendation

Education and counselling increase knowledge and understanding of heart disease and should be an integral part of comprehensive cardiac rehabilitation programs

Strength of evidence = 2

Several studies, in various settings, have investigated whether education and counselling increase knowledge[294–303], including eight randomised controlled studies[294,295,297–302]. Only three of these studies were conducted after hospital discharge[295,297,300], while others were conducted during hospital admission. Only one of these reported trials involved patient education conducted in groups[300].

Increases in knowledge have been reported in four randomised controlled trials comparing interventions with usual care[294,295,297,300] and in another study in which historical controls were used[296]. Other studies have compared different types of educational approaches. Some reported benefits favouring one intervention[298,300,301,303], while others found no differences between interventions[299,302].

One study comparing the effectiveness of a slide tape unit, programmed instruction and traditional lecture presentation during an outpatient program produced significantly higher knowledge scores from the slide tape approach and the programmed instruction[300]. In contrast, a further study found similar levels of knowledge between patients allocated to a group receiving traditional (instructor centred) and collaborative (patient centred) educational approaches[299]. The author recommended that in educating cardiac patients, collaborative approaches might nevertheless be preferable to traditional approaches in order to facilitate the

achievement of other important goals of education, such as reducing anxiety or improving self-efficacy[299].

The educational level of patients can significantly influence retention of information. Many patients are unable to comprehend or retain information because of limited education[171,304–306]. Age may also influence retention of information. In one study, a greater increase in knowledge was found in younger patients compared with older patients[296]. Failure to understand or recall information and advice may also be due to excessive anxiety, particularly during heightened phases of anxiety[305,307]. Even where adequate advice has been given, cardiac patients often deny knowledge of important information about their illness[308]. The specific needs of patients and their receptivity to information must be considered, since some information may not be thought important by individual patients. Joint setting of priorities for educational content by the patient and educator is recommended to maximise learning[305].

The quality of the intervention rather than characteristics of the patients may determine the effectiveness of educational and counselling programs. For example, educational strategies may be unsuccessful because the information given was too much or too general[171]. Further, educational counselling may be ineffective because contradictory information and advice are often given by different health professionals[6,309]. Clarification is therefore required to reduce confusion. Moreover, information needs to be repeated and reinforced. Telephone follow-up after discharge from hospital has been shown to increase patient knowledge and decrease anxiety[295,297,310].

The teaching ability of the educator and the manner in which information is delivered are critical to patients' acceptance of the material. In one study, increased knowledge was found in the group receiving education from a primary nurse compared with a group taught by a nurse educator[303]. These results were attributed to greater familiarity and trust between patients and primary nurses. Further, more informal teaching was undertaken by primary nurses in response to patient enquiries, suggesting that teaching by the primary nurses may have been more relevant to patients and provided at a time of greater motivation. However, in another study, cardiac surgery patients receiving education from more academically qualified nurses had significantly higher test scores at discharge than did patients taught by nurses with lesser academic qualifications[298].

The relevance of knowledge gain as an outcome indicator has been often questioned because increased knowledge has not been shown to significantly influence behaviour change and reduction of risk[171,294,311]. Nevertheless, knowledge empowers patients to become involved in their own health care and has been shown to influence coping and social and emotional recovery after a major cardiac event[312]. Knowledge gain is considered by patients to be a major benefit from attending cardiac rehabilitation programs[6,7,313].

Comment

Relatively few well designed studies have clearly demonstrated improvements in knowledge from educational interventions offered during cardiac rehabilitation programs, especially group programs conducted during convalescence. However, the evidence from three small randomised controlled trials is consistent with improved knowledge. More rigorously designed studies are required involving larger patient numbers. In particular, studies are needed which compare the effectiveness of different educational and counselling interventions. Such interventions should be tested with a variety of patient groups.

Health behaviours and risk factors

There is evidence to show that comprehensive cardiac rehabilitation programs, including exercise training, can reduce smoking, alter lipid profiles, reduce blood pressure, favourably alter body weight and increase physical activity. Improvements in psychosocial outcomes have also been shown. The following discussion examines the impact of education, counselling and behavioural interventions alone upon risk factor modification and behavioural change.

Smoking

Recommendation

Education and counselling programs for smoking cessation and relapse prevention are enhanced by behavioural strategies. Comprehensive cardiac rehabilitation programs should combine these approaches to reduce smoking rates.

Strength of evidence = 2

Several controlled studies have been conducted to determine whether education, counselling and behavioural interventions modify risk factors, including reduced smoking, in cardiac patients[15,104,162,171,310,314–316].

A behavioural intervention was highly effective in a randomised controlled study of 173 consecutive patients who were smoking within the six months of myocardial infarction[314]. The intervention, which was provided to patients individually, was initiated in hospital and involved strong advice to quit smoking, a workbook, relapse prevention strategies and follow-up phone calls from a nurse, initially weekly for two to three weeks and then monthly for four months. Nicotine gum was provided for those who relapsed. The biochemically confirmed cessation rate in the intervention group at 12 months was 71% compared with 32% in the usual care group. Patients who had resumed smoking within three months were unlikely to have stopped by

12 months. Intentions to cease smoking were found to be highly predictive of successful quitting.

A later and larger randomised controlled trial by the same group evaluated the efficacy of a nurse-managed, home based program of exercise training, smoking cessation strategies and dietary and drug management of hyperlipidaemia[104]. Strategies to encourage smoking cessation consisted of physician advice, relapse prevention strategies, nicotine gum for those who relapsed and reinforcement of advice by nurses delivered by telephone. This study of 585 myocardial infarction patients found significantly less smoking at 12 months in the intervention group than in the usual care group. However, a further randomised controlled trial of a multifactorial intervention failed to reduce the smoking rate[15], but since the number of smokers in that study was very low, it may have been difficult to demonstrate a benefit from the intervention.

Strong advice from physicians to stop smoking, especially in hospital, has been shown to be important[317–319]. In one uncontrolled study, such physician recommendations, coupled with follow-up advice from nurses, were associated with a one year self-reported quit rate of 62%[317]. In another study of patients who had undergone coronary bypass surgery, reduced smoking rates were found at one year in the group randomly allocated to a program of exercise training and education, coupled with physician advice to stop smoking, compared with the control group[162].

Spousal support has been shown to facilitate smoking cessation in cardiac patients. In a randomised controlled study of inpatient group education followed by weekly telephone calls for six weeks after discharge from hospital, results showed a significantly greater decrease in smoking and unhealthy eating habits, and a significantly greater increase in physical activity, among patients whose partners also participated in the program[310]. While there were no overall differences at 12 months between the intervention and control groups, a greater rate of smoking cessation was found in the intervention group among patients whose partners had participated.

Two randomised controlled trials of group interventions failed to show benefit[171,316]. In one of these studies which compared exercise, exercise plus education and counselling, and usual care, no differences were found between the three groups in smoking cessation at three and six months[171]. All groups showed high rates of quitting and reduction in the number of cigarettes smoked. Attrition rates in this study were 25% at 3 months and 34% at six months and, and as noted by others, dropouts were more likely than participants to have been smokers[320]. In the second study, a six week outpatient program of group education for post myocardial infarction patients found smoking rates were somewhat higher in the intervention group after six months compared with a control group receiving standard individual education[316].

In another randomised study of the effectiveness of a mail-out intervention supplemented by telephone contact, no significant differences were found between the intervention and usual care groups, with both groups reporting a substantial decrease in smoking[315].

In general, evidence suggests that interventions to reduce smoking are more likely to be effective if they are initiated in hospital when patients are more highly motivated rather than after discharge from hospital[171,314,317]. Further, a meta-analysis of controlled trials of cardiac patient education concluded that while interventions, on average, showed no significant impact on smoking behaviour, behaviourally oriented interventions generally produced better outcomes[321]. Behavioural strategies, such as regular reinforcement of advice to stop smoking and continuing support, appear necessary[314]. The positive studies described above indicate that follow-up telephone contact by nurses is a convenient, inexpensive and effective method of reinforcing physician advice to stop smoking. Lapses tend to occur when interventions cease. Instructing patients in relapse prevention methods before they lapse is therefore of critical importance[314].

Nicotine replacement treatment is important adjunctive therapy for cardiac patients[104,314]. A review of studies of nicotine patches in the general population found that they were effective, especially when coupled with a comprehensive program which included counselling and group support[322].

Comment

Unfortunately, there have been few well designed studies testing interventions to reduce smoking in cardiac patients. However, a few studies indicate that traditional methods of educating patients, either individually or in groups, are less successful in encouraging smoking cessation than behaviourally oriented approaches, especially those which provide longterm follow-up to reinforce advice and offer support. Interventions combining multiple components are likely to be more successful but the specific components which produce beneficial effects have not been well defined[314]. According to the meta-analysis by Mullen, better outcomes are achieved when smoking behaviour is the focus of the intervention, rather than being incidental to an intervention such as exercise[321]. Further research in this area is clearly required. Given that resumption of smoking after an acute event markedly increases the risk of reinfarction and death, the development of effective interventions to reduce smoking should be accorded a high priority.

Lipids

Recommendation

Intensive nutritional education, counselling and behavioural interventions lead to lower dietary fat and cholesterol intake and, with or without pharmacological lipid-lowering therapy, result in significant improvement in blood lipid levels and should be provided as part of comprehensive cardiac rehabilitation.

Strength of evidence = 2

Several studies have investigated the benefits of education, counselling and behavioural interventions upon lipids, either alone or as part of comprehensive cardiac rehabilitation and with or without pharmacological therapy. Of 13 randomised controlled trials[15,104,116,144,162,164,171,315,323–327], five reported statistically significant differences in dietary fat and cholesterol intake favouring intervention groups compared with control groups[15,144,323,325,327]. One study reported differences in dietary fat intake[315] and two studies produced negative results[104,171]. Favourable changes in lipid or lipoprotein levels occurred in seven randomised controlled trials[15,104,116,144,164,323,325,327], compared with control patients and no significant changes were reported in four studies[162,315,324,326].

In two studies involving group exercise and education during convalescence, no significant differences in the degree of improvement in lipid levels were found between intervention and control groups[162,171]. However, a multifactorial intervention in which individual and group counselling were provided for three months followed by a continued intervention lasting three years[325], a significant decrease was reported in the intervention group in dietary fat intake and serum total cholesterol levels at follow-up after one and two years. At the six and 10 year reviews, the intervention group continued to show decreased dietary fat intake but there was no significant difference between groups in total cholesterol levels.

A controlled study of extremely intensive dietary restriction, stress management, exercise and social support produced significantly reduced total cholesterol levels and dietary fat intake in the intervention group at one year[144]. An earlier study by the same group with short-term follow-up also reported favourable outcomes in lipid levels in the intervention group[116]. Another study of strict diet, stress management, relaxation, exercise and medication reported significant differences in mean dietary fat intake and serum cholesterol levels between the intervention and control groups after one year[323].

Patients who participated in an educational program by mail and telephone reported a significant decrease in dietary fat intake after six months compared with a control group receiving usual care, but no significant differences were found between groups in cholesterol levels[315].

Beneficial effects upon lipid levels have been reported from interventions combining education and behavioural strategies with the use of lipid lowering drugs. A large study of a home-based multifactorial intervention combining education, counselling and lipid lowering medication achieved a significant mean reduction in total cholesterol and dietary fat intake in the treatment group after four years, compared with the control group[15]. Another multifactorial intervention which included lipid lowering medication also reported a significant reduction in serum cholesterol levels in the intervention group compared with the control group[104].

A recent randomised controlled trial studied the effects of diet alone, a combination of diet and exercise, exercise alone and usual care in men and postmenopausal women with low levels of HDL cholesterol and raised LDL cholesterol[327]. This study showed that the Step 2 diet of the US National Cholesterol Education Program was ineffective in lowering LDL cholesterol unless it was coupled with exercise training. Similarly, a nonrandomised controlled study reported significant improvements in lipid levels from a combination of education, counselling and exercise compared with exercise alone[328].

Comment

Some reports show that education, counselling and behavioural interventions which are intensive and sustained over a long period have independent effects upon lowering lipid levels. While studies from nonrehabilitation settings support the efficacy of dietary intervention alone, it appears that many patients require pharmacological therapy in addition to dietary and exercise management to achieve their goals related to lipid levels. The degree to which studies have shown a lowering of mean total cholesterol and LDL cholesterol without the use of lipid lowering drugs is not great.

Blood pressure

Recommendation

Education, counselling and behavioural interventions alone have not been shown to control elevated blood pressure levels. However, a comprehensive program of education, counselling, behavioural interventions and exercise training can be effective in the management of hypertension and should be available as an integral part of cardiac rehabilitation programs, in addition to pharmacological therapy.

Strength of evidence = 2

The effectiveness of antihypertensive drugs in lowering blood pressure is well established. Further, beneficial effects upon blood pressure in cardiac patients have been reported from two multifactorial interventions including exercise training[14,15]. One randomised controlled trial of a multifactorial intervention including lifestyle advice, which was reinforced during the four year follow-up, produced significant benefits in reduction of blood pressure in cardiac patients in the intervention group compared with the control group[15]. A significant reduction in blood pressure was also reported in a multifactorial intervention involving exercise, education and support[14]. However, in another randomised controlled trial of exercise training and education, there was no impact upon blood pressure levels[162]. A further multifactorial intervention of stress management, exercise, intensive dietary restriction and support produced no significant impact on blood pressure levels, with both the intervention and control groups showing a decrease in blood pressure at one year[116].

There is little evidence to suggest that education, counselling and behavioural interventions without exercise training are effective in controlling blood pressure in cardiac patients[2]. However, their effectiveness in changing behaviours and thus lowering blood pressure in other populations has been reported[329]. A meta-analysis of studies conducted between 1954 and 1985 showed that a 1kg fall in weight achieved a 1.6 mmHg reduction in mean systolic blood pressure and a fall of 1.3 mmHg in mean diastolic blood pressure[330]. The reduction was more prominent when the blood pressure was higher. In the MRFIT study, a reduction in blood pressure was also shown with reduction of body weight[331]. In another study, a reduction in alcohol consumption alone achieved a reduction of 4.8 mmHg and 3.3 mmHg in systolic and diastolic blood pressures respectively, and together with a reduction of weight of 7.5kg, systolic and diastolic blood pressures were reduced by 10.2 mmHg and 7.5 mmHg respectively[332]. Similarly, reduced sodium intake has been shown to be effective in reducing blood pressure[333].

According to scientific evidence and expert opinion, relaxation and biofeedback alone have not been demonstrated to be effective in controlling blood pressure and stress management is not recommended as the sole intervention for hypertension control[329].

Comment

Education and behavioural interventions for weight reduction, physical activity and moderation of dietary sodium and alcohol consumption are recommended as definitive or adjunctive therapy for hypertension. They are important components of a multifactorial approach to reduce hypertension in cardiac patients.

Body weight

Recommendation

Dietary education, counselling and behavioural interventions designed to reduce body weight can help patients lose weight and should be provided as part of comprehensive cardiac rehabilitation. Education as a sole intervention is unlikely to achieve and maintain weight loss.

Strength of evidence = 2

Several studies have reported a reduction in body weight as a result of comprehensive cardiac rehabilitation programs which include exercise, education, counselling and behavioural interventions[14,15,43,144,275,334].

A randomised controlled trial conducted over four years demonstrated a statistically significant body weight reduction of 4 % in the intervention group compared with the control group[15]. Patients in the intervention group received individual advice regarding lifestyle modification which incorporated goal setting, a monitored home exercise program, follow-up by mail, telephone contact and regular visits to the clinic for follow-up.

Considerable weight loss occurred amongst the dedicated subjects enrolled in a study of a one year intervention including a low fat vegetarian diet, group discussion for social support, stress management and exercise[144]. Significantly greater weight loss was also reported in the treatment group in two further studies[14,43], and in another study, a reduction in body fat was achieved in subjects receiving the intervention[163]. In all three studies, however, the mean weight loss was less than 3 kg. A significant reduction in body mass index, percentage of body fat and other measures was reported in one study[274] and in another, in percentage of body fat in women[275]. Other studies involving exercise reported no changes in body weight[45,90,143]. A randomised controlled study comparing exercise training alone, exercise training plus group education and counselling, and a control group found no significant differences between groups in weight loss after three and six months[171].

Positive results were reported from three studies which did not involve exercise. A randomised controlled trial reported a significant reduction in mean body weight at one to 10 year follow-up in patients in the intervention group receiving nutritional counselling compared with the control group[325]. In that study, the intervention was intensive for the first three months, followed by a continued intervention for three years.

One observational study based on self-report achieved a reduction in body weight in overweight patients[177], while a nonrandomised trial involving counselling reported a significant reduction in body fat[335].

Studies conducted in other settings confirm that educational and behavioural interventions to reduce weight can be effective[334–336]. According to a review of 21 studies involving obese patients, a mean weight loss of 7 to 9 kg was achieved immediately after treatment, with weight loss being related to the length of the program rather than the technique used[336]. While weight gain is common after interventions cease, eight of the studies reviewed reported a 75% maintenance of post treatment weight loss at one year follow-up.

Comment

Education, counselling and behavioural interventions are necessary components of a successful weight reduction intervention. However, they may not be sufficient as the sole intervention to produce sustained weight loss. Mutifactorial interventions including exercise are recommended to achieve weight loss in cardiac patients.

Physical inactivity

Recommendation

Education, counselling and behavioural interventions are recommended, in addition to exercise training, to encourage and facilitate regular continued physical activity.

Level of evidence = 3

In a multifactorial trial of education, counselling, exercise and pharmacological treatment with regular follow-up, the intervention group reported higher levels of physical activity than the control group after four years[15]. However, education, counselling and behavioural interventions have not been shown to improve exercise tolerance and physical activity levels in the absence of exercise training[2,15,116,337,338]. Such programs added to exercise training may nevertheless improve morale, self esteem and adherence to exercise.

Comment

Education, counselling and behavioural interventions to increase exercise tolerance and physical activity are best delivered as part of a comprehensive cardiac rehabilitation program including exercise training.

Psychosocial well-being

Recommendation

Education, counselling and behavioural interventions, either alone or as part of multifactorial interventions, improve psychological well-being and improve quality of life. They should therefore be integral parts of comprehensive cardiac rehabilitation programs.

Strength of evidence = 2

Psychological disability has long been recognised as a greater barrier to recovery than physical impairment[14,25,34,36]. Thus, an important aim of cardiac rehabilitation programs should be to improve the psychological well-being of patients. The psychological benefits of exercise training are widely acknowledged. An important issue is whether specific education, counselling or behavioural interventions enhance psychological well-being, additional to those benefits achieved through exercise training.

Table 3 in Chapter 6 lists the number of studies reviewed by the US Agency for Health Care Policy and Research for each psychosocial outcome[2]. These studies involved a range of different interventions, including individual counselling, group counselling, Type A behaviour modification programs, relaxation therapy, stress management, telephone follow-up and home visits. In some of these studies, exercise training was also provided. In this section, a further review is undertaken of studies investigating the impact of education, counselling and behavioural interventions upon psychosocial well-being. Two recent meta-analyses[321,339] included several of the studies cited below. Studies specifically addressing stress management programs and the Type A behaviour pattern are separately addressed later in this chapter.

Several randomised controlled trials have been undertaken to investigate the effects of education, counselling and behavioural interventions upon psychological outcomes, including anxiety, depression, quality of life and psychological distress[99,121,217,294,310,316,326,340–353]. A number of nonrandomised trials[354–357] and observational studies[156] have also been conducted. Some studies included exercise as a part of comprehensive cardiac rehabilitation[121,156,342,344,352,354,355,357], or as one of two interventions being compared[99,346].

Most of the above studies involved group interventions[99,121,156,294,310,316, 326,340–345,354]. Statistically significant benefits in some psychological outcomes were reported in eight studies favouring the intervention group[121,294,340,344,354] or in subsets of patients in the intervention groups[99,156,310,345]. Negative results were reported in five trials[294,316,326,341–343].

Ten reports involved interventions with individual patients, with or without spouses[297,347–353,356,358], with statistically significant benefits being found in seven studies in the intervention groups or in subsets of patients in the intervention groups[297,347, 349–352,356]. Two studies[348,353] reported no statistically significant differences in psychological outcomes between intervention and control groups.

An inpatient program of individual education and counselling delivered by nurses to 60 male patients produced significantly less anxiety and depression in the intervention group compared with control subjects. These benefits were sustained for six months after leaving hospital[351]. Another smaller study involving counselling of individual inpatients and their spouses also reported a favourable impact upon psychological well-being[350]. A further, similar study of psychological counselling of couples in an outpatient setting reported an improvement in psychosocial adaptation, although the sample size was very small[356]. However, in a recent large study in which 1,173 patients were randomly allocated to secondary prevention programs conducted by nurses in general practice, no differences were found between treatment and control groups in anxiety or depression at one year follow-up[348]. However, eligible patients for this study included many with coronary heart disease who had not recently experienced an acute event. Only 14% of subjects were defined as anxious or depressed at baseline, leaving little room for improvement.

Studies of group interventions have produced conflicting results, as mentioned earlier. A significant reduction in anxiety among inpatients was produced in one study, compared with a usual care group[294] but not in another brief outpatient program to which spouses were also invited[326]. In a further trial, patients in the workforce at the time of acute myocardial infarction were randomised to a three week cognitive behavioural intervention to reduce psychological distress and encourage return to work[340]. Those patients in the intervention group were significantly less distressed psychologically at three months, compared with the control group. An Australian study, however, found no significant benefit from a program of group exercise and behavioural education in patients who had undergone coronary bypass surgery[342].

A recent, large multicentred trial in the United Kingdom also failed to demonstrate significant differences in levels of anxiety or depression between the intervention and control groups at six months[343]. In this study, 2,328 patients were randomly allocated to standard medical care or to an intervention group which received education about heart disease and the recovery process, as well as instruction in relaxation skills. Conducted in both group and individual settings, the program lasted seven weeks.

Exercise training and advice regarding risk factor modification were not included in the program. Despite the absence of a measurable impact upon psychosocial outcomes, those enrolled in the rehabilitation program had somewhat less anginal frequency, requirement for medication and physical disability and reported greater leisure time physical activity. Possible explanations suggested by Mayou for the disappointing psychosocial outcomes in this study are that many patients in the control group achieved a good outcome and did not require further support. Further, the intervention may have been inadequate for those patients who did have substantial psychological problems[359]. Another deficiency in this study may well have been the absence of exercise training, which has been universally recommended in cardiac rehabilitation programs. Further, it should be noted that, of the 792 patients receiving the intervention, 72–80% described the relaxation training, cardiac education, group discussion and individual counselling as helpful or very helpful and rated the programs highly.

Two studies which have included exercise training as well as counselling and behavioural interventions produced favourable results. In one such study, a program of group exercise, counselling and education was compared with usual care in patients who had undergone coronary bypass surgery[344]. Results showed a significant decrease in depression scores in the intervention group but not the control group after eight months compared with baseline measures. In another study, significant improvements in affect and well-being were reported in male patients who attended a group program of exercise and psychosocial rehabilitation, including those experiencing minimal distress[354]. In contrast, another study comparing group exercise, individual counselling of patients together with spouses and usual care found no significant differences in psychological outcomes after one year[346].

Some studies have tested interventions specifically targeting anxious or depressed patients. The effectiveness of exercise training and group counselling was compared in one controlled study of anxious and depressed patients with acute myocardial infarction[99]. Although similar decreases in levels of anxiety and depression were noted for those participating in either the 12 week exercise program or group counselling program compared with control subjects, counselling significantly decreased mean depression scores and significantly increased measures of sociability. In an observational study, Milani also found depressed subjects achieved greater benefits in some behavioural and quality of life parameters following a 12 week exercise and education group program during convalescence compared with nondepressed subjects[156]. Individual counselling has also been shown to be beneficial in introverted or neurotic patients[347].

In a study of 201 patients who were either anxious or depressed after acute myocardial infarction, a small but significantly greater improvement in quality of life and decreased anxiety was found upon completion of a six week early outpatient program of group exercise and behavioural counselling compared with a usual care

group[121]. However, both groups improved significantly and by 12 months, no differences were found between the groups. In this study, it is possible some patients with psychological problems may not have been identified at baseline, since assessments of psychological state were made in hospital rather than during convalescence when psychological problems commonly occur[360]. Further, many patients in the control group were later recognised by their general practitioner to be anxious or depressed and, in consequence, were referred to readily available comprehensive rehabilitation programs in their city (Hamilton, Ontario), thereby possibly contributing to improvements in that control group.

The effectiveness of telephone follow-up after hospital discharge has been evaluated in several studies. In one study, telephone support provided during the first six weeks after discharge for patients who had undergone coronary artery bypass surgery produced significantly less anxiety in patients receiving the intervention[297]. In a randomised controlled study involving education, counselling and weekly telephone follow-up for six months, the intervention group reported significantly greater physical activity and improved dietary habits but no effects were found on anxiety, depression and smoking cessation[310]. In this trial, benefits were significantly greater after two months if partners had participated in the program together with the patients.

A recent study involving a nurse-managed, home based multifactorial risk factor reduction program compared outcomes of 585 men and women after myocardial infarction who were randomly allocated either to the intervention or a usual care group[349]. Patients in the intervention group received counselling in hospital, followed by monthly telephone calls for six months, or more frequently, as required. Separate analyses of levels of psychological distress were undertaken. Results showed similar levels of improvements overall between groups, except for those with low levels of anxiety at baseline in the intervention group who improved significantly by 12 months. The authors suggested that the subjects enrolled in the trial (working, middle class whites with uncomplicated disease and a good prognosis) may not experience the same rate of depression and other types of psychosocial distress after myocardial infarction as other less economically advantaged populations.

A further study in which psychosocial support was delivered by telephone and individual home visits, with an average 20 contacts per patient, only a small impact upon anxiety and depression was reported[353]. Moreover, there was a poorer overall outcome in the intervention group, including a higher mortality rate, among the women participating in the study. The authors speculated that the monthly telephone screening to monitor psychological distress and repeated home visits for those experiencing psychological problems may have been intrusive and harmful. Serious clinical and methodological flaws in the study have been asserted by others[361,362]. One weakness concerns the failure of the reported harmful effects upon women in the study to reach conventional levels of significance. Another concerns the use of nurses

rather than appropriately trained psychologists to deliver the program. Further, an intervention requiring frequent telephone contacts and an average five to six home visits cannot be considered cost effective as standard care. Caution should therefore be exercised in generalising the findings of this study to other more common and more effective forms of cardiac rehabilitation. In this regard, it should be noted that a meta-analysis, which included 23 trials involving 3,180 patients, found that the addition of a psychosocial intervention to cardiac rehabilitation programs produced a greater reduction in psychological distress, as well as a 41% mortality reduction over two years in those receiving the additional intervention compared with those who did not[339].

Home-based self-help programs have also been tested for their effectiveness. In one such study, a rehabilitation program based upon a heart manual and tape dealing with exercise, information and stress management produced psychological benefits among patients in the intervention group compared with a control group receiving standard care[352]. Rehabilitation patients were significantly less anxious and depressed at follow-up, with the greatest improvement being noted in those in whom anxiety and depression were greatest upon discharge from hospital. Moreover, patients in the treatment group used health services less frequently than control subjects. The authors recommended that all patients should receive rehabilitation because of the difficulty in predicting while in hospital those patients who will later experience psychological distress.

Comment

A small number of randomised or controlled trials support observations of numerous clinical papers which claim the effectiveness of various interventions upon psychosocial well-being. Moreover, patients attending rehabilitation programs, as well as the health care providers delivering them, state that the psychosocial benefits of comprehensive cardiac rehabilitation programs are considerable. However, while some studies have demonstrated improvements in psychological well-being, it is difficult to make firm recommendations about the most effective education, counselling and behavioural interventions for facilitating the psychosocial recovery of cardiac patients. Current methods of psychosocial rehabilitation remain extremely variable because of a lack of adequate scientific bases for recommending particular approaches. Many studies suffered from poor research designs, using samples of insufficient size and vaguely described interventions. Moreover, interventions varied considerably in duration, frequency and intensity. Nonuniform outcome measures and different measurement tools were used, making comparisons between studies difficult, and interventions were delivered by personnel with varying degrees of expertise. Further, there was considerable variation between studies in follow-up periods and the types of patients included in the studies. These weaknesses limit the value of the findings of some studies. More rigorous investigations are essential. In particular, additional research is required to assess the effectiveness of interventions,

such as group counselling, as sole modalities or in conjunction with other interventions. An equally important area for further research is the identification of particular interventions which can benefit specific subsets of patients. A range of different model programs is required to cater for the varying psychosocial needs of different patient groups.

Stress

Recommendation

Stress management programs, including relaxation training, may be useful adjuncts to other methods of psychosocial rehabilitation in selected patients.

Strength of evidence = 3

The aims of stress management programs are to assist the patient to identify stressors, to recognise characteristic emotional and physical responses to stress, to decrease levels of general arousal and to develop effective coping strategies. Through the use of various techniques including relaxation therapy, meditation, cognitive therapy, anxiety management and biofeedback, the patient is taught how to reduce stressful reactions by altering stress inducing perceptions of situations. By acquiring more effective coping skills, maladaptive responses to stress may be reduced.

Several studies have reported benefits from relaxation therapy[99,363–366]. In one study, patients who received cognitive training early after myocardial infarction had greater confidence in their ability to control their stress than those who received relaxation therapy[364]. In another, relaxation training was found to enhance the psychological effects of exercise training[365].

In a recent randomised controlled study[366], 50 post infarction and 50 post bypass surgical patients who received a 10 week program of stress management and relaxation therapy three months after their events showed significant improvements six months later, compared with the control group, in emotional well-being, activities of daily living, satisfaction with health and perceptions of family members of the patients' emotional state. However, these patients had not attended a formal rehabilitation program and it may be that similar benefits could have been achieved from a program of group exercise and education offered during convalescence.

In a study involving monthly monitoring of stress levels of patients and home nursing visits for those with high stress scores, a significant reduction in stress scores was found as well as a significantly reduced rate of longterm recurrence of acute myocardial infarction and a marginal impact on cardiac mortality during the first year after infarction[358]. Little impact was observed on those with low levels of stress in hospital. The authors concluded that patients who can benefit from such an intervention may be identified in hospital.

Comment

Stress management and relaxation classes may help patients to feel better and less tense, and in consequence, avoid lapses in recommended behaviours. While there is some evidence to support the effectiveness of stress management programs and relaxation therapy, specific programs are not routinely required during cardiac rehabilitation programs. Further research is required to identify which patients could benefit most from such interventions.

Type A behaviour pattern

Recommendation

Specific interventions to modify Type A behaviour are not recommended as part of comprehensive cardiac rehabilitation programs .

Strength of evidence = 2

The Type A behaviour pattern was defined initially by Friedman[367] and further developed by Rosenman[368] and Jenkins[369]. It is characterised by rapid response to perceived time pressure, by competitive or even aggressive behaviour and by hostility.

The major evidence that the Type A behaviour pattern was an independent risk factor for coronary heart disease came from the Western Collaborative Study[368]. In this prospective cohort observational study, a clear association was demonstrated between the Type A behaviour pattern and mortality from coronary heart disease. A possible correlation was also found in a sub-study of the Framingham Study[370]. Review of this material led to the conclusion by a working party that the Type A behaviour pattern was probably an independent risk factor for coronary heart disease[371].

After the first major report[368], a subsequent review of the Western Collaborative Study data and subjects showed a reversal of risk. Thus, Type B subjects who had lived beyond the first survey report were found to be at greater risk of cardiovascular disease than Type A subjects[372]. As a result of this finding, the manner in which patients were originally classified as either Type A or Type B subjects has been questioned. A clinical trial conducted by Friedman and colleagues[367] demonstrated improved outcomes from a program to modify Type A behaviour. However, the randomisation process in that study has also been questioned.

Meanwhile, several other prospective cohort studies have failed to demonstrate that the Type A behaviour pattern contributes any additional risk beyond the normal recognised risk factors for coronary heart disease or its complications. This applies to those patients who do not have coronary heart disease as well as to those who have

already had acute myocardial infarction (see Chapter 13). Thus, it appears that Type A behaviour may well not be a risk factor for coronary heart disease.

More recent studies are examining the possible link between hostility, a component of the Type A behaviour pattern, and coronary heart disease (see Chapter 13). Hostility is close to aggression and aggression is possibly related to maleness and testosterone levels or sensitivity. As a possible risk factor, it may be of no greater significance than other characteristics of maleness and hence not may not be amenable to significant change through psychosocial interventions.

Comment

Although a fashionable concept in the past, recent research has brought into question the robustness of the concept of the Type A behaviour pattern[373]. Thus, attempts to modify Type A behaviour probably have little or no place in current cardiac rehabilitation programs.

Return to work

Recommendation

Resumption of work should be recognised as a major aim of cardiac rehabilitation programs. Education, counselling and behavioural interventions focusing on vocational rehabilitation are recommended to facilitate return to work.

Strength of evidence = 3

In randomised controlled trials, exercise training alone has not been demonstrated to be effective in increasing the rate of return to work. Further, in randomised controlled trials, the addition of education and counselling to exercise training has also proved generally ineffective in facilitating return to work (see Chapter 11). However, in controlled studies where return to work was an aim of the cardiac rehabilitation program, significant increases in return to work and retention of working status over time have been well demonstrated[16,91,159,160,172,174,374]. In one randomised controlled trial, the addition of vocational counselling to a comprehensive cardiac rehabilitation program was reported to have produced an increased rate of return to work[161]. Observational reports conducted from the 1940s to 1970s in Australia (where resumption of work has traditionally been a major outcome) and the United States support the beneficial effects of cardiac rehabilitation programs upon return to work and continuing in work[20,21,25,34–37]. The emphasis in Australia on return to work is illustrated by one study of 169 unselected men who were in the workforce at the time of onset of myocardial infarction. At four months, 89% of these patients were working and after one year, 87% were working, irrespective of whether they were randomly

allocated to a high or low intensity exercise program[94,96]. These results may be contrasted with findings of a recent study in the United Kingdom[343] where, of 838 patients who were in the workforce before their acute event, only 41% of patients in both the intervention and control groups returned to work within six months. In that study, it appeared that return to work was not a major aim of the intervention and specific vocational interventions were not provided. Such an adverse occupational outcome is amongst the worst in the literature, implying that patient medical management and support, or the health care and social security system, were seriously inadequate in supporting patients in returning to work.

It has been suggested that the benefits of a cardiac rehabilitation program may lie in fostering perceptions of improved health and greater physical mobility, which, in turn, may motivate patients to continue working after their acute event. In one randomised controlled study of a comprehensive cardiac rehabilitation program including exercise, education and counselling followed by booster sessions, an increase was found in the proportion of patients allocated to the intervention group following coronary bypass surgery who were working after three years[375]. However, no differences between the intervention and control groups were evident at other follow-up points, except for those aged under 55 years who returned to work more frequently if they received a program of cardiac rehabilitation. This study found that favourable perceptions of capacity for working and a desire to work were among the most significant factors influencing return to work by one year.

A large study undertaken to identify predictors of return to work in 1,252 patients with coronary heart disease, subsequently validated in a prospective study, concluded that those at high risk of leaving the workforce prematurely can be prospectively identified at a time when it might be possible to intervene[376]. Findings of this study supported the results of other studies which showed that traditional medical factors, such as the severity of illness, have a relatively small impact upon employment outcomes.

Barriers to resuming work may be more cognitive than physiological[377,378]. Thus, behavioural interventions designed to enhance self-efficacy, provide constructive coping strategies and modify perceptions could improve employment outcomes[379–383]. This recommendation is supported by Shanfield in a review of studies concerning return to work after acute myocardial infarction[384].

Comment

The paucity of firm evidence that cardiac rehabilitation, as currently practised, favourably influences resumption of work needs explanation. The initial basis for the establishment of cardiac rehabilitation programs was to facilitate physical, psychological and social recovery, with resumption of work as one of the important outcomes. However, there are few randomised controlled trials where resumption of work has been a major outcome measure. In most cardiac rehabilitation programs

conducted in the United States, using high intensity exercise as the major intervention, the physical benefits of exercise represent the primary endpoint, with resumption of work an almost incidental possible outcome. In the USA and Canada, resumption of work has been considered largely dependent upon social, economic and occupational factors not related to the rehabilitation program itself[2,121,161]. It may be that, if resumption of work is not regarded as a primary or important outcome measure of a cardiac rehabilitation program, then attempts to help patients to resume work will assuredly fail. For resumption of work, maintenance in work and satisfaction with work not to be major aims of cardiac rehabilitation is to deny part of the definition and purpose of cardiac rehabilitation as set out in Chapter 1. Return to work is dependent upon multiple factors including attitudes of the patient, family and employer and confidence in being able to resume work. Comprehensive programs including exercise, education, counselling and behavioural interventions may improve a patient's potential for resuming work but they may be ineffective without directly addressing return to work as a major aim of cardiac rehabilitation. These issues are further discussed in Chapter 15.

Conclusions

Unfortunately, many studies investigating the effectiveness of education, counselling and behavioural interventions in cardiac rehabilitation have been poorly designed, with inadequate sample sizes and without explicit reference to a theoretical model[2,171,299,385–387]. Few studies have investigated outcomes of group programs conducted during convalescence. Further, most investigations have been limited to male patients, particularly those who have had acute myocardial infarction. Thus, clear recommendations regarding appropriate interventions for a broader range of patients are difficult to make. With regard to risk factor modification, it should be emphasised that changing health behaviours is usually a process rather than a single event. The process of change may take considerable time, especially if multiple changes are required. Thus, it is unrealistic to expect that ambulatory programs of six to eight weeks' duration will produce significant and sustained changes in most health behaviours. Nevertheless, ambulatory programs should help patients to initiate steps to begin the process of change by fostering a positive attitude towards change, motivating them to change, increasing their self-efficacy and teaching them skills to help them adopt and maintain healthier lifestyles. Longer programs are required to reinforce the need for change and ultimately to bring about changes successfully. Thus, maintenance programs are highly recommended, in addition to repeated, supportive advice from medical practitioners. Longterm telephone follow-up by well trained nurses or other health professionals is also recommended to monitor health behaviours and to identify those requiring referral for further assistance with psychosocial, occupational or other problems.

CHAPTER 13
CONTENT OF EDUCATION AND COUNSELLING GROUPS

In this chapter, recommendations are made regarding the content of group education and counselling sessions. The scientific literature to which reference is made is to underpin the statements in the text and is not meant to represent a comprehensive review.

Core education program

Recommendation

Education and counselling groups should cover pre-determined core topics.

Strength of evidence = 4

The education and counselling program should cover several specific, defined topics. The core topics are supported by many authoritative bodies[1,10,69,70,74,79,388]. However, depending upon the particular groups of patients attending and their specific needs, some subjects may be omitted, addressed only briefly or expanded. For example, a session on return to work may be omitted if all the patients attending are retired. Similarly, sessions dealing with explanations about cardiac procedures, investigations and medications should be confined to those aspects relevant to the patients in the group. Topics should address questions commonly asked by patients. The following subjects represent the core content of a typical education and counselling program for patients with cardiovascular disease.

Medical topics

- anatomy, physiology and pathology of cardiovascular disease
- coronary heart disease/ischaemic heart disease
- acute cardiac events
- investigations and procedures
- symptoms and their management
- cardiac medications

Modifiable risk factors

- smoking
- raised lipids, nutrition and dietary fat
- high blood pressure
- overweight, obesity and diabetes
- physical inactivity
- other risk factors

Nonmodifiable risk factors

- older age
- male gender
- positive family history

Behavioural and psychosocial topics

- behaviour change and adherence to medication and advice
- mood and emotions
- psychosocial risk factors and social support
- stress
- impact upon the spouse and family
- sexual activity and activities of daily living
- return to work

Medical topics

Patients require simple and clear explanations of the disease process and possible causal factors. Simple and clear descriptions are also essential when explaining acute cardiac events (such as acute myocardial infarction, coronary artery bypass surgery and percutaneous transluminal coronary angioplasty) and investigations and procedures including coronary angiogram, exercise tests, electrocardiography, echocardiography and nuclear cardiography. Drawings, models and videos are helpful. Perceptions of individual patients regarding causes of their disease and the nature of the acute event should be explored so that any misconceptions can be addressed[389–391]. The distinction between heart attack and stroke should be explained and the ongoing and chronic nature of cardiovascular disease emphasised. The typical recovery process should be discussed. Symptoms and their management should also be part of these sessions.

It is necessary for facilitators to be aware of the benefits of frequently prescribed drugs so that they can answer questions commonly asked by patients. Cardiac medications, their purpose and beneficial effects should be explained simply, noting common side effects and stressing the need for taking prescribed medication. Patients should be encouraged to report side effects to their doctors so that alternative

medication may be prescribed. Patients often ask for additional information concerning the following:

- aspirin
- beta blocking drugs
- calcium channel blocking drugs
  - dihydropyridines
  - diltiazem and verapamil
- angiotensin converting enzyme inhibitors and angiotensin II antagonists
- diuretics
  - frusemide (furosemide)
  - thiazides
  - others
- nitrates (tablets, sprays, patches)
- digoxin
- lipid lowering drugs
  - statins
  - others
- antiarrhythmic agents
- antiinflammatory drugs
- psychotropic drugs
- hormone replacement therapy

It is only appropriate to discuss the drugs about which patients enquire. Most patients are properly interested only in their own medications. Better understanding of medications is thought to facilitate compliance (both acceptance and adherence) with prescribed medications.

Additional medical topics may also be discussed during groups, depending upon the medical and surgical problems of the patients present. For example, other kinds of cardiac surgery including cardiac transplantation may be relevant, as well as heart failure and cardiomyopathy.

Risk factors

All major risk factors should be covered, either in separate sessions or together with discussion of several risk factors. Both modifiable and non-modifiable risk factors need to be addressed. The compounding of risk if several risk factors are present should be highlighted and the possibility of reversal of risk, coupled with stabilisation or reversal of disease, explained. Further, it should be pointed out that other common diseases, including stroke, peripheral vascular disease and diabetes, share many of the same risk factors as those for coronary heart disease.

Smoking

Patients must be made aware of the considerable risks of continued smoking, particularly the increased likelihood of further cardiac events and death. The hazards of continued cigarette smoking amongst patients with cardiovascular disease are well reported in powerful observational studies[392,393]. Patients need to understand that many benefits accrue from stopping smoking, including a marked reduction in morbidity and the halving of mortality from coronary heart disease and stroke[392–396]. While smoking usually ceases with acute events and hospital admission, resumption of smoking commonly occurs soon after hospital discharge and occasionally before the patients leave hospital. In some patients, relapses occur after months or even years. The proportion of patients who continue to smoke, or who lapse after initially ceasing, has been reported to be as low as 10–20% in some studies[66,397] and as high as 60% in others[395,398]. Continued advice and support should be offered to current or former smokers. The effect of the culture to which the patient returns is likely to be an important influence upon adherence to non-smoking advice. In Australia, with its current anti-smoking culture, advice and support during a cardiac rehabilitation program, reinforced by advice and support from others, will usually be effective[66]. Encouragement to stop smoking is especially important during convalescence when patients are most motivated[399]. In addition to providing information about the dangers of smoking and the potential benefits of ceasing, patients should also be shown how to use simple behavioural strategies for stopping smoking and for maintaining the status of a non-smoker. Patients should be encouraged to discuss any barriers they perceive to stopping smoking and techniques for quitting which they may have found helpful in the past. The use and benefits of nicotine replacement therapy should be explained[322,400,401]. Information should be provided about sources of further assistance and counselling. Referral to smoking cessation programs (such as QUIT) should be recommended for those unable to stop smoking on their own.

Raised lipids, nutrition and dietary fat

Education and counselling programs should provide information, explanation and practical advice regarding nutritional aspects of coronary heart disease. Unfortunately, nutritional education presents a common problem for many patients who are exposed to conflicting and confusing information from advertising and the media. They also receive conflicting advice from professional sources, including different members of the rehabilitation team. Nutritional advice given by nurses and general practitioners, in particular, often conflicts with advice given by dietitians[6,309]. It is therefore most important for team members to achieve consensus regarding what constitutes accurate nutritional information. They should also develop guidelines for specific groups of patients, such as the elderly, the overweight and those with hypercholesterolaemia, so that advice can be individualised. Since dietary advice changes over time (for example, the shifts between recommending polyunsaturated

or monosaturated oils), periodic expert review of nutritional guidelines is particularly necessary.

Sessions should include discussion of total cholesterol, LDL and HDL cholesterol levels, the nature of fat in food, hidden fat in food, the distinction between saturated, polyunsaturated and monosaturated fats, the importance of fruit, vegetables and fibre and the protective effects of "traditional" diets[402]. Patients and families have little understanding of the role of saturated fat in raising total and LDL cholesterol or of the difference between fat, lipoproteins and cholesterol. They also have a poor understanding of the role of blood lipid levels in deposition of cholesterol in the arterial subintimal layer, the development of atheroma and its progress to atherosclerotic cardiovascular disease. These aspects should be clearly and simply explained, supported by visual aids. It is important to avoid unnecessary detail and complex terminology during sessions dealing with nutrition.

During acute cardiac episodes, falls in total and LDL cholesterol occur, coupled with loss of appetite and loss of weight[403]. During convalescence, appetite recovers. Weight then increases and lipid levels gradually rise. This pattern occurs with both attenders and nonattenders of cardiac rehabilitation programs. The aim of dietary advice and counselling is to induce behavioural change (reduced fat intake, increased physical activity and control of kilojoules) to minimise or reverse the natural trend to rising lipid levels. Studies have demonstrated that the trend to reversion to previous habits, with loss over time of the beneficial effects of counselling during convalescence, can be prevented or reduced if patients are reviewed and if advice and support continue over years[14,15,16,91]. Thus, nutritional advice to cardiac patients during convalescence needs to be followed up and reinforced continuously by the patients' doctors and other health care providers. Patients need to be motivated to continue adhering to nutritional advice and should be helped to acquire the necessary skills for making dietary changes[404]. They should also be advised that, in general, the lower one's total and LDL cholesterol levels, the better[405,406], rather than aiming to fall below specific cutpoints for levels of cholesterol. Patients should be informed of the need to continue adhering to any prescribed drug treatment and dietary advice. The benefits of following dietary regimens can now be supported by firm evidence of reversal or slowing of coronary atherosclerosis through long term dietary self control and adherence to medication[15,407–410]. This effect is associated with reduction of recurrent cardiovascular disease events and mortality[15,411].

While much of the necessary learning may be achieved in one group session, patients and family members commonly cite a need for additional education about diet and nutrition[7]. Further, during open discussion on other subjects, dietary and nutritional questions are commonly asked. Topical issues are often raised such as the role of red wine, the "French paradox", antioxidants, fibre, vitamins, fish oil, coffee and garlic. To ensure that nutritional issues are adequately addressed, it is preferable to include

at least two sessions which deal with nutrition during the program. One should focus upon practical aspects of shopping, food label reading, preparing food and cooking. Where necessary, group sessions should be supplemented by counselling of individual patients and couples by the dietitian. Simple written nutritional information should be available, both in English and other languages.

High blood pressure

Education and counselling sessions should include explanations of the role of high blood pressure in causing coronary heart disease and stroke. The added risk from hypertension in patients with established cardiovascular disease should be discussed[412–417]. The considerable benefits arising from good blood pressure control in these patients should be emphasised[418,419]. Many patients with previously raised blood pressure have a fall in both systolic blood pressure and diastolic blood pressure following acute myocardial infarction and coronary artery bypass graft surgery. A gradual recovery towards previous or higher levels then occurs over some months[94]. This rise in blood pressure is most marked amongst those patients whose hypotensive medication was changed or stopped while they were in hospital. The most effective method of controlling this rising blood pressure is resumption of medication. Additional lowering of blood pressure, possibly with lesser dosage of medication, may be achieved through weight reduction, exercise, salt restriction and dietary change with the addition of fruit and vegetables[420]. The importance of adherence to advice regarding hypotensive medication and the need for regular blood pressure checks should be stressed. The benefits of blood pressure control through physical activity, weight control and salt restriction should also be pointed out. Further, patients should understand that it is possible that the lower the blood pressure, the better[421]. Since stress, especially work-related stress, is thought by many patients to cause high blood pressure, this issue also needs to be addressed.

Overweight, obesity and diabetes

Overweight (body mass index 25–30kg/m²) and obesity (body mass index > 30kgs/m²) are significant risk factors for cardiovascular disease. Facilitators should define overweight and obesity and explain their role in the aetiology of cardiovascular disease and diabetes. They should also explain their role as risk factors for further cardiovascular events and mortality[422–424], the development of Type II diabetes[425,426] and raised cholesterol and blood pressure[427]. Reduced caloric intake, particularly reduced fat intake, together with regular, maintained or increased physical activity, has been shown to be effective and should be encouraged for all overweight patients and those with non-insulin dependent diabetes[428,429]. In some patients, obesity may be coupled more with physical inactivity than with a high caloric intake[430–432]. However, weight loss is hard to achieve, especially in those who have a long history of obesity. The difficulties faced by overweight and obese patients in achieving and maintaining lower weight should be recognised and

discussed[336,433–436]. Gradual weight loss should be recommended, with limited targets over time. Psychological factors associated with overweight and obesity should be explored and the development of a supportive environment encouraged for those seeking to lose weight. Behavioural interventions can be effective for overweight cardiac patients, as discussed in Chapter 12. Such interventions are probably best implemented by a psychologist.

Physical inactivity

A sedentary lifestyle, with little or no physical activity during leisure or at work, is a risk factor for the development and progress of cardiovascular disease, almost as potent as raised blood pressure or lipid levels[191]. The role of a sedentary lifestyle as a risk factor for the development and progression of cardiovascular disease should be explained and the benefits of physical activity emphasised. Education is required concerning the need for lifetime physical activity, in addition to participation in exercise sessions during the rehabilitation program. Patients should be reassured regarding the safety and ease of undertaking physical activity outside the rehabilitation class. It should be emphasised that major health benefits can be achieved through light to moderate activity and that high intensity exercise is not necessary[191,212,214,437]. Weekly utilisation of 1,500 to 2,200 kilocalories above the caloric utilisation of sedentary living achieves considerable protective benefit[105]. Low or moderate levels of daily activity are readily embraced by patients during convalescence after acute cardiac events, as well as by patients with past or controlled heart failure, the obese and older men and women generally (see Chapter 8).

The cumulative benefit from all common physical activities, whether as sports, social activities (such as dancing), work or activities at home (such as housework and gardening), should be discussed. Patients should be advised that physical activity which is undertaken in several short bursts during the day (such as three walks each of 10 minutes) is as beneficial as one longer session of activity (such as a walk lasting 30 minutes)[191]. Activities which are enjoyable and which may be undertaken in company should be recommended because they are more likely to be maintained in the long term. Advice regarding physical activity should be individualised to take into account the patient's age, past habits, personal preferences and co-morbidity. For those patients who seek it, a maintained high level of activity should assure greater levels of fitness and may supply added health benefits[210,211,438].

Unfortunately, patients tend to revert to their previous sedentary habits over time. Patients need to be forewarned of the risk of such relapses. They may occur gradually or they may happen abruptly following an incidental event which may be of physical, social or psychological origin. Patient education is therefore important regarding the benefits of activity, how it may be achieved and the need for its lifelong continuation. Barriers to physical activity should be explored during group discussions and alternative approaches suggested. The level of unfitness parallels physical inactivity

as a risk[213,439,440]. Those who are unfit but who successfully increase their activity and fitness improve their prognosis compared with those who remain unfit[228].

Other modifiable risk factors

Alcohol

Excessive consumption of alcohol should be recognised as a contributor to hypertension and therefore as a risk factor for stroke[441–444]. Patients also need to understand that alcohol may adversely affect myocardial function, particularly amongst those who are hypertensive and those who have suffered myocardial infarction[445,446]. Further, alcohol may be a basis for resumption of smoking, physical inactivity or a previously unsatisfactory diet[447,448]. Patients who are aware that alcohol (whether it be red wine or any other alcoholic drink) protects against subsequent myocardial infarction[441,449–452] may use that information to increase their alcohol consumption. It is important to emphasise the multiple other hazards of exceeding the recommended daily maximum of two to four standard alcoholic drinks for men and one to two drinks for women.

Salt

Most cardiac patients leave hospital on a low salt diet. This is usually advised because of the desire to prevent fluid retention in those who had had acute myocardial infarction or coronary artery bypass surgery. Patients need to understand that a balance should be struck so that, if they are not found to have high blood pressure or incipient heart failure, then it is reasonable for them to consume a moderate amount of salt. A moderate amount of salt is already present in many foods. Hence, the general advice for all should be to avoid adding salt at the table and to minimise the addition of salt during cooking. For those who are hypertensive and found to be salt sensitive, then persistence with a low salt diet is desirable[333,453–457]. Salt excretion may be increased by diuretic treatments, but if the intake of salt is reduced, the dose of diuretic can be less.

Non-modifiable risk factors

Age, gender, family history and existing disease

Education and counselling sessions should address non-modifiable risk factors, including the increased risks of age, male gender and positive family history. The older the patient with cardiovascular disease, irrespective of gender, the greater the risk of death and disability from cardiovascular disease. The hazards of premature cardiovascular disease are greater amongst males than females. However, late onset cardiovascular disease and death from cardiovascular disease are now more common amongst females[278,458].

The use of hormone replacement therapy to reduce the risk of cardiovascular disease in women has been widely canvassed in recent years. The role of hormone

replacement therapy with oestrogen alone, as in the earlier studies in the United States of America[459–462], or with combined oestrogen/progestin regimens[463–465], should be addressed. Many female patients are aware of the reduction of mortality, cardiovascular disease episodes and acute myocardial infarction in postmenopausal women who are taking hormone replacement therapy. They are also aware of the possible benefits of hormone replacement therapy in the prevention of osteoporosis[466,467]. For many patients, these potential gains are offset by concerns regarding the increased risk of cervical cancer[463,468] and, possibly, breast cancer[469]. The mechanism whereby cardiovascular disease events and mortality are reduced through hormone replacement therapy may be largely through the beneficial effects of hormone replacement therapy on lipid levels (reducing total and LDL cholesterol, raising HDL cholesterol and other changes) and reducing fibrinogen levels, with consequent reduction in the progress of atheromatous lesions and the tendency to thrombosis[278,470]. It is further suggested that oestrogen reduces the uptake of LDL cholesterol in the arterial wall[278,471]. It is yet to be defined which patients should be treated with hormone replacement therapy, but current thinking suggests those postmenopausal patients with known cardiovascular disease who have low HDL cholesterol levels or high LDL cholesterol levels should take hormone replacement therapy[278,470].

A positive family history of cardiovascular disease is a powerful marker of risk for the development and accelerated progress of cardiovascular disease[472–475]. It has been clearly demonstrated that those with a positive family history for cardiovascular disease commonly have worse risk factor profiles in terms of lipids, blood pressure, obesity, diabetes and smoking habit, in addition to their non-modifiable genetic background[66,476–481]. Hence, risk factor modification is of greater importance in patients with a positive family history than it is for those with identified modifiable risk factors without a family history.

A past history of stroke[482], other vascular disease or diabetes mellitus[423,424,483,484] is also a powerful marker of risk for coronary heart disease and an indicator of the need for attention to all risk factors.

Behaviour change and adherence to regimens

Providing patients with information about heart disease and explaining risk factors should help patients to accept the need for changing their habits and adhering to advice in order to reduce their risk of further events. However, imparting information and increasing patients' knowledge do not necessarily produce behavioural change[311]. Skills need to be acquired to help patients make and maintain changes[404].

It is useful during education and counselling sessions to explain the usual stages of behaviour change[485,486] and to stress that lifestyle changes are difficult for many and can take some time. Education and counselling sessions can facilitate behaviour

change by increasing the patient's motivation to change, fostering positive attitudes towards change and strengthening intentions to make changes[487]. Attitudes and predictions regarding health behaviours correlate well with subsequent behaviours[488].

It is important to ask participants in the group about those aspects of their lifestyles which they are finding difficult to change. Common barriers to change should be discussed and possible ways of overcoming them explored. It is usually found during discussions that several patients face the same difficulties. Perceptions of causal factors in the development of the disease may also be relevant. For example, a belief that factors outside the patient's control (such as heredity or fate) are responsible for the disease may stop patients from addressing any lifestyle factors which may have contributed to the illness. Factors which exert a negative influence upon behaviour should be discussed, as well as perceived costs and benefits of making the recommended changes[383]. Such perceptions may significantly influence adherence to advice regarding the modification of health behaviours. It is important to challenge patients' erroneous beliefs and negative perceptions. Patients' beliefs about causal factors and the course of the illness are important predictors of adherence[385].

Self-efficacy or confidence has also been shown to exert a powerful influence upon successful behaviour change[314] and other outcomes, including resumption of work[489,490]. Psychological functioning and support from others are further important determinants of compliance[491]. In particular, spousal support increases compliance[303,309]. The benefits of social support should be addressed during group discussions[491]. For example, activities which patients can do together with their spouse or friends, such as daily walking, can facilitate adherence.

Simple behavioural strategies should be explained in lay terms. These may include determining realistic goals for change, planning ways of coping with any lapses and learning how to alter thoughts and feelings about habits which require change[404,492]. A depressed mood or perceived stress, for example, can lead to lapses, such as resumption of smoking[493]. Thus, patients need to become aware of factors which trigger mood change and plan strategies for handling such stress in a more positive way. Patients should be forewarned that lapses become more common with the passage of time[309,397]. Individual behavioural counselling may be necessary for some patients, especially those who have several changes to make.

Unfortunately, nonadherence to advice regarding behaviour change and medication is common in cardiac patients. For example, resumption of smoking among former smokers has been shown to be as high as 40–50% six to 12 months after the event[319,397,494]. Longterm nonadherence with lipid lowering medication is also high[495]. A recent Australian study showed that up to 60% of patients who had been prescribed lipid-lowering medication ceased taking their medication[496]. Fifty percent of these patients discontinued their medication within three months and 25% within one month. Common reasons for abandoning the medication were a belief that the

drug therapy was not needed or that it produced unpleasant side effects. Nonadherence with medication among heart failure patients ranges from 20% to 60%[264] and is commonly a cause of rehospitalisation. Such hospital readmissions are potentially preventable through improved patient education and comprehensive discharge planning[264]. Adherence to medication is especially important, since it has been demonstrated that nonadherence with medication has an independent effect on mortality in both men[497] and women[498]. Continuing medical supervision to encourage adherence is essential. Patients need to understand the importance of regular visits to the doctor for this reason.

Mood and emotions

Patients need to understand the typical emotional responses to an acute cardiac event. It is usual for patients to pass through a period of anxiety after their acute event[499–504], especially upon transfer to the ward and on discharge from hospital[505]. Common concerns include a fear of death, a further cardiac event, physical disability and unemployment. Physical symptoms such as palpitations, breathlessness and chest pain may be caused by anxiety, although patients may not recognise such symptoms as manifestations of anxiety. Anxious patients usually have little concentration and often fail to comprehend, accept or recall information provided in hospital[305,307]. Further, anxiety may lead to a delay in resuming activities.

Depression is also common after an acute cardiac event[360,493,502] and has been associated with increased mortality and morbidity[358,506–509] and increased costs associated with rehospitalisation[510]. In most cardiac patients, such depression is more a grief or bereavement reaction rather than a depressive illness[511,512]. It is best referred to as a "depressed mood" in which a sense of real or imagined loss is experienced. Symptoms are mostly mild and transient and their manifestations are usually subtle. A depressed mood may be experienced first in hospital. However, it typically peaks during convalescence[513]. Common symptoms of a depressed mood include an inability to concentrate, restlessness, disturbed sleep, early waking, irritability, a sense of fatigue, loss of interest and motivation, sentimentality or even tearfulness. Patients may become pessimistic about their recovery and fearful of a recurrence. Fatigue and weakness may be equated by them with heart damage greater than anticipated[504]. They may then become preoccupied with the supposed limitations of the illness. Withdrawal and irritability during convalescence are frequent symptoms of a depressed mood. Concerns are increased if there is awareness of heart action, ectopic beats or palpitation, non-cardiac or cardiac chest pains, breathlessness from hyperventilation or unfitness or of any other symptoms of physical and psychosomatic origin. It is important to explain and discuss such symptoms during group sessions. Forewarning patients that a depressed mood commonly occurs during convalescence can also be most valuable. Anxiety and depression often co-exist[513]. Several symptoms, including irritability, reduced concentration and sleep disturbances, are common to both conditions.

Patients may cope with their anxiety, depression or other symptoms by denial, convincing themselves that any problems they have are not serious and that they are not at risk of future problems. While denial may be a useful defence mechanism in the short-term for coping with anxiety and a depressed mood[514] it can exert a negative influence upon outcomes if patients cease to adhere to regimens regarding lifestyle, medication and other advice[515].

It is usual for anxiety and depression to decrease spontaneously during the months after the event[342,349,516–518], although they may persist for up to a year or more[36,501,502,519]. Studies suggest women have poorer psychological outcomes than male patients[520–524].

Early detection and management of psychological difficulties can prevent persisting disturbances. Facilitators of group sessions need to identify those at risk of continuing psychological problems and, if necessary, refer them to appropriate team members for individual assistance. Psychological difficulties persisting for several months are usually attributable to an unrecognised and untreated depressed mood[520,525], which can lead to nonadherence with advice, occupational difficulties, and marital and sexual dysfunction[309,360,385,507,520,526]. Moreover, as already stated, depression is a powerful predictor of mortality after acute myocardial infarction[527–529]. A further loss or crisis can intensify or prolong the depressed mood[530]. In some patients, the onset of depression may be delayed[531]. In these cases, the acceptance of loss and the need for change have usually been denied earlier. Those who do not display some signs of depressed mood early will often become depressed at a later stage of their recovery[530,532].

Psychological responses can be effectively addressed during group sessions by a skilful facilitator. When patients are able to disclose feelings during group sessions, identification with others who are experiencing similar problems can be a major benefit[7,309]. Recognition that problems are not unique is reassuring[7,533,534]. Facilitators of group discussions should explain that anxiety and a depressed mood are typical after acute cardiac events but that they are usually mild and transient. Fear of further cardiac episodes, anxiety about resuming work and concern about overprotectiveness in spouses may be successfully shared with others in the group. In addition to identifying with others who have similar problems, patients also gain from observing positive changes and a rapid recovery in others[7,309]. Thus, a group should ideally contain patients at all stages of recovery, including "elders" who often adopt a preceptor role for the newer group members. Discussion groups for patients can also benefit from the occasional attendance of former patients who have made a favourable adjustment. The practice of introducing successfully rehabilitated post-surgical patients to those awaiting the operation is based on the same premise.

Small groups of about six to eight are more effective than large groups for uncovering more complex emotions and concerns of patients and spouses. Where possible, small group discussions should be available as adjuncts to the larger education and counselling sessions. It is preferable for small group discussions to be facilitated by a social worker, psychologist or other qualified counsellor with appropriate training.

Psychosocial risk factors and social support

Education and counselling groups should address psychosocial risk factors, including life events, social stresses, social isolation and depression. The ways in which social support from friends and family can minimise the impact of psychosocial stress should also be discussed. Several observational and cohort studies have demonstrated that social isolation (for example, living alone, particularly without a close friend or confidant) has a marked adverse effect upon outcomes after acute myocardial infarction, including recurrent events, cardiovascular deaths and deaths from all causes[535–538]. Social stresses and life events (for example, bereavement, loss of job, movement of home) have also been shown to have a negative impact upon outcomes[535,539]. Such increased morbidity and mortality are largely independent of other risk factors and other physical indicators of prognosis. Social support has been associated with improved quality of life in cardiac patients[540,541].

The mechanisms whereby psychosocial factors affect outcomes are not known. It has been suggested that a sense of loss associated with isolation may lead to despair, depression, nonadherence with advice and abandonment of a healthy lifestyle. These patterns of psychosocial deprivation and depression are now recognised as powerful risk factors[528,529,535–538,542]. Patients with lower levels of education, occupational and socioeconomic status and income, coupled with limited control over their lives and working conditions[537,543–545], or those who live in a poor area[546], have a greater risk of poor outcomes.

The role of depression and how best to develop support structures within a community for patients with cardiovascular disease and for others in an ageing population and a deteriorating family structure is an area for significant concern and research. Potentially effective interventions remain under investigation. Patients need to understand the importance of their life's circumstances upon their health outcomes. They should be encouraged to develop personal or community linkages to acquire or maintain friendships and support[547].

Group sessions during cardiac rehabilitation programs can provide patients with considerable social support by helping them to be less self-absorbed and by giving them a feeling of being among others who are successfully coping with their illness. Participation in a group can lessen the sense of helplessness, particularly in patients who are depressed[548]. Friendships are often formed during cardiac rehabilitation programs which may be long lasting[309]. Thus, groups may be a significant source of psychosocial and motivational support[549]. Indeed, it has been suggested that much of the psychological benefit demonstrated to arise through group exercise programs may be due to the supportive effect of group activity[99]. The emotional and social support which patients receive as members of consumer groups can be invaluable during early convalescence and for many months after ambulatory programs cease.

Stress

Patients commonly attribute their cardiac illness to stress[309,385]. Stress and perceptions of the causal role of stress in the patient's illness should be explicitly addressed during group sessions, possibly together with discussion of mood and emotions. While life stress, as discussed above, has been shown to be a factor leading to adverse outcomes, this type of stress is not necessarily that which most concerns many patients. The perceived stress which patients typically describe arises from external pressures and demands, time constraints, work problems or adverse personal interactions and low levels of control over these stresses. There is some evidence that such stress may worsen prognosis[550–554]. Patients often perceive such "job stress" to be the main cause of their disease[96,309]. However, there is no substantial scientific evidence to support these views[555,556]. While "strain" may not be a significant risk, poor "control" may be so[544,545]. Such poor "job control" may be another reflection of less education, reduced job opportunities and lower socioeconomic status[557]. Nevertheless, since these concerns regarding occupational stresses are so widely held by patients, the topic needs to be discussed during group sessions. Failure to address the issue can have adverse consequences. Concern about the effects of "work stress" may lead to unemployment, whether it is the concern of the patient, spouse, other family members, workmates, foreman or employer. Patients should be encouraged to talk about how they feel about resuming work and to raise any anticipated problems. Many problems can be resolved by discussion with the patient and close family members or in the group where others may have similar concerns about their work.

Facilitators should explain the two aspects of stress: the stressor and the response to the stressor. Most important is recognition that the response to the stress may influence the progression of the patient's disease. Thus, for some, occupational or domestic stress may lead to resumption of smoking or consumption of more cigarettes, food and alcohol and to physical inactivity. Alternatively, patients may handle such stress by walking or exercising during work breaks, pacing up and down rather than sitting while working and by increasing leisure time physical activity. Some patients can face stress by "switching off" or by avoiding situations which they are aware will induce a sense of stress. Patients need to understand that the evidence for stress being directly harmful is insecure. There is some evidence that it does not contribute directly and independently to the progression of cardiovascular disease[556]. Patients may therefore accept the presence of stress, but be led to modify their responses to embrace favourable rather than harmful behaviours. Some may also be able to modify their perception of stress and their responses to stress through stress management techniques.

Although currently a less fashionable concept than previously, the Type A behaviour pattern[367,368,371,558] may be raised during group discussions, especially by those who do not have any of the standard risk factors. Facilitators should briefly explain that the concept has been largely discredited following further research[372,373,506,559–563] and

discourage patients from labelling themselves as "Type A" individuals. The concept of "hostility" as a marker or cause of risk for cardiovascular disease events[564–569] may also be addressed in the context of multiple responses to a perceived stress. Such "hostility" is associated with increased risk of all cause mortality, not cardiovascular mortality alone, and the effects appear to be mediated primarily through adverse behavioural risk factors[570].

Impact upon the spouse and family

Spouses and partners of patients should be invited to participate in the education and counselling sessions, both for their own and the patient's benefit. Spouses often receive insufficient information and support in hospital[306,571–574] or show a limited understanding of the advice and information given to them[306]. Attendance of spouses at group discussions during convalescence is highly recommended so that they can obtain valuable information about the illness and gain insights into problems experienced by patients, such as the psychological basis of patients' irritability and other symptoms. Education and counselling sessions can also provide opportunities for spouses to raise their own concerns. They commonly have many conflicting feelings about the patient's illness, including anxiety, guilt, resentment and anger[356,575,576]. Underlying their distress may be fear of a further event and possible death of the patient.

Stress reported by spouses is marked during the acute phase[572,577–579] and typically peaks during convalescence[580,581]. The practice of discharging patients early from hospital has been shown to contribute significantly to the insecurity of spouses at this time[582]. Spouses of patients who have undergone coronary artery bypass surgery commonly experience considerable stress during the waiting period which is often prolonged[583]. Anxiety in spouses may be greater than that found in patients and may persist for some time[534,577,579,580,584–589]. However, depression in spouses appears to be less marked[584]. Emotional responses of spouses should be discussed during group sessions. Other family members share similar concerns to those of spouses and can also benefit from participating in group discussions.

Marital disagreements and tensions are common during convalescence[309] and pre-existing marital problems may be exacerbated by the illness[589]. There may be marked differences between patients and spouses in their perceptions of the severity of the event, expectations of outcome, the likelihood of the patient's compliance with regimens and the level of the patient's progress[309,534]. There may also be considerable disagreement regarding the prescribed regimens, especially those concerning diet, activity levels and resumption of driving, sexual activity or work[309,587]. Awareness that they are expected to be providers of support to the patient[590] often leads spouses to become overprotective[591] so that they may attempt to limit the patient's activities[504,577–579]. Facilitators should raise this common scenario for discussion. Open

discussion can be useful to clarify regimens and to reassure spouses. It may be necessary to refer some couples with significant marital problems to a social worker or psychologist for further counselling. Separate groups for spouses are also recommended to provide support during convalescence, as discussed in Chapter 15.

Sexual activity and activities of daily living

Resumption of sexual activity may be dealt with during discussion of physical activity, resumption of car driving and other activities of daily living. Occasionally patients or spouses may initiate discussion about their fears of resuming sexual activity but usually the subject needs to be raised by the group facilitator. The main concerns of patients and spouses are time of resumption and the safety of sexual activity[592,593]. A delay in resuming sexual activity after an acute event is not uncommon[594] because of anxiety or depression. The issue of impotence may also be addressed during group discussions, since it is not an uncommon problem for male patients at this stage of their recovery[595]. It is useful to mention medications or depression as possible causes of impotence and to provide reassurance that the problem is usually temporary. Further discussion between the patient and the treating doctor should be advised. Reduced sexual activity after myocardial infarction has been shown to be significantly associated with psychological distress[596].

Patients and spouses require clear guidelines about when they can resume their usual activities safely. Discussion of such matters generally occupy much time during education and counselling groups. It is important to reduce the amount of conflicting information provided by different team members. The occupational therapist or other team member should produce written guidelines regarding resumption of car driving, housework, gardening, hobbies, recreational and other activities, based upon current recommendations. Such a document should be considered to be a general guide only. Specific advice for individual patients may vary, depending on the patient's age, physical status or other factors. Possible reasons for different guidelines given to patients should be discussed in the group. As a general rule, however, patients can use the level of their perceived exertion during exercise classes as a guide to appropriate levels of activity at home. Patients can usually resume most activities when they feel confident to do so and if they have no symptoms. If they remain in doubt, patients may undergo an exercise test to determine their capacity for resuming various activities.

Return to work

The importance of returning to work for those recently in the workforce should be emphasised regularly during the program. Discussion should cover appropriate times of resuming manual and non-manual work for medical and surgical patients and the possible benefits of returning to work initially on a part-time basis. Common occupational problems after resuming work and how to handle them should also be

covered. Such problems include fatigue, reduced concentration, irritability, interpersonal tensions and perceptions of a reduced capacity for work[96,309].

It is usually desirable for patients to resume their former job rather than to seek a new one. Anxious patients and spouses should be reassured about groundless concerns, especially fears that stress at work may cause a further cardiac event. The possibility of retirement is often entertained by patients and spouses. A decision to retire during a period of anxiety or depression after an acute event is often regretted. Patients need to understand the processes of recovery, physically and psychologically, and to be prepared to postpone retirement or other major occupational decisions until they and others feel the patient has recovered and after a trial of return to previous work, possibly modified. Open discussion of these issues is recommended so that patients can address their future with less apprehension and probably with advantageous outcomes. Additional advice from the occupational therapist about resuming work can be most helpful. If there are several patients in the program planning to resume work, a separate session dealing with work-related issues may be appropriate. Further aspects of vocational rehabilitation are discussed in Chapter 15.

CHAPTER 14
STRUCTURAL ASPECTS OF GROUP EDUCATION AND COUNSELLING PROGRAMS

In this chapter, recommendations are provided regarding structural aspects of education and counselling groups. In Australia, ambulatory programs usually last six weeks and provide weekly group education and counselling sessions. In some programs, groups take place more frequently[5,39,41]. While similar topics are addressed in most educational and counselling groups, there is considerable variation between programs in the depth and extent of information given. Further, the methods of delivery range from more didactic presentations to informal, interactive discussions.

Most studies report an individual, group, or combined approach to educating patients but few describe details of the content of the intervention or the style in which the information is delivered. Support for the recommendations made in this chapter largely come from expert opinion and consensus statements based upon general education and adult learning principles.

Group versus individual counselling

Recommendation

Education and counselling should be conducted in groups. Individual counselling should be available, if required.

Strength of evidence = 4

No study of cardiac rehabilitation has been found which compares the effectiveness of group versus individual education and counselling programs upon patient outcomes. However, studies involving other populations confirm the benefits of group approaches[597]. While specific queries and concerns of some patients require individual attention, expert opinion supports the view that most education and counselling is best delivered in a group setting. Group sessions allow patients to listen to questions asked by others which they themselves may have been too inhibited to raise. Further, group programs involve less staff time and are therefore more cost effective than individual counselling.

Principles of adult learning

Recommendation

Education groups should be based on adult learning principles and should encourage interactive discussion.

Strength of evidence = 4

The superiority of interactive discussion over didactic lectures has not been confirmed in controlled studies in cardiac rehabilitation. However, studies of other populations indicate that least is learned from didactic lectures, while most is learned from interactive group discussion[598]. Because education based upon interaction is a relatively slow method of covering a syllabus, didactic lectures followed by limited question time are commonly offered instead in cardiac rehabilitation programs. However, a guided group discussion, led by a facilitator rather than a lecturer, is the preferred method for educating cardiac patients. As such, the term "lecture" is best replaced with "group discussion". More active involvement of participants achieves better understanding and learning and provides greater opportunity for clarifying misunderstandings[599–602] and increasing self-efficacy[603]. More direct participation of patients in their own health care has been shown to influence coping and social and psychological recovery after a major cardiac event[312]. Other basic educational principles apply in conducting education groups, such as reinforcing and individualising advice, providing feedback and ensuring that the material presented is relevant to participants[321].

Range of topics

Recommendation

Education and counselling groups should aim to cover a defined range of topics during the program. However, discussion should be flexible.

Strength of evidence = 4

Each session may focus on one particular topic (see Chapter 13) or combine a number of topics. However, discussion should be sufficiently flexible for participants to raise questions on other issues of concern. The focus of discussion should be on topics of relevance and interest to the participants in the group, with the patients rather than the facilitator at the centre of the learning experience[602]. The specified topic for the discussion may occupy only part of the available time to permit open and almost free ranging discussion between patients and the facilitator or between patients. Participants should be encouraged to ask questions. Participants frequently refer to

topics mentioned in the media and ask for comments and explanation from the facilitators. Topics of particular interest to participants should be identified and addressed. While in some programs patients are advised in advance of the scheduled dates of topics for discussion, this may unfortunately lead some patients to miss certain sessions which they consider are not especially relevant to them. Participants in the group who seek to dominate discussion should be invited to see the facilitator at the conclusion of the session.

Duration and frequency of sessions

Recommendation

It is recommended that education and counselling group sessions lasting approximately 45 minutes should take place twice weekly for four to eight weeks.

Strength of evidence = 4

The optimal number, frequency and duration of group education sessions required to produce favourable effects upon knowledge, attitudes, behaviours or risk factors have not been investigated in controlled trials. However, a recent small study comparing programs held once, twice or three times per week suggests greater patient satisfaction with the amount of information provided in programs with two or more education sessions per week[7]. Based upon expert opinion and common practice, it is recommended that the "syllabus" should be covered in twice weekly sessions over four to eight weeks. Some patients prefer to continue attending group sessions beyond the end of the program to reinforce their understanding.

Time of entry to the education program

Recommendation

Patients should start attending education sessions within a week to 10 days of leaving hospital.

Strength of evidence = 4

Patients should enter the cycle of rotating education sessions at any time rather than waiting to attend a particular session first. The concept of conducting "closed" groups, whereby a group commences when sufficient numbers of new patients are recruited, is not recommended. As explained in Chapter 17, early entry to group rehabilitation programs is advised to facilitate physical recovery and to minimise psychological problems during convalescence.

Size of groups

Recommendation

The size of education groups may vary but ideally should include no more than 20 to 25 people.

Strength of evidence = 4

Education groups need to be limited to 20 to 25 people, including spouses or other family members, to maximise participation of individuals and to facilitate interactive discussion. The participants should sit in a semicircle or in groups to encourage discussion rather than in rows in a lecture theatre or room which generally inhibits individual participation. Smaller groups of six to eight are advised for more intensive counselling and exploration of attitudes and emotions.

Style and level of presentation

Recommendation

Information should be delivered using simple language, supported by appropriate audiovisual materials and teaching aids.

Strength of evidence = 4

Patients and family members may have limited education[304]. Those from non-English speaking backgrounds often have limited English. Use of complex terminology and jargon should be avoided during group education and counselling sessions. Unnecessary detail should also be avoided. Medical terms which may have been used about patients in hospital should be explained simply and clearly. Information regarding risk factors should be provided both orally and visually and should be coupled with practical advice regarding behaviour change. The learning process may be facilitated by the use of diagrams and audiovisual aids, including short videos. The use of a blackboard or whiteboard for diagrams or topics is much valued by patients. Studies have compared interventions such as prepared written materials[604], slide and sound packages[294,300] and self directed learning and management packages[605]. These studies have all shown benefits in increasing knowledge among cardiac patients. Posters on the walls are often useful. Information booklets and factsheets may be given to patients to take away to reinforce health messages, providing they are simply written and their contents appropriate for the particular group of patients (for example, patients with rheumatic heart disease usually prefer not to have information about coronary heart disease and vice versa). A resource area should be established where session materials and handouts can be stored. Some pamphlets and factsheets for patients and family members should be on display in the room used for group sessions.

Individual counselling and referrals

Recommendation

Participants requiring additional support should be identified early, referred to appropriate team members and offered individual counselling.

Strength of evidence = 4

Comprehensive assessment of the educational, psychosocial and behavioural needs of each individual patient is not feasible in most programs. However, those patients requiring additional advice or support may be identified during entry assessment to the program or later during group sessions. They should be referred for further counselling to appropriate members of the team or to another health professional in the community. In particular, additional dietary counselling is advisable for many patients, preferably together with their spouses. Such advice needs to be individualised[404]. Individual counselling regarding weight loss may also be necessary for patients who are significantly overweight or who need behavioural interventions to assist them in making other lifestyle changes. A social worker or psychologist should provide individual counselling for those with marital, sexual, financial or psychological problems. Work related counselling should ideally be given by the occupational therapist or other vocational counsellor. Patients should be referred to their general practitioner or specialist if they have concerns regarding diagnosis, symptoms, medication or other medical matters relating to their cardiac or other illness.

Protocol for education programs

Recommendation

Production of a written protocol of the education program is recommended.

Strength of evidence = 4

A written protocol for the education program is recommended to ensure key issues are addressed and to introduce some uniformity into sessions. It should contain an outline of the core content and main objectives of each session, as well as some factual information and suggestions regarding methods of delivery, appropriate audiovisual aids and suitable resources for patients. Common questions should be listed, together with appropriate answers. The availability of such a protocol would also enable different facilitators to lead sessions more readily.

Review of education program

Recommendation

The content of education programs should be subjected to periodic expert review.

Strength of evidence = 4

A review of the content of education sessions should be undertaken soon after the program begins and thereafter at intervals to ensure the accuracy and scientific validity of information in the light of changing policies and practices and the availability of new evidence. The review should be undertaken by persons with a knowledge of cardiac rehabilitation and secondary prevention and expertise in medical, educational, behavioural and psychosocial aspects of cardiovascular disease. Feedback from participants should also be sought to ensure that the education and counselling sessions are meeting their needs. Additional sessions covering topics recommended by participants should be incorporated, where possible.

Session facilitators

Recommendation

Education and counselling groups should be facilitated by different members of the multidisciplinary team.

Strength of evidence = 4

While most group sessions can be facilitated by one trained health care provider in smaller programs in rural and local communities, it is desirable in larger programs for different members of the multidisciplinary team to facilitate education sessions in turn. Specific areas of expertise of each team member are discussed in Chapter 16. Program co-ordinators should ensure that at least one other team member is able to take each education session, as well as the primary facilitator, should the need arise.

Training of facilitators

Recommendation

Facilitators should receive training covering the content of education and counselling sessions and effective methods of presenting material to groups.

Strength of evidence = 4

Professional development is recommended for team members conducting the education and counselling group sessions. Such training should cover key topics addressed in programs, ways of presenting material and suggestions regarding further resources to enhance facilitators' knowledge of the area. Health care providers working in cardiac rehabilitation should attend a short course[51], especially those planning to remain in the field and those working in remote areas. Inhouse training of team members is also advised.

CHAPTER 15
PROGRAMS FOR SPECIFIC GROUPS

Recommendation

Additional modules or separate programs tailored to the needs of specific groups are recommended.

Strength of evidence = 4

Additional modules or separate programs are required for special groups, such as patients resuming work, those who have undergone percutaneous transluminal coronary angioplasty, patients with other forms of heart disease, and those of non-English speaking or aboriginal background. Home-based programs should be provided for patients unable to attend a group program and those living in rural or remote areas with no group programs. Separate groups for spouses of patients are recommended.

Patients resuming work

Recommendation

The goal of return to work is implicit in physical, educational and psychosocial components of cardiac rehabilitation programs. Specific attention to vocational rehabilitation in recommended.

Strength of evidence = 3

All team members should reinforce the desirability of resumption of work as an expected outcome of rehabilitation for those patients previously in the workforce. Efforts to facilitate work return should begin as early as possible, since patients who delay are less likely to resume work[34,377,606]. Return to work has been shown to improve emotional well-being[377].

In assessing patients for resumption of work, the Expert Committee on Rehabilitation after Cardiovascular Diseases of the World Health Organisation[1] recommends that the following two questions should be asked early in the rehabilitation program: "What is the nature of the job to which you hope to return?" and "what is the most strenuous or demanding aspect of your job?". The exact nature of the physical demands of the job need to be assessed, preferably by the occupational therapist. General reconditioning during exercise sessions can prepare patients for resuming physically demanding work, coupled with specific muscular strength training, as discussed in Chapter 7. In this regard, repetitive exercises simulating the activities of work are recommended. However, there are commonly just a few aspects of manual occupations which require much physical effort, since most materials nowadays are handled mechanically.

Resumption of work is largely dependent upon psychological recovery and acceptance that work itself is not dangerous. Studies have found that patients' perceptions of their illness and their ability to return to work are the most significant predictors of resumption of work[344,385,607,608]. The significant role of doctors in fostering positive expectations of return to work has also been shown[609,610].

To foster greater confidence in the patient's ability to return to work, work evaluations are recommended which closely simulate work demands, such as using a shovel, lifting heavy boxes or crawling under buildings[39,381,611]. This approach is particularly helpful for patients who are anxious about resuming manual jobs. Such simulated work testing is best undertaken by an occupational therapist or another trained staff member. In some cases, it may be appropriate for a doctor to be present and for a defibrillator to be available. Satisfactory performance on such a test can help not only the patient. The doctor and employer can also be reassured that the patient is able to return to work safely. Similarly, a successful exercise test undertaken towards the end of the program can confirm fitness to return to work[39]. However, there have been few studies investigating the most effective interventions for facilitating return to work and for assisting patients to remain in work. Further research in this area is required[384].

If uncertainty about fitness for work persists, then the employer may agree to a trial at work. If the job is found to be too demanding, then modification, if feasible, may be recommended. Further assistance may be required by patients with poor motivation or other difficulties preventing resumption of work, particularly those in manual occupations who have had coronary bypass graft surgery. Work visits undertaken by the occupational therapist can often facilitate return to work. Although job opportunities may be scarce in some occupational groups, efforts should be made to find alternative employment for patients unable to resume their previous work. Referral to a special vocational rehabilitation program, such as the Commonwealth Rehabilitation Service, is recommended for such patients.

Patients who have had percutaneous transluminal coronary angioplasty (PTCA)

Recommendation

Separate programs of secondary prevention addressing behavioural change should be provided for PTCA patients. Such programs may be abbreviated and conducted outside normal working hours to facilitate attendance.

Strength of evidence = 3

In most cardiac rehabilitation programs in Australia, myocardial infarction and coronary bypass surgery patients participate in the same exercise and education sessions[5,40–41]. Patients who have undergone PTCA are also eligible to attend these group programs but frequently fail to do so[5,6,52,53]. Because PTCA patients have not usually experienced the crisis of an acute cardiac event such as myocardial infarction or coronary bypass surgery, they frequently deny any psychological difficulties or the need for a rehabilitation program, initiating fewer lifestyle changes than other cardiac patients[612]. Restenosis occurs within the first six months in over 40% of patients receiving PTCA, but is less frequent in patients where stent implantation accompanies the PTCA[613–615]. Results from randomised trials with one to five year follow-up show a significantly higher incidence of repeat revascularisation, greater prevalence of angina and greater use of medication for PTCA patients compared with those who have undergone coronary bypass surgery[616–618]. Moreover, many PTCA patients also have poor psychological outcomes, which demonstrates the need for more effective follow-up[612,619]. Importantly, return to work rates have not always met expectations, with delays in resuming work ranging from 25 days to four months[489,620,621]. If exercise testing is arranged after PTCA, it should be undertaken as soon as possible, since patients may delay their return to work until the test has been conducted[621].

A program of secondary prevention is required to encourage PTCA patients to change their behaviours in order to reduce the risk of a major cardiac event in the future[612]. In view of the low attendance rates of PTCA patients at standard cardiac rehabilitation programs, an alternative approach is required for this group of patients[612,619]. It is therefore recommended that, where possible, separate programs should be provided. They should focus, in particular on education and behavioural interventions to promote behaviour change. Such programs should preferably be made available outside working hours to enable PTCA patients who have resumed work to attend. Suitable models need to be devised and fully evaluated to determine their effectiveness for widespread implementation.

Patients with other forms of heart disease

Recommendation

Patients with other forms of heart disease may attend specific programs appropriate to their particular educational needs. Small numbers may necessitate individual rather than group education.

Strength of evidence = 4

Cardiac rehabilitation programs, designed for patients with coronary heart disease, may satisfy some of the needs of patients with other forms of heart disease such as congestive cardiac failure, rheumatic heart disease, congenital heart disease, hypertensive heart disease, cardiomyopathy and inflammatory heart diseases. However, additional or separate programs are recommended. Rehabilitation for such patients aims to achieve minimal physical, psychological and social impairment, coupled with lifestyle adjustment, to delay disease progress, disability and death. It also aims to provide education about the causes, prognosis and control of the disease[1]. Education regarding lifestyle change, stressing the importance of adherence to medication, is also essential. Most important is that sufficient support is given to ensure some optimism and hope about the future. This applies to both patient and family. For many, corrective or palliative surgery or transplantation may be offered.

Traditional advice for patients with cardiomyopathy or cardiac failure in the past included the imposition of physical restriction. This advice is now reversed. As discussed in Chapter 11, studies have now demonstrated that low intensity exercise training is safe and beneficial for such patients, both physically and psychologically. The benefits of physical activity and exercise training for patients with coronary heart disease also apply to these patients. While major changes in cardiac function are not usually expected, improvement in peripheral muscle function leads to lesser disability through raising the threshold of activity until dyspnoea or fatigue appear. While such improvement may be demonstrated during group exercise classes, it is also necessary to assure that patients and families learn and understand the benefits and safety of exercise.

Children with congenital or rheumatic heart disease may require specific educational and vocational training to assure they may achieve occupations which do not impose much physical demand.

Although patients with cardiac failure may join standard cardiac rehabilitation programs, the death rate is high in this category of patients which can be distressing to younger cardiac patients recovering from an acute event. If numbers are sufficiently large and resources are available, therefore, a separate group should be

formed. Patients with cardiomyopathy or cardiac failure are usually aware that they have a poor prognosis. They usually require individual counselling and may also benefit from participating in a special support group.

Overnututrition is a common feature among patients with coronary heart disease, manifested by overweight, obesity, insulin resistance and raised LDL cholesterol. However, the opposite may apply to patients with other forms of heart disease. Wasting is common amongst those with heart failure from all causes. Hence, dietary advice is required to assure adequate caloric and other nutritional intake.

Patients with rheumatic, congenital and other forms of heart disease, particularly those with heart failure or atrial fibrillation, require an understanding of different medications from those prescribed for patients with coronary heart disease. In particular, anticoagulant treatment, usually with warfarin, must be understood. Digoxin is taken by most patients with atrial fibrillation and by many others. The prevention and management of heart failure is of major importance in these patients. Angiotensin converting enzyme inhibitors and diuretics are usually taken on a long term basis. Thus, the need for balance of medication effects and fluid intake must be understood. Some patients need to learn how to steer a course between fluid retention, on one hand, and hypovolaemia and syncope on the other[622,623].

Patients with rheumatic heart disease must understand the need for longterm penicillin prophylaxis against further episodes of rheumatic fever and the need for antibiotic prophylactic cover to prevent infective endocarditis following dental and other procedures.

Younger patients

Recommendation

While younger patients may benefit from separate exercise classes, they may be enrolled in the same education groups with older patients.

Strength of evidence = 4

According to anecdotal evidence, younger patients frequently state that they dislike exercising in groups which include many older patients and may, therefore, drop out from programs prematurely[6]. If a number of younger patients enrol in the rehabilitation program, a separate exercise session for them is desirable. However, their educational needs may be largely met in a standard education group.

Patients of non-English speaking background

Recommendation

Patients of non-English speaking background should be encouraged to attend cardiac rehabilitation programs. Separate programs conducted in other languages are recommended, especially for education sessions. These programs may be delivered on a regional basis. Individual counselling, together with an interpreter, should be provided where necessary.

Strength of evidence = 3

A significant proportion of patients with limited English fail to attend cardiac rehabilitation programs[5,6,52], commonly because of language barriers and cultural attitudes. Such patients may not be invited or they might not fully comprehend the referral arrangements or the nature of the program[624]. In some cultures, there may also be a reluctance to participate in a health education program of any kind, especially one conducted in a mixed group. Patients who have some command of English can achieve considerable benefits from participating in an exercise program. However, surveys show that in general, the needs of patients of non-English speaking background are not adequately met by standard rehabilitation programs[5,7]. Thus, consideration should be given to the establishment of separate educational programs for different groups which are culturally relevant and which can be conducted in their own languages. This is especially necessary for the delivery of educational health messages, particularly dietary advice[404]. The specific requirements and preferences of each ethnic group should be carefully investigated before setting up such programs. Consumer advisory groups may assist in confirming the cultural appropriateness of such ethnospecific cardiac rehabilitation programs. Similarly, the production of literature in other languages should be preceded by examination of the needs of each group. Staff working with patients of non-English speaking backgrounds should seek to understand the cultural beliefs and practices of different ethnic groups. Ideally, ethnic specific groups should be conducted in collaboration with local ethnic communities, possibly in conjunction with a local community health service. Interpreters should be available in hospital to explain follow-up procedures and the need for rehabilitation to patients of non-English speaking backgrounds.

Aboriginal Australians with heart disease

Recommendation

Separate, culturally appropriate programs delivered by aboriginal health workers should be provided for aboriginal cardiac patients.

Strength of evidence = 3

Aboriginal Australians die from cardiovascular disease at approximately twice the rate of the total Australian population[458]. Several behavioural risk factors for cardiovascular disease are known to be more prevalent among aboriginal Australians than non-aboriginal Australians, especially diabetes and smoking. In a study of a rural community, aboriginal people were more likely to be smokers and not to participate in vigorous exercise than the general population living in capital cities[625]. About 60% of aboriginal males and 57% of aboriginal females are classified as overweight or obese[57]. Results of a survey in one region suggest that hypertension is two to three times more prevalent among aboriginal people than the general Australian population[626]. The National Health Priority Areas Report on Cardiovascular Health (1998)[627] recommends that risk factors among aboriginal men and women should be assessed and appropriate preventive health services introduced and integrated into primary health care. The incidence of rheumatic heart disease among aboriginal Australians living in remote areas is currently the highest in the world[628].

Major problems confronting aboriginal Australians include poverty, lower education, poor health status and cultural and racial barriers. These make access to mainstream prevention and treatment services difficult for aboriginal people. In remote areas, these problems are exacerbated by distance. Many of the problems of aboriginal Australians appear similar to those of native North Americans[629–635].

Anecdotal evidence indicates that standard cardiac rehabilitation and secondary prevention programs are not suitable for aboriginal patients[5,40,41,51], who rarely attend available programs. Separate, culturally relevant programs should be devised and aboriginal communities should be involved in the development of such programs[636–639], together with representatives of peak Aboriginal bodies.

As a first step, an assessment should be made of the knowledge of aboriginal health workers concerning coronary heart disease and cardiac rehabilitation. Appropriate training should be available for aboriginal health workers to deliver programs for aboriginal cardiac patients. The content and method of delivering health education to aboriginal health workers needs to take into account the learning styles and environmental and cultural differences of aboriginal people. Health workers in mainstream services in rural and remote Australia should acquire the necessary cross cultural skills to work effectively with aboriginal people.

Patients from rural and remote areas and others unable to attend a group program

Recommendation

Patients in rural areas should attend a group program if one is available in the region. Otherwise, individual follow-up should be provided by general practitioners and nurses, with regular telephone contact and use of appropriate self-help resources.

Strength of evidence = 4

The number of cardiac rehabilitation programs is rapidly increasing throughout urban and rural Australia[5,40,41,640]. However, patients living in rural and remote areas may nevertheless find it difficult to attend a program because of distance from the program venue. There may be other patients as well who find it impossible to attend a group cardiac rehabilitation program, even if one is available locally, because of illness or other commitments[624]. For such patients, suitable audiovisual resources should be provided, including a sheet of home exercises, booklets, tapes or videos about heart disease, symptom management, lifestyle change, risk factor modification and advice regarding resumption of activities of daily living. Such self-help programs have been found to be effective[352]. A manual has recently been produced to guide rural nurses counselling cardiac patients in remote areas in Australia[641]. If feasible, home visits by a community nurse should be offered[5,6,171].

Outreach programs have been developed in the United Kingdom in recent years to provide cardiac rehabilitation to rural patients and spouses. In one such program, patients are given a heart manual in hospital and during the first six weeks after leaving hospital, patients work through the manual under the supervision of a nurse facilitator[642]. Patients are telephoned or visited during this period. They are then automatically referred to an assessment clinic run by cardiologists. Patients found to be still anxious or depressed are referred for assistance. The program is considered beneficial for more remote dwellers who receive support and continuity of care from primary care staff who often have detailed knowledge of the family.

In some parts of rural Australia, outreach programs have been recently introduced by Divisions of General Practice which involve regular follow-up of individual cardiac patients by general practitioners[643]. These outreach rehabilitation programs are based on the concepts of low intensity, home based exercise and general practice supervised rehabilitation. Patients are supported with an education manual addressing recovery issues, exercise and medication. Patients visit their general practitioner within the first week of hospital discharge and then weekly or fortnightly for the next eight weeks.

While such programs provide patients living in remote areas with much needed advice and guidance, they do not provide peer support which is a major benefit of group programs. If another non-cardiac community program is available which provides group physical activity and/or health education, patients should be encouraged to attend it so that they may achieve some of the psychological and social advantages of interaction with others.

Telephone calls from hospital staff soon after hospital discharge and at intervals during the next six or 12 months are also recommended for ongoing support and to provide advice, if required. Studies have demonstrated the effectiveness of providing education and support to cardiac patients by telephone[644]. Significantly improved outcomes in preventive care were demonstrated in one study involving telephone support to cardiac and other patients[645], and in another, improved knowledge about coronary heart disease, self care and regimens was found[295]. Telephone and mail follow-up by nurses significantly improved smoking habits, cholesterol levels and functional capacities in patients enrolled in a recent randomised controlled study[104]. Such telephone follow-up of patients may reduce medical costs as well as achieving improved medical outcomes[646].

The feasibility of establishing telephone networks with other cardiac patients should also be determined, especially in remote areas, to provide peer support. Similar telephone networks could also be used by health practitioners to provide education and counselling to a small group of individual patients linked by telephone. Further, telephone communication between groups of rural practitioners may be beneficial to provide support and to facilitate exchange of ideas about effective methods of cardiac rehabilitation for rural and remote patients. Other technologies may also be useful, including video conferencing, the internet and CD ROM programs. Isolation and limited access to continuing education have been cited as major problems among practitioners in rural areas[5,6,51].

Spouses of patients

Recommendation

Spouses should be invited to attend the program and encouraged to participate in exercise and education groups. Individual counselling should be available, as required. In addition, separate spouse groups are recommended.

Strength of evidence = 3

As stated in Chapter 13, spouses of cardiac patients often experience much emotional distress during the acute phase of the illness and during convalescence. Longterm studies also report that female spouses continue to have more responsibilities than

before the event and enjoy less leisure and social activities[309,586]. Since the attitudes and behaviours of spouses are important determinants of the rate and extent of patients' recovery[647], the effects of a cardiac illness upon spouses must be considered. Wives with poor coping capacities[648], dependent personalities[589] and fewer perceived sources of support[649] are particularly vulnerable to distress and may require considerable assistance. Younger spouses who are in the workforce and those from a non-English background may also experience major difficulties[309]. The effects of a cardiac illness upon male spouses has been little studied[282].

Anxiety of spouses in hospital can be reduced by frequent information and reassurance about the patient's condition[650] and written information about the illness[572]. Family conferences before the patient's discharge from hospital may also be helpful[651,652]. For surgical patients, pre-operative counselling for both patients and spouses is highly recommended[583]. Individual counselling of couples in hospital has been shown to be effective in reducing anxiety of spouses, with benefits persisting up to six months[584]. In another study, spouses who had access to a counsellor and who received a booklet reported less anxiety than others[653].

The support of spouses during convalescence is best achieved through their participation in an outpatient group rehabilitation program. In addition to participating in education and exercise groups with the patients, group sessions for spouses alone may also be effective in meeting spouses' needs for further information and for reducing their emotional distress[356,534,654].

Discrepancies between patient and spouse concerning the patient's abilities can have a negative impact upon the patient's recovery[309,534,577]. Nevertheless, perceptions of spouses regarding the patient's capacity can be modified. In one study, spouses were randomly assigned either to participating in an exercise test, observing their husbands' undergoing the test or to a control group of spouses who waited outside the exercise testing room[380]. The perceptions of the patients' exercise capacities of those spouses who underwent an exercise test themselves were similar to those of the patients. Spouses who merely observed the test were less confident than the patients about the patients' capacities, while those spouses who remained outside the room were the least confident.

In another randomised study involving patients and spouses, training in cardiopulmonary resuscitation was provided to spouses[655]. However, results showed that patients of spouses in the intervention group were significantly more anxious three months after acute myocardial infarction and had a poorer overall adjustment to their illness at six months.

While some studies have produced favourable outcomes, further research is required to develop and evaluate effective interventions to assist spouses of patients who have had an acute cardiac event.

CHAPTER 16
CARDIAC REHABILITATION TEAMS

The recommended model for ambulatory cardiac rehabilitation and secondary prevention programs is based upon groups, with input from a variety of health professionals. This chapter outlines the main functions of each team member. Program co-ordination, team meetings, staff training and core competencies are also addressed. Recommendations are largely based upon consensus statements of practitioners who participated in a series of focus group discussions[6]. They are consistent with recommendations of other bodies[1,69,70].

Membership

Recommendation

Ambulatory cardiac rehabilitation and secondary prevention programs should be conducted by a multidisciplinary team.

Strength of evidence = 4

Minimum standards for ambulatory cardiac rehabilitation and secondary prevention programs in Australia[79] state that programs may be conducted by one single health practitioner with back-up from other local or regional health practitioners, where available, consistent with recommendations for a "basic" facility of the World Health Organisation Expert Committee on Rehabilitation after Cardiovascular Diseases[1]. This approach has been demonstrated to be feasible in small Australian rural communities where staffing is limited and patient numbers are low[5,41]. However, the recommendation for best practice cardiac rehabilitation in metropolitan areas and larger rural centres is for programs to be conducted by a multidisciplinary team of health professionals[656,657], in accordance with recommendations for an "intermediate" facility of the World Health Organisation Expert Committee on Rehabilitation after Cardiovascular Diseases[1]. The team should include a nurse, physiotherapist, dietitian, occupational therapist, social worker, psychologist, cardiologist, cardiac surgeon and general practitioner. Others who may participate as members of the team include an exercise physiologist, physical educator, diabetes educator, welfare worker,

pharmacist, psychiatrist, vocational counsellor, ethnic health worker, ambulance officer and pastoral care worker.

Roles of team members

Recommendation

Special areas of expertise amongst team members should be recognised.

Strength of evidence = 4

While many tasks can be shared by more than one member of the team, some tasks require specific skills and training and should be performed by the appropriate, designated health professional. Team members have different backgrounds and training and therefore different areas of expertise. It is important to determine in advance those tasks which should be undertaken by a designated team member and those which may be shared by several team members. Failure to do so can create tension within the team. Activities such as processing referrals, co-ordinating programs and following up patients after program discharge may be allocated to any team member who has good organisational and interpersonal skills and sufficient time available to carry out these duties.

Nurse

Recommendation

Nurses fulfil a range of functions in cardiac rehabilitation and secondary prevention programs and should be considered key members of the team.

Strength of evidence = 4

Nurses are involved in most ambulatory cardiac rehabilitation and secondary prevention programs throughout Australia. In their view, one of their important roles is to detect medical and other problems which become apparent during the program and to refer patients to other health care providers, when required[6,658]. Nurses are also extensively involved in patient education. They commonly facilitate group discussions on heart disease, risk factors for cardiovascular disease and other medical topics. In many smaller hospitals and community health centres, especially in rural areas, nurses are responsible for a greater range of activities, including conducting exercise sessions and recruiting patients to programs[5]. Whereas some teams members rotate for a short time through a particular service in the hospital or attend outpatient programs only for specified sessions, nurses often attend patients from the time of the patients' admission to hospital. Nurses therefore provide continuity for patients after

discharge from hospital and are often perceived by patients to be the program co-ordinator. Nurses also consider they are best suited to the co-ordinating role because they are multiskilled and have an overall perspective of patients' problems. Nurses co-ordinate 72% of programs in Victoria[5]. A similar pattern prevails nationally[41].

Physiotherapist

Recommendation

The physiotherapist should assess the physical needs of patients, devise exercise programs tailored to meet the requirements of the individual patient and supervise the exercise sessions.

Strength of evidence = 4

The physiotherapist is mainly concerned with the physical aspects of the patient's recovery. Specific roles of the physiotherapist include assessing the physical needs and cardiovascular fitness of patients at entry to the program , prescribing exercise to minimise the deconditioning effects of physical inactivity and promoting reconditioning. The exercise program needs to be flexible and adapted to the needs of the individual patient. It should aim to facilitate recovery to a level necessary for patients to resume their work and other activities of daily living. The physiotherapist is considered best equipped to design and conduct exercise sessions. In 52% of Victorian programs, the physiotherapist supervises the exercise sessions[5].

While focusing particularly upon the patients' physical needs, the physiotherapist should also address emotional concerns of patients and explore any perceived barriers to exercise. For those patients who have been almost totally inactive, the physiotherapist needs to design an acceptable exercise program, encouraging such patients to initiate and continue the recommended exercises. According to physiotherapists, patients enjoy exercise sessions and place great importance upon what they can do physically. Exercise is viewed by patients as something which is tangible, measurable and understandable[6,7].

Other key roles of the physiotherapist include monitoring patients during exercise sessions. Pains and other physical problems reported by patients need to be assessed by the physiotherapist. The physiotherapist should provide practical advice to patients about what they can and cannot do safely, including any sporting activities. Patients seeking to exercise at high levels require particular attention and usually require medical clearance. Such patients may benefit from referral to a trained exercise therapist.

The physiotherapist may play a useful role in addressing the work requirements of patients, especially if the job is physically demanding. In this respect, the role of the

physiotherapist may overlap to some extent with that of the occupational therapist. To minimise role conflict, each team should determine which health professional has more appropriate skills for the tasks involved in promoting the physical rehabilitation of patients and allocate roles accordingly.

Dietitian

Recommendation

The dietitian is an essential member of the team, undertaking group and individual counselling about nutrition and appropriate dietary habits.

Strength of evidence = 4

Although patients receive some dietary information in hospital, dietary advice is best provided by the dietitian during the outpatient program when more time is available to follow-up advice given in hospital. Discussion over a period of weeks is highly desirable to address individual queries, especially from those with limited ability to comprehend dietary information. Moreover, several dietary sessions are recommended, because patients are generally unable to absorb all the necessary information at once.

Nearly all ambulatory programs throughout Australia involve a dietitian but the extent of the dietitian's input varies considerably between programs[5,41]. In some programs, dietitians facilitate several sessions[39], whereas in other programs, only one session is devoted specifically to dietary issues. Research findings suggest that cardiac patients generally want more dietary advice than they currently receive[7].

Regardless of their cholesterol levels, patients require counselling about healthy dietary habits and explanations about food labels in order to make informed choices about their diet. Practical advice about the preparation of food is also vital. Dietary information needs to be realistic, simply presented and easy to follow. The dietitian needs to provide individualised advice, where possible. Information provided in a group setting can be confusing if there is a significant disparity in the ages and cultural backgrounds of participants. For example, information for an overweight, prediabetic 40 year old patient with lipid abnormality might be quite inappropriate for a 70 year old female with average lipid levels whose major risk factor was hypertension. According to dietitians, general practitioners tend to give the same advice to all patients[6]. For example, they may prescribe unnecessarily restrictive low fat diets to elderly, female patients whose cholesterol is above some publicised, arbitrary cutpoint (such as 5.5 mMol/L) and give no advice to a young man whose cholesterol level is below the same cutpoint.

Referral of patients from non-English speaking backgrounds to dietitians of similar ethnic origin is desirable. Apart from language barriers, most dietary information available to cardiac patients remains oriented towards Australian habits and thus may not be relevant to patients from other cultures. Dietitians from other ethnic backgrounds may be employed at community health centres or attached to general medical practice in the region.

An important function of the dietitian is to clarify misconceptions about diet and nutrition. Team members agree that there is considerable confusion in the community, among health care providers, and even among dietitians themselves, about dietary guidelines. Moreover, guidelines seem to change intermittently. As a result, patients receive conflicting dietary advice from different health care providers[6] and are understandably confused about which advice they should follow.

According to dietitians, dietary advice provided by general practitioners and nurses, in particular, is often at variance with advice given by dietitians[6]. To avoid conflicting and inaccurate dietary information being imparted by different members of the team, dietitians need to ensure that all team members follow the same general guidelines concerning diet and reinforce the dietitian's advice. To encourage more consistent and relevant dietary advice to patients, it is desirable for team members to receive regular inhouse training and updating regarding appropriate dietary advice for cardiac patients. The problem could be minimised further by having regular team meetings and producing or having available written guidelines and formal protocols for nutritional education sessions. Specific dietary advice should be delegated to the dietitian, with other team members providing general information only.

Counselling regarding weight loss may also need to be individualised and appropriate. Dietitians expressed concern that other team members commonly provide incorrect information about weight loss and recommend fad diets to patients, putting pressure on them to lose weight quickly when slow loss is considered more appropriate[6].

Occupational therapist

Recommendation

The occupational therapist has important roles in the team, especially in facilitating return to work and assisting the patient to function effectively and independently.

Strength of evidence = 4

The occupational therapist's role in cardiac rehabilitation programs is oriented towards assisting the patient to function effectively and independently in employment, family, social and recreational activities. Where this is not possible or appropriate, the occupational therapist should assist the patient to live as productive a life as possible within any constraints imposed by disablement.

The occupational therapist has specific training to undertake vocational assessments to determine the feasibility and capacity of the patient to resume work at a reasonable level of physical or other occupational demand. To prepare the patient for resuming work, the occupational therapist undertakes work conditioning and, if required, may also conduct simulated work tests, liaise with the employer and visit the worksite[611]. Occupational therapists state that doctors are often unaware of the nature of the patients' jobs and may give the patient inappropriate advice about resuming work. Thus, communication is recommended between the treating physician and the occupational therapist regarding plans for return to work.

The occupational therapist also assesses the patient's functional status and potential for resuming usual activities of daily living. Leisure and social activities are assessed. Realistic goals are set and activities are prescribed which are functionally based. The skills acquired by the patient can then be transferred to the home or work setting.

The roles of the occupational therapist are poorly defined[659] and are commonly misunderstood by other team members[6,40,41]. While occupational therapists have a particular role in facilitating occupational recovery of the patient, their training is broadly based and they can contribute to the program in several areas and back up other staff[660]. For example, stress management sessions are sometimes conducted by the occupational therapist[5,6,41]. Occupational therapists are involved in patient education and counselling and are trained in group dynamics and facilitating groups. In some programs, the occupational therapist participates in the group exercise sessions[5,41]. Occasionally the occupational therapist co-ordinates the overall program[5,41]. It is important for other team members to refer patients to the occupational therapist, if there are perceived occupational problems.

Although the roles of the occupational therapist and physiotherapist may overlap, their primary functions differ, with the physiotherapist using exercise and physical

modalities to improve physical status, while the occupational therapist's approach is a functional one, which applies the patient's skills to perform a wide range of activities of daily living or at work. However, as revealed by surveys of cardiac rehabilitation programs, many tasks may be undertaken by either team member[5,40,41]. Typically, however, the occupational therapist is more involved in the later stages of the patient's recovery rather than in hospital.

Social worker

Recommendation

The social worker plays an important role in the team by promoting the psychosocial recovery of the patient and supporting the patient's family.

Strength of evidence = 4

The social worker can make an important contribution to the psychosocial adaptation of the patient and family through education and intervention[661,662]. The social worker's primary role is to detect any psychological or social problems and to undertake counselling, if required.

Issues commonly addressed during counselling include grief and stages of loss; the development of coping strategies to handle emotional responses such as anxiety and depression; the impact of the illness on the family; and sexual activity, a concern commonly raised with the social worker during individual counselling rather than with other team members, and return to work and the future. Ideally, the social worker should have access to patients in hospital to assess the need for counselling, rather than awaiting referral from other staff. Detection of psychosocial problems may be difficult because of their subtle presentation.

In many programs, the social worker is responsible for attending to the practical needs of patients including discussion of the patient's financial status, and where necessary, facilitating the patient's access to social security benefits, liaising with employers and arranging for interpreters[5,40,41,663]. The social worker may also facilitate access to community services such as meals on wheels and home care nursing agencies. In some hospitals, these functions may be carried out by a welfare worker.

The social worker also has an important linking function[661,663], communicating with patient's spouse and family, especially during the acute phase of the illness, and offering assistance. A family meeting may be organised by the social worker to assess and assist with the patient's and family's adaptation to the illness[651]. Another useful role played by the social worker is to organise and conduct separate spouse groups during convalescence to address any psychological problems and concerns they may

have. The social worker may also follow up the patient during convalescence and, if the patient dies, offer support to the spouse.

Greater involvement of the social worker in addressing the needs of special groups is recommended. Such groups include those patients from other cultures and those who are insecure about resuming work. The social worker can make a positive contribution to teamwork by providing feedback about how the patient is coping with the illness. Instructing patients in stress management and relaxation techniques may also be undertaken by the social worker.

While the social worker's role is especially important during the acute phase, some emotional, family and other problems may only become apparent during convalescence. Thus, it is essential for a social worker to be involved in the ambulatory program. Social workers perceive that, unfortunately, there is a far greater emphasis upon the physical aspects of rehabilitation during outpatient programs, with insufficient time allocated to psychosocial aspects[6]. This deficiency is becoming more pronounced with shortened hospital stays. At present, social workers participate in 56% of the education groups provided in Victorian ambulatory programs.

Social workers report that doctors and other members of the team do not always understand the roles of the social worker, often encroaching upon their territory without the necessary skills to do so[6]. They state that while nurses may undertake counselling of patients, they are more limited in their approach. Welfare workers also counsel patients but have relatively little training to do so. According to social workers, welfare workers are less aware of the dynamics of psychosocial aspects of rehabilitation[6]. Apart from the psychiatrist and psychologist, the social worker is the only member of the team with training in psychosocial counselling in individual, group and family settings.

Psychologist

Recommendation

The psychologist should be involved in cardiac rehabilitation and secondary prevention programs to assist with psychosocial aspects of the patient's rehabilitation and to facilitate behavioural changes.

Strength of evidence = 4

Psychologists have a role in conducting relaxation or stress management sessions[664,665]. The psychologist may also be trained in individual and group counselling and can therefore facilitate sessions with patients and spouses[666]. In undertaking counselling and stress management, the psychologist's role overlaps to some extent with that of the social worker and the occupational therapist. The roles of the psychologist may

also include assessing the psychological status or cognitive functioning of cardiac patients and relaying the results to the doctor and other team members. Such information can be useful in developing the patient's rehabilitation plan. Relatively few cardiac rehabilitation and secondary prevention programs in Australia include a psychologist at present[5,41] and their involvement in programs in European countries varies considerably[667]. However, clinical psychologists can also make a significant contribution by using behavioural strategies to help patients acquire skills to change and maintain healthier behaviours. This aspect of secondary prevention needs further development in cardiac rehabilitation programs. Psychologists should be more extensively involved in programs to address this need.

Cardiologist

Recommendation

The cardiologist should define the medical parameters of the program, review the medical content, encourage patients to attend the program, facilitate the roles of other team members and support the program.

Strength of evidence = 4

Cardiac rehabilitation and secondary prevention programs include a significant component of education concerning medical topics, as discussed in Chapter 13. These topics include cardiovascular disease risk factors, the development of coronary heart disease, acute cardiac events, procedures and investigations. It is essential that patients and family members receive accurate medical information from team members. Thus, the cardiologist should define the medical parameters of the program from the outset, reviewing the medical content at intervals to ensure information is current and accurate. Some cardiologists have expressed concern that inaccurate medical information is given by nurses and allied health workers during cardiac rehabilitation and secondary prevention programs[6]. Further, they maintain that restrictive dietary advice is often given to patients by nurses and that information provided to patients by general practitioners often conflicts with advice from cardiologists. Better communication between cardiologists, general practitioners and other team members could minimise the amount of conflicting and inappropriate advice, as recommended in Chapter 17.

While cardiologists do not generally play an active role in group cardiac rehabilitation programs[276], they can make a significant contribution by referring patients to programs, encouraging them to attend, enquiring about the patient's progress at the program and supporting the roles of other team members[668].

Where possible, it is highly desirable for the cardiologist to facilitate an occasional group discussion during the outpatient program. Occasional brief visits by the

cardiologist to a group discussion or an exercise session are also much appreciated by patients[6]. Patients perceive the cardiologist as an authoritative figure. The cardiologist's participation in, or visit to, the group enhances patients' acceptance of the program as being important to their recovery. Further, the cardiologist should supervise the discharge review and, if undertaken, the discharge exercise test. In some larger city hospitals, the registrar or resident may participate in place of the cardiologist[5].

In a few programs, a cardiologist with a special interest in cardiac rehabilitation may be appointed as Director of Cardiac Rehabilitation. However, such programs are usually managed by an appointed co-ordinator.

Although most hospitals have a policy of automatic referral of eligible patients to ambulatory programs[5,41], some cardiologists claim that certain patients (such as those with atypical chest pain with no confirmed diagnosis of coronary heart disease) who are unsuitable for the program are sometimes enrolled by nurses or other team members[6]. If cardiologists consider certain individual patients unsuitable for rehabilitation, they should advise the program co-ordinator and include a written note to this effect in the patient's medical records.

Cardiac surgeon

Recommendation

The cardiac surgeon should support cardiac rehabilitation and secondary prevention programs by referring patients and encouraging them to attend.

Strength of evidence = 4

While cardiac surgeons do not actively participate in cardiac rehabilitation and secondary prevention programs in Australia[5,40], they should endorse the program, referring patients and encouraging them to attend. Most cardiac surgeons endorse automatic referral of almost all patients who have undergone coronary artery bypass surgery[6].

General practitioner

Recommendation

The general practitioner should refer patients to group rehabilitation programs and manage the long-term medical follow-up of patients.

Strength of evidence = 4

Referral to an ambulatory rehabilitation program should be organised before the patient is discharged from hospital. However, the general practitioner should confirm referral to the program at the patient's first visit and encourage the patient to attend[276]. Failure of medical practitioners to advise or encourage patients to attend a cardiac rehabilitation and secondary prevention program is a major reason for poor participation rates[6,40,288]. According to one study, the strength of the primary physician's recommendation to attend a cardiac rehabilitation program was the most powerful predictor of attendance[288]. The general practitioner should reinforce the goals of rehabilitation, ensuring that the patient understands the expected benefits of the program and the functions of other team members. To fulfil these roles adequately, the general practitioner needs sufficient information about the aims and content of cardiac rehabilitation and secondary prevention programs. As recommended in the following chapter, information about available programs should be circulated to general practitioners.

General practitioners consider that their role in cardiac rehabilitation has been limited to date and that they are underutilised as a resource[6]. In their opinion, cardiac rehabilitation offers opportunities for a shared care approach in which their input could be very valuable. While recognising that the cardiologist is in charge of the medical management of patients in hospital, the general practitioner is in an ideal position to put follow-up plans into action and to coordinate the patient's medical management after discharge from hospital. To maximise the contribution of the general practitioner, the cardiologist should involve the general practitioner in the early stages of each patient's recovery and provide clear guidelines on how to manage patients following their acute events[6]. Follow-up of patients by the general practitioner may be further improved if the general practitioner was informed of the patient's admission to hospital and was able to visit the patient in hospital.

The general practitioner is primarily responsible for the long-term medical follow-up of patients and for assisting patients to maintain healthy lifestyle changes[669–671]. Thus, the general practitioner has an important educational role, especially after the patient completes the ambulatory group program. The program co-ordinator should ensure that the general practitioner receives a discharge summary about what the patient has achieved at the program. Any difficulties the patient is experiencing on completion of the program should also be communicated. This information should be sent to the

general practitioner directly, as well as recorded on a card for the patient to take to the general practitioner. A patient held record may encourage patients to take increased responsibility for their health. Early communication with the general practitioner should minimise the likelihood of patients receiving conflicting information.

The general practitioner has continuing responsibility for ensuring that there is longterm satisfactory control of patients' symptoms, lipids, smoking habit, blood pressure, diabetes, weight and well-being. This may necessitate intermittent or regular testing, as indicated by national or other current guidelines.

Team members should emphasise the importance of the general practitioner's role and encourage patients to see their general practitioner at regular intervals. While the general practitioner is often close to the patient and family, other health care providers may have more time to devote to handling the patient's nutritional, psychosocial and other concerns. The general practitioner should refer the patient to other health care providers, such as dietitians and social workers, as required[6].

In a few programs in Australia, especially in community settings, a general practitioner facilitates occasional education group discussions at cardiac rehabilitation and secondary prevention programs[5,40]. However, as a general rule, it may not be feasible for the general practitioner to be an active participant in the group program because of time constraints[6].

Exercise physiologist

Recommendation

The exercise physiologist has advanced training in exercise prescription and should design and conduct exercise sessions which involve high intensity exercise training.

Strength of evidence = 4

In a few parts of Australia, an exercise physiologist conducts exercise sessions instead of a physiotherapist[40–41]. Exercise physiologists are more likely to be employed in exercise programs providing high intensity exercise training.

Exercise therapist

Recommendation

An appropriately trained exercise therapist may conduct exercise sessions as part of ambulatory cardiac rehabilitation and secondary prevention programs.

Strength of evidence = 4

A physical educator may conduct exercise sessions and supervise patients with cardiovascular disease, providing appropriate additional training has been obtained. Previous experience with cardiac patients, especially those who have recently suffered an acute cardiac event or those who are aged and infirm, is also required.

Diabetes educator

Recommendation

A diabetes educator is a valuable member of the team and may provide individual or group counselling.

Strength of evidence = 4

Many cardiac patients suffer from diabetes mellitus or are at high risk of developing diabetes because they are overweight or obese. Diabetes educators occasionally facilitate education groups in ambulatory programs but are more commonly involved in the counselling of individual patients who are referred to them by other team members[5,41].

Welfare worker

Recommendation

A welfare worker, with additional training or experience, may fulfil some of the roles of the social worker.

Strength of evidence = 4

Some hospitals employ a welfare worker as well as, or instead of, a social worker. The welfare worker's training lies more in attending to practical issues, such as arranging payment to the patient of any social security benefits and liaising with employers about matters concerning return to work[5,40]. These issues are of great importance to some patients. The welfare worker may also assist the patient with financial problems arising during periods of unemployment and provide family support.

Rehabilitation physician

Recommendation

A rehabilitation physician who has experience managing patients with cardiac illness may participate in the team conducting the cardiac rehabilitation and secondary prevention program.

Strength of evidence = 4

In some countries, the rehabilitation physician is actively involved in inpatient and ambulatory cardiac rehabilitation programs. In Australia, however, the rehabilitation physician is rarely involved in programs conducted during convalescence, apart from a few which are provided for patients admitted to rehabilitation hospitals[5,40,41].

Pharmacist

Recommendation

The pharmacist can play an important role by providing information and advice to the patient regarding medications and encouraging compliance with regimens.

Strength of evidence = 4

Patients attending cardiac rehabilitation programs typically have many questions concerning the purpose of their medications and common side effects. These issues can be effectively addressed either by a pharmacist, doctor or nurse, providing that simple terms are used and complex pharmacological jargon avoided. Pharmacists are currently involved in 65% of ambulatory programs in Victoria. In country programs, pharmacists facilitate education groups more frequently than in metropolitan centres[5].

Psychiatrist

Recommendation

A psychiatrist should be available to the team for referral of cardiac patients with psychiatric problems.

Strength of evidence = 4

The psychiatrist's role in cardiac rehabilitation programs is primarily to manage patients with a psychiatric illness or psychiatric symptoms. Psychiatric referrals are appropriate only for a minority of patients, such as those with a premorbid

psychiatric illness which is exacerbated by the cardiac event or illness[672]. The social worker, psychologist and other staff trained or experienced in counselling are able to help most patients who are experiencing psychological problems, referring them to a psychiatrist if it is indicated.

Vocational counsellor

Recommendation

A vocational counsellor should be available to team members for referral of patients requiring vocational advice, support and possible retraining.

Strength of evidence = 4

As discussed in Chapter 15, patients who need specialised vocational counselling may be referred to special vocational rehabilitation centres in the region, such as Commonwealth rehabilitation centres. Here they are prescribed an exercise program specifically tailored to their job requirements. They also receive help in resuming work or finding new employment. For most cardiac patients, however, assistance from an occupational therapist is usually adequate.

Community health worker

Recommendation

The community health worker can provide ongoing support to patients and families, especially during later stages of the patient's recovery.

Strength of evidence = 4

The community health worker commonly has a nursing background and is generally multiskilled. He or she can provide ongoing support and assistance to patients and families, referring to other health care providers, as required. Teams delivering hospital-based cardiac rehabilitation and secondary prevention programs should strengthen links with community health services and encourage patients to use these services for further support and advice.

Other health practitioners

Recommendation

Other personnel may occasionally participate in cardiac rehabilitation programs, including such health professionals as medical interpreters, ethnic health workers, ambulance officers and pastoral care workers.

Strength of evidence = 4

Medical interpreters should be available to assist patients with little or no English. Occasionally, an ethnic health worker may also attend programs to support such patients. In some ambulatory programs, an ambulance officer may be included among facilitators of group discussions. The pastoral care worker may offer support to patients during the acute phase of their illness or subsequently.

Program co-ordinator

Recommendation

One member of the team should be designated the co-ordinator to ensure proper organisation of the program. Any member of the team with appropriate skills may be the program coordinator.

Strength of evidence = 4

A designated program co-ordinator is essential to ensure efficient running of the program. The co-ordinator requires good organisational, management and interpersonal skills, the time to devote to the tasks involved and a commitment to the program. Team members should approve the choice of co-ordinator.

It has been traditional for nurses to co-ordinate programs in Australia[5,40,41], in part because there are more nurses available to fulfil this role. Nurses have usually had previous contact with patients and have established empathy with them[6]. While some cardiologists and general practitioners consider that the cardiologist should co-ordinate the program, they also recognise that the cardiologist does not have the time to carry out the many duties of program co-ordinator[6]. Other team members, such as occupational therapists, consider that in some respects, nurses are less suitable to be the program co-ordinator because their backgrounds are generally in acute health, whereas others, including occupational therapists, are trained in rehabilitation[6].

An important function of the co-ordinator is to organise referrals, liaise with general practitioners and forward discharge summaries to them when patients complete the program. The co-ordinator should also be responsible for referring patients to

appropriate community services during or following the program and maintain contact with patients, if possible, to follow-up their long term progress. The co-ordinator requires good record-keeping skills for these tasks.

Another responsibility of the co-ordinator is organising team meetings and ensuring all team members are familiar with the program. The co-ordinator should identify specific roles within the team, minimising any conflict between team members and avoiding duplication of effort. However, some overlapping of roles may be beneficial if it reinforces advice from other team members. In-house training of team members should be organised by the co-ordinator, as required.

The co-ordinator requires enthusiasm, confidence and a commitment to cardiac rehabilitation. Another important attribute is the ability to motivate others in the team. Further, the co-ordinator needs to have a sound knowledge of coronary heart disease and other cardiac conditions, as well as the relevant terminology. A good knowledge of each stage of recovery from an acute cardiac event and of the rehabilitation process is also required.

Regional co-ordinator

Recommendation

In regions where several programs are offered, it may be appropriate to appoint a regional co-ordinator of programs.

Strength of evidence = 4

A regional co-ordinator may be necessary in certain regions to facilitate referrals between programs in the same area or within the same health care network and to encourage uniformity in the structure and content of programs.

Team meetings

Recommendation

Meetings of the rehabilitation team should be held at regular defined times

Strength of evidence = 4

Team meetings are recommended to facilitate communication between team members and to provide regular opportunities to discuss patients who have recently enrolled and those who are experiencing problems. The specific input of each team member in relation to individual patients can also be clarified during meetings to avoid overlapping of roles. Team meetings should be held at least monthly, and preferably

weekly. They should be attended by all team members. As well as addressing the needs of individual patients, these meetings should also review the program, refining it as required.

Core competencies and staff training

Recommendation

Team members should have appropriate qualifications and core competencies.

Strength of evidence = 4

Core competencies of health professionals involved in best practice cardiac rehabilitation and secondary prevention programs in Australia have not yet been defined and require further study. However, it is generally accepted that team members should hold a recognised qualification, such as a degree or diploma. Nurses should ideally have coronary care training in addition to general nursing qualifications. Additional qualifications for program co-ordinators or other team members who plan a longer career in the field may also be appropriate, such as a tertiary qualification in health education or cardiac rehabilitation, if available. A minimum requirement should be attendance at a short course in cardiac rehabilitation[51], together with observation of some established programs. Continuing education by attending national and state conferences and workshops is highly desirable. As previously stated, all team members should participate in some form of periodic inhouse training to acquire an understanding of the aims and content of each component of the program and to appreciate the roles of other team members. While certain team members may be primarily responsible for specific tasks, it is useful for all team members to have some knowledge and skills in areas such as the following:

- counselling patients
- facilitating behaviour change
- supervising exercise sessions
- conducting interactive discussion groups
- discharge planning
- program management
- patient follow-up
- nutrition education
- emergency procedures (all staff should have current CPR training)

It is also advantageous for program co-ordinators and other team members to acquire basic skills in data collection and documentation, and the use of a personal computer. Such skills should facilitate systematic record keeping of patients' progress, contacts with attending doctors and other health care providers, and periodic auditing of the program.

CHAPTER 17
ORGANISATIONAL ISSUES

Best practice requires monitoring and continuous improvement of the processes of program delivery, as well as measurement of program outcomes. Earlier chapters examined the scientific evidence for the benefits of cardiac rehabilitation and secondary prevention programs. This chapter deals with the processes for effective organisation and implementation of programs. A number of authoritative bodies recommend that referral procedures and other organisational aspects of cardiac rehabilitation and secondary prevention programs should be formalised[70,388]. Material in this chapter draws extensively upon health care providers' perceptions of best practice and consumer feedback.

Establishing programs

Recommendation

Organisational aspects of the program should be clearly defined and documented and periodically reviewed.

Strength of evidence = 4

When establishing a cardiac rehabilitation and secondary prevention program, a document should be produced giving details of the following:

- overall business plan
- aims and objectives
- content and program modules
- equipment, equipment maintenance and resources
- venue and space
- patient target groups
- entry and discharge assessments
- program duration and session times
- frequency and length of sessions
- referral procedures
- strategies for handling nonattenders and dropouts
- staffing, team roles

- liaison with doctors and other health care providers
- reporting lines and responsibilities
- staff training and performance reviews
- funding, budgets and budget management
- health and safety responsibilities
- professional and public liability
- promotion of the program
- procedures for recording patient information
- methods of benchmarking and evaluation
- review of program objectives, content and structure

Some of the above matters are covered in more detail elsewhere in these Best Practice Guidelines. Those specifically relating to organisational aspects of programs are dealt with in this chapter.

The process of establishing a program should include consultation with practitioners already working in the field. In Australia, the recently revised manual produced by the National Heart Foundation of Australia entitled "How to plan a cardiac rehabilitation program" should be purchased and used as a guide[674]. Attendance at a short training course[51] is also recommended.

Professional and public liability issues need to be considered and expert advice should be sought regarding these matters.

Eligibility for referral to the program

Recommendation

All eligible patients should be automatically referred to an ambulatory cardiac rehabilitation and secondary prevention program, unless the patient's doctor advises otherwise. Agreement for automatic referral to programs should be sought at each hospital, with provision for veto in individual cases where medical contraindications are considered to exist.

Strength of evidence = 4

Automatic referral to ambulatory programs is practised in over 70% of hospitals and community health centres in Victoria[5]. Elsewhere in Australia, formal referrals are more often required, although automatic referral is becoming increasingly common[41]. There may be contraindications on medical grounds to the enrolment of some individual patients. In such cases, the treating doctor should advise the program co-ordinator of the patient's unsuitability for attendance at the outpatient program, together with the reason. This decision should be recorded in the patient's history.

The treating doctor must be consulted about referral of patients whose diagnosis is equivocal, in order to avoid the harmful effects of inaccurate "cardiac" labelling"[675].

Hospital discharge plan

Recommendation

Hospital discharge plans should include clear written procedures for referring patients to an ambulatory group program and for arranging follow-up doctors' appointments.

Strength of evidence = 4

As discussed in Chapter 3, participation rates in cardiac rehabilitation programs is less than half the eligible patients who have suffered an acute cardiac event attend an ambulatory cardiac rehabilitation program in Victoria[53], despite the widespread network of programs[5]. In the United States of America, probably less than one fifth of eligible patients attend[2,54]. A major factor in such nonattendance is the absence of effective referral procedures[2,5,6]. Referrals should be arranged before patients are discharged from hospital. Follow-up appointments with the patient's general practitioner and specialists should also be routinely arranged. After leaving hospital, patients should be contacted by the program co-ordinator who should reinforce the desirability of the patient's attending the program and provide assistance, if required, to facilitate attendance

Method of invitation to the program

Recommendation

Invitations to attend an ambulatory program should be given to patients in writing, preferably signed by the patient's treating doctor, together with a simple brochure about the program, and an appointment for first attendance arranged and documented in the patient's hospital records.

Strength of evidence = 4

Because of patients' heightened anxiety in hospital and their concern with other issues, invitations to attend a rehabilitation program which are conveyed verbally are commonly forgotten or misunderstood[6,52]. Therefore, a letter of invitation handed to the patient by the program co-ordinator or other designated person is required. It may be given to the patient together with written details of follow-up medical appointments. The letter should be accompanied by a simple brochure about the program. Information about the program should include a brief description of the

contents of the program and details of the venue, date of first attendance, frequency and duration of the program, clothing requirements and cost, if any. An appointment for first attendance at the program should be negotiated and the benefits of attending should be highlighted. The letter should be signed by the program co-ordinator and, ideally, by the patient's doctor as well. Studies in other settings suggest that invitations to attend a program by letter attracts a higher rate of attendance than verbal invitations, especially if the letters are signed by the patient's doctor or other authoritative person[676]. Participation in a ambulatory program may also be increased if doctors, during their ward rounds, refer to the program and encourage patients to attend.

Invitations in other languages

Recommendation

Patients of non-English speaking backgrounds should be given a letter of invitation and brochure about the program in their own language. An appointment should be arranged for first attendance at the program.

Strength of evidence = 4

Patients of non-English speaking background may not fully understand what the program entails if the invitation is given verbally or if the invitation is written in English. Invitations written in the patient's own language have been shown to increase participation rates at health education programs. The assistance of interpreters should be sought in hospital and when patients of non-English speaking backgrounds first attend the program. Since family members are expected to play an important role in the patient's recovery, it is also desirable for such patients to bring a relative fluent in English to the first, and where possible, subsequent sessions, so that family members can hear and understand the discussion..

Initiating referrals and motivating patients

Recommendation

The program co-ordinator or nominee should personally hand the patient the letter of invitation, explaining its contents, encouraging the patient to attend and arranging the first attendance.

Strength of evidence = 4

Some patients are not sufficiently motivated to attend a cardiac rehabilitation program. Others anticipate problems in attending because of transport, language,

work commitments or other difficulties. It is important for the co-ordinator to determine the level of patients' motivation to attend and to explore possible barriers to attendance before the patient is discharged from hospital. Further explanation and an offer of assistance may encourage such patients to attend. This should be done when handing the patient the letter of invitation to the program. It may be helpful to ask a former patient who has participated in an ambulatory program to talk to patients who appear reluctant to attend. Contacting patients by telephone after discharge from hospital may also increase attendance rates. If the patient does not have a telephone at home, the telephone number of a neighbour or relative should be requested and noted in the program co-ordinator's records in case follow-up is required.

Invitations to spouses

Recommendation

Spouses should receive an individual letter or brochure, inviting them to attend the program and pointing out the potential benefits of their attendance.

Strength of evidence = 4

In most cases, spouses are encouraged to attend the program with the patient. However, the proportion of spouses who actually do attend varies between programs[5,6]. Spouses who are in the workforce cannot usually attend day-time sessions. Nevertheless, they may appreciate the invitation to attend and to learn about the program and the importance of the patient attending. Some studies have found that spouses who may have been keen to participate in the program were not informed by the patient that they were invited to do so[309]. Thus, direct contact with the spouse by a team member is desirable. If spouses are unable to attend the entire program, they should be encouraged to attend the initial session when the patient is assessed and rehabilitation plans are made. Spouses who cannot attend personally may be offered the opportunity to discuss any concerns with a team member by telephone.

Selection of program

Recommendation

The program co-ordinator should refer patients to the program at the parent hospital or to another suitable program near the patient's home, whichever is most acceptable to the patient.

Strength of evidence = 4

Patients may attend the program offered at the hospital to which they were admitted or, if discharged from a metropolitan hospital to the country, to the nearest program in the district. Patients in metropolitan areas who live some distance from the parent hospital may also be referred to another program near their home. Program co-ordinators should consult the Directory of Cardiac Rehabilitation Programs produced by the National Heart Foundation of Australia to identify the most appropriate program[640]. Possible options should be discussed with the patient before discharge from hospital. Contact should then be made by telephone with the co-ordinator of the program to which the patient is being referred to make the necessary arrangements. A written referral should then follow, which should be transmitted by facsimile prior to discharge to minimise any delay in enrolling the patient. The co-ordinator of the designated program should be responsible for contacting the patient about a commencement date. Anecdotal evidence suggests that these procedures are not always followed[5,6].

Time of commencing the program

Recommendation

Patients should begin attending the program within a few days or a week of leaving hospital, unless there are medical reasons for delaying enrolment.

Strength of evidence = 4

Early enrolment in a program is strongly recommended. Convalescence is a time when patients commonly experience significant psychological problems, especially a depressed mood[360,499,503,513]. Patients gain significant psychological benefits from attending a group rehabilitation program, through recognising that their problems are not unique and by observing rapid progress in others and themselves[7,309]. Since the recommended rehabilitation programs are based on light to moderate exercise, there is no need to defer attendance at the program until a greater level of fitness has been attained or an exercise test conducted (see Chapter 10). Patients unable to exercise during early convalescence can benefit psychologically and socially from meeting other patients and from participating in the education sessions. Reports indicate that

some patients are not invited to begin a program for four weeks or more after hospital discharge because of long waiting lists[5,6]. In such cases, it is preferable to refer patients, if possible, to another program with no waiting list rather than allow an excessive delay before starting the program. If there is a frequent overload of patients, a second parallel program should be introduced.

Entry assessment

Recommendation

Patients should be formally assessed at entry to the program and a mutually acceptable treatment plan devised.

Strength of evidence = 4

Before patients commence the program, they should attend for a pre-program assessment. At this interview, the purpose of the program and its contents should be explained to the patient and, if present, family members. Consent should be obtained from the patient to enter the program. Patients must also be informed that they may withdraw from the program at any time or seek to have the program modified to suit their specific needs.

Patients' perceptions of their illness and their expectations of recovery should be explored. Specific concerns should be discussed and the regimens clearly explained. A plan should be devised and agreed upon, focusing on specific goals of rehabilitation for that patient and addressing potential barriers to lifestyle change[290]. For patients who need to make several behavioural changes, it is preferable to prioritise the desired changes. Where possible, the patient's spouse or partner should attend and participate in the decision-making process, together with the patient and staff member conducting the assessment. The importance of attending and completing the program should be emphasised to the patient at this stage, and if possible, a commitment to attend should be obtained from the patient. Studies have shown that obtaining a written commitment to attend reduces dropout. The entry assessment may be quite brief, but approximately 30 minutes on average should be set aside for each patient. The entry assessment interview facilitates the establishment of rapport. Fortunately, most patients have relatively few problems and these are commonly readily recognised. Further targeted planning may take place during the first few sessions. The plan may be reviewed and revised, as appropriate, during the course of the program. A provisional time for review and discharge of the patient should be set. Input into the plan from other members of the multidisciplinary team is important, either at the entry assessment or later during team meetings.

At the entry assessment, the patient's medical record should be consulted. The following should be documented on an appropriate form:

- diagnosis
- past medical history
- current medications
- physical and functional status
- risk factor profile
- health behaviours
- occupation, employment status, plans for resuming work, type of work
- most demanding aspect of work or lifestyle
- financial status
- psychosocial issues, including the availability of social support.
- appointments to attend general practitioner, cardiologist or surgeon

Selection of program modules

Recommendation

In addition to group exercise and education sessions, other program modules may be recommended for some patients, if required.

Strength of evidence = 4

Patients should be referred, if required, to specialised programs addressing specific needs or to other health care providers for individual counselling about specific problems. For example, some patients may benefit from vocational retraining or attendance at smoking cessation classes. Others may require individual counselling to help them deal with psychological, social or financial problems. Many patients require separate, additional dietary counselling. The need for such referrals may be identified at the entry assessment, during the rehabilitation program, at weekly team meetings or informally by any team member conducting sessions. Some larger programs provide a range of exercise, education and counselling sessions. Patients should be enrolled in those modules which best suit their individual rehabilitation needs.

Encouraging participation in programs and monitoring attendances

Recommendation

Program staff should document attendances at each session and monitor attendance patterns carefully. Nonattenders and dropouts should be contacted and encouraged to attend the program.

Strength of evidence = 4

Several studies report high rates of nonattendance and dropout at cardiac rehabilitation and secondary prevention programs[52,53,276,285,288]. Factors commonly associated with nonattendance include distance from the program venue or lack of transport[276,288], inconvenient timing of the program[624], female gender[54,55,276,285], older age[54,55,277,624], especially among women[55,276], unemployed status and lower socioeconomic status[52,55,276,285,677], functional impairment[285], presence of complex problems[56], a perception that the illness is not serious[288], lower socioeconomic status and less education[55,285], lack of referral[52,276,286], especially among patients discharged from a general medical ward[678], or those who are depressed[288]; and weak or no recommendation by the doctor[288,671]. Studies show dropout from programs is more common among smokers[679], and those of lower socioeconomic status[677,679].

A program register should be available to record details of patients who have been referred to the program and of those who have been enrolled. Attendances at sessions should be monitored. Patients who have been referred to the program but who fail to attend, or who drop out after a few sessions, should be contacted to find out their reasons for doing so and to provide assistance to facilitate their attendance. Referral sources could also be examined to identify whether patients from particular hospital units are not attending. Characteristics of nonattenders and dropouts should be documented. A contact name and telephone number should be included in the letter of invitation and in the brochure about the program so that patients can advise staff if they cannot commence on the specified date or if they need to be absent from the program after commencing. As noted previously, local patient "consumer" groups can be helpful in contacting patients to encourage them to attend the program, especially in country areas. Other ways of minimising nonattendance and dropout should be explored. Different approaches may be required to encourage the attendance of specific groups of patients (for example, those who have had coronary angioplasty, older women, patients with limited English or patients who do not drive a car).

Discharge review

Recommendation

Patients should be formally assessed upon discharge from the program.

Strength of evidence = 4

As previously stated, an exercise test towards the end of the program can be an effective way of demonstrating the patient's progress and assessing readiness to resume work and other activities[39,379]. The exercise test should be coupled with a medical review of the patient's risk factors and medications and discussion of any concerns. Plans for returning to work, if applicable, should be addressed. For some patients, simulated work assessments should also be undertaken before discharge, as noted earlier. Arrangements for medical follow-up should be confirmed and patients should be encouraged to attend their doctors. Patients and spouses should be invited to contact the program co-ordinator in the future, if they have any concerns.

Referral to maintenance programs

Recommendation

All patients should be encouraged to enrol in a maintenance program or another suitable local community program upon completion of the ambulatory program.

Strength of evidence = 4

Because of their short duration, ambulatory programs conducted during convalescence may not produce major changes in lifestyle or achieve significant reduction of risk factors. However, early programs can be effective in motivating patients to adopt healthier lifestyles[96,171]. To facilitate maintenance of behaviour change and adherence with advice, patients need continuing support[495,680]. They should be referred to a longterm maintenance program, if one is available, and strongly encouraged to attend. Considerable benefits have been demonstrated from ongoing participation in longterm programs through continued access to expert advice, as well as support from other group members. These benefits include a reduction in hospital admissions, further cardiac events and deaths[14,17,80,81,185]. If applicable, individual patients should also be referred to a special clinic for ongoing management of specific problems, such as hyperlipidaemia, diabetes, obesity, hypertension or smoking.

Referral to community health services and support groups

Recommendation

Referral to a community health service in the area may also be appropriate.

Strength of evidence = 4

Patients should be advised of other local community services, which commonly provide physical activity programs, behavioural and psychosocial counselling and other relevant services. Patient "consumer" groups also offer ongoing social support for cardiac patients and their family members.

Communication with doctors

Recommendation

The program co-ordinator should communicate in writing with the patient's general practitioner and specialist, advising them of the patient's enrolment in the program. The program co-ordinator should also inform the patient's doctors about any problems which have occurred during the program and forward a brief discharge summary.

Strength of evidence = 4

So that doctors are adequately informed about the rehabilitation program, a brochure should be produced and circulated to them. It should include a brief description of the content of the program and provide details of the co-ordinator's name and contact details. Doctors must be advised about enrolment of their patients in the rehabilitation program and asked to encourage the patient to attend. Any problems which arise during the program should be communicated to the general practitioner and specialist. A brief summary of the patient's progress should also be sent to the general practitioner and specialist at the time of the patient's discharge from the program, including any exercise test results, risk factor measurements, assessments of physical and psychosocial functioning and other outcome data. Patients should also be given a patient held record containing this information which they should take to their doctors and other health care providers to facilitate communication and shared care.

Longterm follow-up of patients

Recommendation

Patients should be invited to initiate contact with team members after their discharge from the ambulatory program. The program co-ordinator or other team member should also contact patients by telephone after three, six and 12 months.

Strength of evidence = 4

In addition to longterm management from the general practitioner and specialist, patients should ideally be contacted by telephone by a member of the rehabilitation team so that patients who are experiencing psychological or work problems or difficulties maintaining recommended lifestyle changes can be identified. Significant problems some months after an acute cardiac event are not uncommon[309,531]. Such contact with high risk patients is particularly important to identify lapses with regimens, particularly those concerning smoking, diet, medication and medical attendances. Advice and support can be offered and assistance in making medical or other appointments, if necessary. If telephone contacts are not feasible, a postal questionnaire may be sent to assess progress and to offer further support, if required. Appropriate referrals, including medical appointments, should be arranged for those requiring assistance.

Comment

The low attendance rate of patients who are invited to ambulatory programs[2,5,52–56] raises serious issues of access and equity. Patients who have failed to attend a ambulatory program, for whatever reason, may well be able to attend at a later date. Motivation may change, awareness of need may increase, transportation may become possible later in convalescence, the patient may learn late of the benefits of rehabilitation programs from another patient; a doctor may learn late of the benefits of rehabilitation programs from another patient; a doctor or other health professional may discover that the patient has failed to attend the hospital-based program. The convalescent period may well be over. Such patients should be offered a second chance. This may well be at a program other than at the parent hospital. Community-based maintenance programs recruit many such patients, who need similar education and support as do those in ambulatory programs. Thus, programs designed to be maintenance (phase 3) programs find that they largely also have to function as if they were ambulatory (phase 2) programs. The division of cardiac rehabilitation into "phases" becomes blurred in the face of this reality. Development of community programs designed to cope with both convalescent and maintenance needs of patients seems to be required to offer proper facilities with good access and equity. This is an issue for further research and development.

CHAPTER 18
PROGRAM EVALUATION

As discussed in previous chapters, the benefits of many aspects of cardiac rehabilitation programs have not been adequately substantiated in rigorous scientific studies[680]. More research is required to determine the effectiveness of the various components of cardiac rehabilitation in facilitating recovery of the patient and promoting secondary prevention of the disease.

Further, there is a need for greater uniformity in the outcomes measured and in the tools and methods used to evaluate outcomes of cardiac rehabilitation programs. Discrepancies in the findings of past investigations in this area may be attributable in part to differences in the selection of outcomes, measurement tools and overall research design, rather than to actual differences in the effectiveness of the interventions under examination. Reliable, valid and responsive measures of outcome are essential.

Program evaluation

Recommendation

Evaluation is recommended to monitor and, if necessary, to improve the processes of program delivery and to document outcomes.

Strength of evidence = 4

Careful outcome evaluation is required to determine and compare the costs of interventions in cardiac rehabilitation. Demonstration of the benefits of interventions used in cardiac rehabilitation programs is important for decision-making regarding the allocation of health care resources. There is therefore increasing pressure upon those delivering cardiac rehabilitation services to be accountable in terms of quality and costs[681]. As well as documenting outcomes, comprehensive process evaluation is essential to ensure efficient programs and to identify weaknesses requiring attention in the delivery of programs.

This chapter briefly reviews approaches to evaluation and provides guidelines for both outcome and process evaluation for best practice cardiac rehabilitation and secondary prevention programs.

Outcome evaluation

Traditional goals of cardiac rehabilitation have been to promote recovery following the acute illness by improving physical outcomes and functional status of the patient and encouraging early return to work. Reduction of mortality and morbidity have been recognised longterm aims for secondary prevention of the disease. A number of studies referred to in earlier chapters have investigated the effects of cardiac rehabilitation programs upon "hard" endpoints, such as mortality, morbidity (including recurrent events and rehospitalisation) and resumption of work. However, outcome studies of this kind require longterm follow-up of large numbers of patients in controlled studies which are beyond the scope of most programs.

Outcome evaluation of cardiac rehabilitation programs usually involves investigation of short term outcomes including functional capacity, quality of life, risk factor profiles, health behaviours and knowledge.

Instruments assessing functional capacity

While commonly a part of quality of life assessments, functional capacity may be measured independently.

Graded exercise test

Objective evaluation of exercise capacity is commonly measured by performance of a continuous graded exercise test, either on a treadmill or a cycle ergometer. In outcome studies, exercise tests are undertaken before entry to an exercise training program and upon completion of the program. Exercise testing may be undertaken some months later to measure the longterm effects of the program.

6 minute walk test

A less costly and simpler test, the 6 minute walking test, is also used for objective assessment of exercise capacity of cardiac patients[682–684]. In this test, patients are asked to walk as hard as they can. The 6 minute walk test is of particular use with older cardiac patients. It has good reliability, especially in patients with heart failure.

Shuttle walk

The shuttle walk is another measure of exercise capacity for use with cardiac patients[685], which closely mimics a graded exercise test.

Duke Activity Survey Index

A further self-report questionnaire measuring functional status is the 12 item Duke Activity Survey Index[686].

Specific Activity Questionnaire

A recently developed Australian tool is the Specific Activity Questionnaire (SAQ)[687]. Unlike the New York Heart Association and Canadian Cardiovascular Society classifications, the SAQ provides a measure of functional capacity which is reported to correlate moderately well with peak VO_2 determined by exercise testing and is therefore recommended as a useful tool in cardiac population studies when formal exercise testing is impractical and uneconomical[687].

Instruments assessing symptoms

New York Heart Association (NYHA)

Despite some flaws, the functional classification of the New York Heart Association (NYHA)[688] is a commonly used observer rated classification for quantifying the degree to which symptoms limit the performance of everyday physical activities.

Canadian Cardiovascular Society (CCS)

The Canadian Cardiovascular Society (CCS)[689] has produced an improved modified version of the NYHA criteria for anginal symptoms.

Seattle Angina Questionnaire

Another tool for assessing symptoms is the Seattle Angina Questionnaire, a 19-item self-administered questionnaire designed for cardiac patients who have chest pain, chest tightness or angina[690].

Minnesota Living with Heart Failure Questionnaire (LIhFE)

The LihFE is a valid, reliable and responsive instrument containing 21 items[691].

Quality of life

While there is no universal agreement regarding the definition of quality of life, it is accepted that it is a multidimensional phenomenon, embracing psychological wellbeing and social functioning as well as physical functioning. Improvement in quality of life has been widely recognised as an important goal of cardiac rehabilitation. However, quality of life has only recently been used as an outcome measure in major studies.

Generic measures and disease specific measures represent the two basic approaches to assessing health related quality of life (HRQL). Generic instruments include health profiles and utility measures. Health profiles are single instruments which measure different aspects of HRQL, while utility measures basically require patients to

estimate their HRQL along a single continuum from death to full health[692]. Generic HRQL instruments are designed as outcome measures to allow comparisons across populations and interventions, while disease specific HRQL instruments focus on symptoms and problems relating to a particular disease and are thus used as outcome measures in specific populations.

Generic measures of health related quality of life (HRQL)

The following generic HRQL tools have been used in previous studies of cardiac patients.

Medical Outcomes Study Short Form 36 (SF-36)

The Medical Outcomes Study Short Form 36(MOS SF-36)[693] is a shortened version of the Medical Outcome Survey (MOS)[694]. It has 36 items measuring eight health concepts, namely: physical functioning, bodily pain, general health, vitality, social functioning, role limitations due to emotional problems and mental health. The different scales in the SF-36 show adequate internal consistency. Construct validity has been demonstrated through factor analysis in a study with patients experiencing a variety of conditions[693]. The SF-36 has been used with a range of different illnesses, including coronary heart disease. Some studies of patients undergoing cardiac rehabilitation[275,695] have used the SF-36. Evaluation of a cardiac rehabilitation sample before and after a 12 week program showed significant improvement on all scales[695]. However, as pointed out by Oldridge, these observational studies were limited by the absence of a control group or longterm follow-up[696]. The SF-36 is being increasingly used in Australian studies. In Victoria, it is being administered to patients attending cardiac rehabilitation programs to establish its suitability and sensitivity in this population[697]. The Australia Bureau of Statistics has released normative data for the Australian population.

Nottingham Health Profile (NHP)

The NHP[698] is a widely used tool, particularly in the United Kingdom, for measuring perceived health problems and their effects upon activities of daily living. The NHP has been used with cardiac populations[699,700]. Studies have shown that patients with a poor perceived health status measured by the NHP also have a poorer result using other traditional clinical measures of outcome, such as exercise capacity determined by treadmill test[700]. However, some limitations in scoring the NHP have been identified[701]. A study comparing the SF-36 and the NHP in cardiac patients found that the SF-36 was a better measure of quality of life than the NHP, its scales showing more sensitivity, with higher internal consistency coefficients and clearer evidence of discriminant validity[701].

Profile of Moods States (POMS)

The POMS provides 65 adjectives which are self rated to indicate various mood states (eg anger, tension; depression) considered transient and responsive[702]. The POMS has been used in past studies of cardiac patients[516,703,704] and is simple to administer.

Sickness Impact Profile (SIP)

A longer questionnaire, the SIP, contains 136 items which measure physical functioning, psychosocial domains and five independent factors[705]. It has been used with cardiac patients[706]. The SIP provides more detailed information than the SF36 but it takes 45 minutes to complete.

Psychosocial Adjustment to Illness Scale (PAIS)

The PAIS is an interviewer administered questionnaire, although a self-report version has been developed[707,708]. It provides an assessment of functioning in a variety of psychological and social domains, including health care orientation, vocational environment, domestic relationships, sexual relations, extended family relations, social and leisure activities and psychological distress.

Specific measures of health related quality of life

Several health related quality of life (HRQL) instruments have been specifically developed for use with cardiac patients. They include the following.

Quality of Life after Myocardial Infarction Questionnaire (QLMI)

The QLMI contains subscales measuring physical symptoms and restrictions (the Limitations domain) and emotional function, confidence and self-esteem (the Emotions domain)[696]. It is reported to be a valid, reliable and responsive specific HRQL instrument. Developed in Canada, it has recently been modified and validated for use in Australia as the MacNew Quality of Life after MI Questionnaire[709].

Minnesota Living with Heart Failure Questionnaire(LIhFE)

The LihFE[691] has 21 items and assesses physical, socioeconomic and psychological impairment in patients with heart failure. It has been widely used, particularly in pharmacological trials.

Heart Patients' Psychological Questionnaire (HPPQ)

The HPPQ[710] has a 12 item Disability Scale and a 12 item Well-Being Scale. It was designed and validated in Belgium to assess changes in feelings of disability and well-being in men with coronary heart disease attending an outpatient cardiac rehabilitation program. Reports indicate that the HPPQ is a reliable and sensitive measure of psychological functioning in cardiac patients[710].

Instruments measuring single psychological states

Several instruments are available to measure specific psychological states, such as anxiety and depression. The following commonly used questionnaires were not specifically developed for cardiac patients, with the exception of the Cardiac Depression Scale[711].

State Trait Anxiety Inventory (STAI)

The STAI is a 40 item questionnaire consisting of a 20 item scale assessing state (current) anxiety and a 20 item scale measuring trait (general) anxiety[712]. It can be completed quite quickly and has been used in previous studies of cardiac patients[713,714].

Hospital Anxiety and Depression Scale (HADS)

The HADS is a 14 item scale with separate subscales for anxiety and depression[715]. Developed for use with medically ill patients in hospital, it is commonly used as a screening tool to detect psychological disturbance. While it is brief and has been widely used in past studies of cardiac patients[716,717], it has some limitations. For example, the depression subscale omits many items relating to somatic symptoms and thus measures only some aspects of depression[711].

Beck Depression Inventory (BDI)

The BDI is a 21 item scale for measuring depression[718]. A short version has also been produced. Although commonly used to assess depression in cardiac patients[719,720], it is less suitable for this population than other scales because, unlike the HADS, it was originally designed for use with psychiatric patients. Thus, many items cover more severe symptoms of a depressive illness (such as suicidal thoughts), rather than milder symptoms of a depressed mood experienced by most cardiac patients. Consequently, many cardiac patients achieve very low scores on the BDI and subtle changes in mood are not detected[512].

Cardiac Depression Scale (CDS)

Developed in Melbourne, the CDS was produced to provide a more sensitive depression scale for cardiac patients. Its 26 items reflect the range of depressive symptoms seen in cardiac patients. The CDS correlates well with the BDI but without the marked skewness of the latter[711].

Other questionnaires

There are a number of other scales which have been used to measure psychological functioning in cardiac patients, including the Zung Self-Rating Depression Scale[721], the Center for Epidemiological Studies-Depression Inventory (CES-D)[722], the IPAT Anxiety Questionnaire[723] and the IPAT Depression Questionnaire[724].

Visual Analogue Scales (VAS)

Visual Analogue Scales[725] are a simple method of measuring psychological states, such as anxiety, depression and denial. Visual Analogue Scales typically consist of 10 centimetre lines, anchored at both ends with words descriptive of the maximal and minimal extremes of the dimension being measured. The subject is required to indicate his or her feelings by marking the line at the appropriate point between the two extreme statements (for example, "I have never felt happier" to "I have never felt more miserable"). Visual Analogue Scales are also used to assess self efficacy and perceived level of fitness or physical symptoms such as pain level. They are particularly useful in monitoring changes in individuals over time. Like other measures, they have some weaknesses (such as the tendency for scores to cluster) but they are simple and speedy to complete and have been established as valid and reliable in a range of clinical and research applications. They are usually used for self assessment but they can also be useful for observer ratings.

Measures of other psychosocial outcomes

Other outcomes relevant to cardiac rehabilitation include social, occupational, marital and sexual adjustments. Few measures in these areas have been specifically developed for studies of cardiac patients. However, interview-based instruments, such as the Structured and Scaled Interview to Assess Maladjustment (SSIAM)[726] and the Social Adjustment Scale (SAS)[727] have been modified and administered to cardiac patients to enable a more detailed investigation of these dimensions of recovery[96]. Another instrument used in past research with cardiac patients includes the Life Experience Survey[728], which measures perceived stress.

Patients' perceptions of outcomes can also be quantified without using numerical scales. For example, patients can assess their usual sexual activity as "better than", "worse than" or "the same as" before their cardiac event. Similarly, patients' perceptions of their physical, psychological or overall recovery can be classified as "total", "almost", "partial" or "not at all"[96].

Selecting methods of assessing quality of life

Selecting instruments to measure quality of life and other psychological and social outcomes can be difficult. While brevity and ease of administration and scoring are important considerations, other important criteria include the need for instruments to be easy to understand; responsive (sensitive to changes); valid (measuring the characteristics desired); clinically relevant (providing meaningful data) and reproducible (producing the same results when repeated or when administered by different team members). Further, instruments selected must be able to detect any changes in affect or quality of life. Some questionnaires may be unsuitable because they were intended only for screening purposes.

Generic HRQL tools (eg NHP, SIP) are useful in that they enable comparisons to be made between different populations and between interventions so that cost effectiveness of an intervention can be demonstrated. A potential disadvantage of generic tools is that they may be unresponsive to small disease-specific changes in quality of life which might have clinical significance. In this respect, instruments specifically designed for cardiac patients may be more appropriate.

However, according to Oldridge[696], good outcomes measurement requires the use of both generic and disease specific measures, since a range of information is required. Generic and specific HRQL measures provide complementary types of information. Thus, no single outcome measure will suffice.

The significant limitation of administering psychological questionnaires to cardiac patients which were originally developed for other populations has already been noted. Because instruments such as these were originally standardised on psychiatric patients, many items are unsuitable and address a wide range of psychopathology which is irrelevant to medically ill patients. Cardiac patients do not typically experience problems of psychopathology but feelings of disability and diminished well-being. Nevertheless, instruments such as the BDI[718] and the 567-item Minnesota Multiphasic Personality Inventory (MMPI)[729] have been frequently used in the past to investigate outcomes of cardiac patients, possibly because they were well-known questionnaires. The BDI continues to be used to assess depression in cardiac patients. The failure of many studies to demonstrate improvements in quality of life from cardiac rehabilitation may possibly be attributable to the use of inappropriate instruments such as these.

Psychological scales administered to cardiac patients need to measure affective responses commonly experienced after an acute cardiac illness, such as a sense of loss (for example, loss of energy, interest or optimism), and must be able to detect any subtle changes in affect. As discussed in Chapter 13, depression in cardiac patients is more akin to a bereavement reaction than to a depressive illness and is usually subtle and transient. Measures focusing on common problems such as feelings of disability, loss and impaired well-being may be more appropriate than traditional measures to provide evidence for the psychological benefits of cardiac rehabilitation.

An important practical consideration in deciding how best to assess quality of life in cardiac patients is the applicability of the method to various subgroups of patients. Patients with little English find it difficult or impossible to complete many of the above self-report inventories. Few are currently available in other languages. Moreover, many commonly used inventories contain jargon, complex wording and colloquial expressions which can confuse patients with lower levels of education. Even relatively brief questionnaires can be an ordeal for some older patients. Other patients simply do not enjoy completing questionnaires of any kind and consequently

may not answer questions properly. Thus, outcome assessment based on self-report questionnaires may exclude many patients.

Although more time-consuming, a brief interview may be a more suitable method of assessing quality of life in such patients. Responses to open-ended questions asked during interviews can provide important insights into patient attitudes and add meaning to the quantifiable responses collected via structured self-report questionnaires.

While quality of life instruments are becoming increasingly accepted as useful assessment tools and suitable outcome measures in cardiac rehabilitation, further research is needed to provide guidance regarding the suitability of particular questionnaires. Further, data are required to determine whether the instruments outlined above are valid and reliable measures in specific groups of patients, such as older patients, those who have undergone coronary angioplasty and those with multiple diseases.

It is most important to explain the purpose of the questionnaires to patients and to establish rapport with them beforehand to increase their motivation to complete the questionnaires satisfactorily. Staff training in administering questionnaires and checking responses is essential.

Knowledge

While increased knowledge may not lead to favourable behaviour change, it can decrease anxiety and give patients a greater sense of control over their progress. Knowledge has been used as an outcome measure of cardiac rehabilitation in several studies, as discussed in Chapter 12. However, few studies have used validated instruments to assess knowledge. Two such knowledge questionnaires are the Cardiac Health Knowledge Questionnaire[389] and the Coronary Angioplasty Risk Factor Inventory (CARFI)[730]. Both questionnaires have been used in recent studies of cardiac patients[731,732]. The Victorian Cardiac Rehabilitation Questionnaire (VCRQ)[733] includes items which assess knowledge, as well as behaviour change and attitudes towards behaviour change.

Cardiac Health Knowledge Questionnaire

The Cardiac Health Knowledge Questionnaire[389] comprises three subscales: the Basic Cardiac Health Knowledge scale (30 items) investigating knowledge of the functions of the cardiovascular system and the pathogenesis and manifestations of coronary heart disease; the Cardiac Lifestyle Knowledge scale (15 items) covering behavioural aspects in the aetiology of coronary heart disease and in rehabilitation; and the Cardiac Misconceptions scale (10 items), which assesses awareness of common misconceptions about the consequences of a heart attack.

Coronary Angioplasty Risk Factor Inventory (CARFI)

The CARFI[730] consists of 25 true-false, multiple choice or fill-in items and has three different forms for use before coronary angioplasty and at two follow-up assessments. The questionnaire provides two scores assessing knowledge of PTCA procedures and cardiac risk factors, together with an overall score totalling the two scores. The third form measures risk factor knowledge only.

Victorian Cardiac Rehabilitation Questionnaire

The Victorian Cardiac Rehabilitation Questionnaire[733] provides multiple choice items to assess knowledge, health behaviours and symptom management. It is currently undergoing further development.

Open-ended questions

It is asserted by some that questionnaires containing multiple choice items provide a measure of recognition rather than recall. They may therefore be a less reliable method of measuring actual knowledge than open-ended questions which may be asked via self-report questionnaire or interview.

Risk factors and health behaviours

Achieving a reduction in modifiable risk factors (smoking, high cholesterol, high blood pressure, obesity and physical inactivity) is a primary goal of cardiac rehabilitation and secondary prevention programs.

Smoking

Current smoking status should be recorded for all patients who have been smokers in the past. Measurement for the purposes of program evaluation is usually by patient self-report. Years of cigarette smoking, frequency of smoking and number of cigarettes smoked should be recorded. Because deception among smokers is not uncommon, confirmation may be sought from a family member. In rigorous studies, objective assessments of smoking status are usually obtained to corroborate self report, using physiological or biochemical measures of serum thiocyanate, expired carbon monoxide or salivary, urine or plasma cotinine levels.

Cholesterol

A fasting blood sample should be taken after the patient has rested for five minutes to provide a lipid profile (including total cholesterol, HDL cholesterol, LDL cholesterol and triglyceride levels). The cholesterol level recorded immediately upon admission to hospital is regarded as the most accurate baseline measure. Measurements made soon after the acute event may not accurately reflect the patient's lipid profile because of the effect of the event upon lipid levels. A further measurement should be made after three months. Total cholesterol levels of patients may be grouped as follows: <4.5 mmol/L (desirable); 4.5 to 5.4 mmol/L(acceptable); 5.5 to 6.4 mmol/L (raised);

>6.5 mmol/L (high). The aim for all patients should be to achieve a lower level of cholesterol.

Blood pressure

Systolic and diastolic blood pressures should be measured while the patient is seated after resting for five minutes. This should suffice for routine measurements. Ambulatory monitoring of blood pressure may be utilised for special purposes. Systolic blood pressure may be categorised as follows: <130 MmHg (normal); 130–139 MmHg (acceptable); 140–149 MmHg (borderline); and >150 MmHg (raised).

Body weight

Body mass index (BMI) is calculated by dividing the patient's weight (kgs) by height (metres) squared. Abdominal girth and hip waist ratio should also be measured. A BMI < 20 is classified as underweight; 20–25 as normal; >25–30 as overweight; and > 30 as obese[734].

Physical activity

Physical activity is typically assessed by self-report because of the impracticality of monitoring patients' leisure time activities. Physical activity may be investigated by assessing the frequency of walking, including the duration and time taken for each walk)[735] and other activities such as gardening, housework and dancing. Categories such as "very active", "moderately active", and "inactive" may then be assigned. Scales designed to measure physical activity in the general community are usually unsuitable for older cardiac patients. An appropriate instrument to assess and quantify physical activity in such cardiac patients needs to be produced. The Specific Activity Questionnaire[687] is a useful measure of perceived ability to undertake specific physical activities.

Dietary habit

Commonly used tools for measuring dietary intake are diet histories, weighed food intake records and 24 hour dietary recall. However, these methods can be time consuming. Questionnaires recording the frequency with which the listed foods are eaten are preferable. The Short Fat Questionnaire[736] is a brief 17 item self-report questionnaire developed in Australia which measures dietary saturated and unsaturated fat intake and provides a total score. However, no questions are included to assess consumption of low fat alternatives. Additional questions may be asked to assess the consumption of other foods.

Adherence to medication and advice

As previously noted in Chapter 13, nonadherence to medication is associated with higher death rates[497,498] and is thus an important marker of adverse outcomes. Methods used in clinical trials to monitor adherence to medication regimens, such as pill counts, are usually not feasible in a rehabilitation setting. Thus, it is necessary to

rely on patient self-report. However, satisfactory correlation has been shown between self-reports of adherence and pill counts[737]. Patients may be asked, either during interviews or via self report questionnaires, whether they always take their medication exactly as prescribed, or whether they occasionally or regularly fail to follow the prescribed advice. However, the manner in which patients are asked about adherence to advice will largely determine the validity of their responses. More valid responses are likely to be obtained during semistructured interviews with a trained interviewer. Patients may be broadly classified as "totally compliant", "partially compliant" or "not at all compliant" with advice regarding their medication. Adherence to other regimens (such as advice to lose weight, stop smoking or increase physical activity) can be similarly classified. Nevertheless, it should be emphasised that it is difficult, if not impossible, to give global measures of adherence or nonadherence. Most cardiac patients are placed on a number of regimens, adhering to some but not to others. Further, they may adhere for some, but not all, of the time to particular regimens[309]. Patients should always be asked to explain their reasons for not adhering to advice.

Attitudes towards behaviour change

Behaviour change is a process, as emphasised in earlier chapters. A four to six week program of cardiac rehabilitation may not be sufficient to achieve actual changes in health behaviours. A longer follow-up (for example, after three, six and 12 months) is usually required to assess behavioural outcomes. Nevertheless, it is important to assess the effectiveness of cardiac rehabilitation upon intention to change, attitudes towards change and self-efficacy (or confidence) in making changes. A number of studies of cardiac patients have measured these outcomes in relation to behaviours such as smoking, making dietary changes, losing weight and becoming more physically active, although the relationship between patient attitudes and such behaviours is not yet well defined.

Intention to change

The strength of intention to adopt a new health behaviour, such as starting a regular walking program, may be simply measured using a self rating scale containing several points ranging from "extremely likely" to "extremely unlikely"[738].

Attitude towards change

A similar approach may be used in assessing which stage of change the patient has reached in changing a particular behaviour, such as stopping smoking. Using statements based upon the Prochaska and diClemente model of behaviour change[485], patients may be offered a choice of five statements ranging from "I have no thought of stopping" to "I'm definitely taking action to stop" smoking.

Self efficacy regarding change

A similar approach may be used to measuring how confident or certain the patient is about stopping smoking by asking whether the patient is "very confident", "quite confident", "not very confident" or "not at all confident"[739].

Work

It is important to record occupational outcomes of patients who were in the workforce before their cardiac event. Patients should be contacted after six and 12 months to determine whether or not they have resumed work, changed or modified their jobs and remained in the workforce. Time of return to work (number of weeks since the acute illness or entry to the program) should also be recorded. A more comprehensive evaluation of occupational outcomes should include investigation of how well the patient has adapted to work after resuming. Occupational adjustment is best assessed by interview, using semistructured questions such as those contained in a modified version of the SSIAM[726] which was recently used in an Australian trial involving cardiac patients[96].

Outcome indicators

The following are suggested outcomes and outcome indicators to use in evaluation of cardiac rehabilitation and secondary prevention programs. However, it must be emphasised that it would be difficult, and indeed unnecessary, to attempt to assess all these outcomes and outcome indicators for all patients attending programs. The extent of assessment will depend upon the particular population of patients, the purpose of the evaluation and the resources available to conduct the evaluation. It may be considered appropriate to assess outcomes of a consecutive series of patients attending over a specified period. Given the complex issues involved in comprehensive program evaluation, advice from experienced researchers should be sought regarding sample size, methods of data collection and data analysis.

The following outcome indicators apply to patient evaluation at the end of the program. However, they may also be used for longterm evaluation after six or 12 months. These indicators need to be tested and modified in the light of their usefulness.

It should be noted that the recommended cutpoints for cholesterol and blood pressure change with time, with lower levels now being recommended than in the past. They are currently under review by many bodies. Appropriate levels depend to some extent on the age and gender of the patient.

Functional capacity

- Number (%) of patients whose functional capacity is assessed
- Number (%) of patients with increased functional capacity

Activities of daily living

- Number (%) of former drivers who resume car driving
- Number (%) of patients who resume their usual sexual activity
- Number (%) of patients who resume appropriate daily activities as specified at entry assessment

Physical status

- Number (%) reporting reduced angina/dyspnoea or other physical symptoms
- Number (%) reporting improved physical health

Quality of life

- Number (%) of patients whose quality of life is assessed
- Number (%) of patients reporting satisfactory physical functioning
- Number (%) of patients reporting satisfactory psychological functioning
- Number (%) of patients reporting satisfactory social functioning
- Number (%) of patients reporting satisfactory marital functioning
- Number (%) of patients requiring additional support referred for counselling

Knowledge

- Number (%) of patients whose knowledge level is assessed
- Number (%) of patients with improved knowledge

Risk factors, health behaviours and attitudes

Smoking

- Number (%) of smokers who stop smoking
- Number (%) of smokers who maintain nonsmoking status
- Number (%) of smokers who strengthen their intention to stop smoking
- Number (%) of smokers who are more confident about stopping smoking
- Number (%) of smokers who are more confident about maintaining nonsmoking status
- Number (%) of smokers taking active steps to stop smoking

Cholesterol

- Number (%) of patients who know their total cholesterol level
- Number (%) of patients whose cholesterol is measured by the GP or program staff
- Number (%) of patients with high cholesterol on cholesterol lowering diet
- Number (%) of patients with high cholesterol on medication

Blood pressure

- Number (%) of patients who know their blood pressure
- Number (%) of patients whose blood pressure is measured
- Number (%) of patients with high blood pressure on medication
- Number (%) of patients with high blood pressure whose blood pressure is reduced

Body weight

- Number (%) of patients who know their weight
- Number (%) of patients whose weight is measured
- Number (%) of obese or overweight patients who reduce their weight by >2 kgs
- Number (%) of patients who strengthen their intention to lose weight
- Number (%) of patients who are more confident about losing weight
- Number (%) of patients who are more confident about maintaining weight loss
- Number (%) of obese or overweight patients taking active steps to reduce weight

Physical activity

- Number (%) of patients whose level of physical activity is assessed
- Number (%) of patients who walk or who are physically active 30 minutes daily or on most days
- Number (%) of patients who strengthen their intention to increase physical activity
- Number (%) of patients who are more confident about increasing their level of physical activity
- Number (%) of patients who are more confident about maintaining their level of physical activity
- Number (%) taking active steps to increase their physical activity

Dietary habits

- Number (%) of patients whose dietary habits are assessed
- Number (%) of patients consuming less saturated fat
- Number (%) of overweight or obese patients who reduce their total daily caloric intake
- Number (%) of patients who strengthen their intention to change their dietary habits
- Number (%) of patients who are more confident about changing/maintaining improved dietary habits
- Number (%) of patients taking active steps to change their dietary habits

Adherence to medication and advice

- Number (%) of patients whose adherence to each defined regimen is assessed
- Number (%) of patients defined as totally, partially or not at all compliant with each regimen

Work (paid employment)

- Number (%) of patients formerly in the workforce who resume work
- Number (%) of patients formerly in the workforce who resume within 3 months of the event or program entry
- Number (%) of patients with work difficulties who receive additional assistance from occupational therapist and/or receive a work visit after resuming work
- Number (%) of patients working at one year
- Number (%) reporting satisfactory occupational adaptation at work

Hospital readmissions

- Number of hospital readmissions during the 12 months since entry to the program
- Number of days spent in hospital during the 12 months since entry to the program

Process evaluation

It is essential to assess patient satisfaction with the program and to monitor the efficiency with which the cardiac rehabilitation program is delivered to patients.

Patient satisfaction

Patients should be asked whether they found the program beneficial and in which ways. Criticism of the program should also be sought, although it is most important that patients should be invited to make suggestions for improving the program, rather than soliciting criticisms per se. Most patients feel a sense of gratitude towards members of the rehabilitation team and will be reluctant to make open criticisms, even via a self-report questionnaire. Comments about specific components of the program should be sought, including the adequacy of information given and the areas where more information is desired. Feedback about the program duration, time of the program and other structural issues should also be requested. Patients should be asked for their feedback at the time of their discharge from the program. In addition, patients may be invited to comment about individual education sessions upon completion of the session.

Patient evaluation of programs is usually sought via an anonymous self-report questionnaire, because this method is considered to be both time efficient and conducive to more honest appraisals. Such questionnaires are generally produced inhouse and tailored to suit the particular program. The usual format is for boxes to be provided which patients are requested to mark to indicate their response. It is important to provide extra space so that patients can add any additional comments if they wish.

However, as already emphasised, many patients dislike filling in questionnaires or find them difficult to complete. An effective alternative approach is to conduct exit satisfaction surveys by telephone. Ideally, these should be carried out by a health

professional not closely involved in delivering the program. A questionnaire can be completed by the interviewer, which should include open-ended questions and probing questions to elicit as much information as possible about the patient's attitude towards the program. It is useful to seek feedback from patients after about three months following their discharge from the program when they are commonly more responsive and forthcoming about which of their needs were not adequately met by the program.

It is essential to obtain feedback from patients and to implement suggested improvements, where feasible. Feedback from patients who have dropped out of programs may be especially valuable. Patient evaluation of programs constitutes possibly the most important aspect of program evaluation.

Delivery of the program

Several recommendations regarding processes for program delivery were made in Chapter 17. In this chapter, process indicators are suggested which should demonstrate how well an individual cardiac rehabilitation program has achieved its goals in relation to program delivery.

Process indicators

Efficient delivery of cardiac rehabilitation services is reflected by careful attention to discharge plans and the timely completion of tasks concerning referral of patients to the program, entry and discharge assessments, attendance patterns, consumer input into evaluation, communication with doctors and documentation of the program content and staffing requirements. Other recommended practices, including making a range of modules available to suit the needs of particular patients, should also be assessed as part of program evaluation. The following are suggested as potentially useful quantifiable indicators. They are grouped according to whether they concern communication, patient management or program evaluation.

Communication

Program referrals

Timely forwarding of referral to program co-ordinator
Time between patient's discharge from hospital and receipt by program co-ordinator of referral by telephone and confirmed by facsimile or mail (timely = within three working days).

Indicator: Number (%) of patients whose referrals are received within three working days of patients' discharge from hospital

Timely response by co-ordinator to referrals:
Time between receipt of referral and initial contact with patient (by telephone/facsimile/mail or personal contact) to inform the patient that the referral has been received and to arrange initial assessment (timely = within three working days).

Indicator: Number (%) of patients for whom attempts to contact have been made within three working days of receipt of referral.

Timely documentation of entry assessment and agreed rehabilitation plan
Time from entry assessment to placing documented assessment and plan in the patient's rehabilitation file and forwarding hospital medical record (timely = within two working days).

Indicator: Number (%) of patients with a documented entry assessment and plan in the patient's rehabilitation file within two working days from the entry assessment, with a copy forwarded to the hospital medical record.

Timely documentation of discharge summary
Time between discharge review and placing of written discharge summary in the patient's rehabilitation file and forwarding the summary to the hospital medical record, documenting outcomes of the cardiac rehabilitation program and follow-up arrangements (timely = five working days).

Indicator: Number (%) of patients with documented discharge summary in the patient's rehabilitation file within five working days from discharge review, with a copy forwarded to the hospital medical record.

Liaison with general practitioners

Good communication between the cardiac rehabilitation program co-ordinator and the patient's general practitioners (GP) is essential. The following indicators of effective communication with GPs are recommended:

Timely forwarding of entry assessment and plan to GP
Time from entry assessment to forwarding of entry assessment and plan to the GP (timely = within two working days).

Indicator: Number (%) of patients whose entry assessment and plan are forwarded to the GP within two working days from the entry assessment.

Timely forwarding of discharge summary to GP
Time from discharge review to forwarding of discharge summary to the GP (timely = five working days).

Indicator: Number (%) of patients whose discharge summary is forwarded to the GP within five working days from the discharge review.

Patient management

Assessment of patients

Timely entry assessment of referred patients
Time from receipt of written referral by program co-ordinator to the first meeting with the patient (and family member) for entry assessment (timely = within seven working days).

Indicator: Number (%) of patients assessed within seven working days of receipt of referral

Completion of discharge review
Completion of a discharge review including review of risk factors, medication, work plans, psychosocial functioning and, where possible, a graded exercise test. Follow-up arrangements should include details of medical appointments, advice regarding a maintenance program, community supports, plans for a review phone call and a telephone number the patient can call for further assistance.

Indicator: Number (%) of patients formally reviewed at discharge from the program

General practitioner follow-up

Patients should be encouraged to see their GP at appropriate intervals for follow-up after discharge from the rehabilitation program.

Timely follow-up by GP
Time between discharge review and appointment with GP (timely = within four weeks of the discharge review).

Indicator: Number (%) of patients who consult their GP within four weeks of completing the rehabilitation program.

Program evaluation

Program attendance

Every program should endeavour to improve its attendance and completion rates and to reach all its target groups. Patients should receive a written referral to the program and should attend soon after hospital discharge. The following indicators may be used to evaluate the effectiveness of the program in these respects.

- Number (%) of patients for whom a written referral to the program has been received before hospital discharge
- Number (%) of patients who first attend the program within 10 days of hospital discharge
- Number (%) of patients referred to the program who attend the program

- Number (%) of patients who complete the program (attending > two-thirds of available sessions)
- Number (%) of female patients referred to the program who attend the program
- Number (%) of female patients who complete the program (attending > two-thirds of available sessions)
- Number (%) of patients with limited English who attend the program or an ethno-specific program
- Number (%) of patients with limited English who complete the program (attending > two-thirds of available sessions)

Program modules

The characteristics of patients attending a program will depend on the location and size of the program and the availability of other services in the area. It has been recommended that programs contain separate modules to cater for the needs of different subgroups, particularly those who often fail to attend available programs, such as those who have undergone coronary angioplasty, younger patients and those with a limited command of English. It is also desirable to provide separate spouse groups. Recommended indicators in relation to program modules are as follows:

- Availability of appropriate sessions for patients who have undergone coronary angioplasty
- Availability of appropriate sessions for younger patients
- Availability of appropriate sessions for patients with limited English
- Availability of appropriate sessions for spouses or other family members

Consumer input

As discussed above, it is important to obtain feedback from patients about the program so that any weakness can be overcome. Indicators of consumer input may include the following:

- Number (%) given a patient satisfaction survey or participating in a telephone interview
- Number (%) completing a patient satisfaction survey or participating in a telephone interview
- Number (%) of dropouts who are contacted and asked for feedback

Participation of general practitioners

GP referrals to programs should also be encouraged and, where possible, participation of the GP in the rehabilitation program itself (for example, by facilitating one of the education sessions). The following indicators are recommended:

- Number (%) of patients referred to the program by GPs
- Number (%) of sessions in which GPs have participated

Documentation

Recommendations for best practice have been made regarding the availability of documented emergency procedures, program protocols and GP referral procedures. The following indicators should be used for benchmarking purposes:

- Availability of written emergency procedures
- Availability of written program protocol
- Availability of written referral procedures
- Systematic documentation of attenders, nonattenders and dropouts
- Written protocols for follow-up of attenders, nonattenders and dropouts

Staff issues

The following indicators pertain to recommendations made regarding the desirability of holding regular team meetings, employing appropriately qualified staff and encouraging further training:

- Occurrence of regular team meetings
- Employment of staff who have recognised professional qualifications
- Availability of opportunities for further training

Minimum data sets

Whereas evaluation may involve assessment of only some of the indicators listed above, all cardiac rehabilitation program co-ordinators should record a certain amount of basic information about all patients attending the programs. The development of a common minimum data set is important for the process of comparing programs, both for reporting requirements for funding and the future use of clinical indicators. The minimum data sets developed by the National Heart Foundation[388] should be routinely collected. Additionally, the following should be recorded for each patient: employment status (ie whether the patient is in the workforce or not); current or most recent occupation (last paid occupation of those who have retired should be recorded so that occupation (either current or past) can be used as an indicator of socioeconomic status); and living arrangements (whether the patient lives alone - an indicator of possible social isolation).

- program ID
- date of birth
- home address postcode
- preferred language
- aboriginality
- country of birth
- date of entry to program
- principal diagnosis (ICD-9-CM)
- reason for dropout
- living arrangements
- patient ID (eg Medicare number or other unique identifier)
- gender
- marital status
- occupation (current or last)
- employment status
- date of hospital discharge
- additional diagnosis (ICD-9-CM)
- date completed program

The name of a relative or close friend not living with the patient may also be noted to facilitate later follow-up of patients who change their place of residence.

The following data concerning program delivery should also be collected:
- number of referrals
- number of patients who attend
- number of family members who attend
- number of major cardiac complications during the program
- number of minor cardiac complications during the program.

External audit or peer review

External audit or peer review of cardiac rehabilitation and secondary prevention programs is not yet practised in Australia but it is undertaken in some countries such as Germany[721]. Such assessments involve benchmarking a selected program against other programs which represent best practice in the field. Process and outcome indicators such as those listed above are used to evaluate the adequacy of the program. The audit also involves investigating records of individual patients, whose identities remain anonymous to the review team, to confirm that the nominated patients have attended the stated number of sessions and undergone the rehabilitation program and assessments claimed. Results of such audits conducted in Germany are required by the health insurance commission.

Conclusion

This chapter has discussed several of the major issues involved in undertaking process and outcome evaluation. While program evaluation is critically important to achieve best practice, it should not consume a disproportionate amount of staff time. Expert advice should be obtained regarding appropriate methods of evaluation which best suit the needs of particular programs or the specific purpose of the proposed evaluation.

CHAPTER 19
COST, COST SAVING AND COST EFFECTIVENESS

Cardiac rehabilitation program costs vary throughout the world. Costs in Australia, New Zealand and the United Kingdom are similar, as the programs are similar. Canadian programs are somewhat more costly because of the greater exercise component. Programs in the USA are markedly more expensive because frequent sessions of high intensity exercise are the basis for the program, with consequent monitoring costs and prior exercise stress testing.

Victorian public hospitals

A costing has been undertaken at a major metropolitan teaching hospital in Melbourne, with a large medical and surgical throughput. At this hospital, the patient attendance rate after myocardial infarction and coronary bypass surgery is less than 50% of those eligible. This is a common feature worldwide. The exercise component of the program is of low to moderate intensity. Monitoring is by perceived exertion or heart rate without ECG or telemetry. Exercise stress tests and other tests undertaken upon patients enrolled in the program are not costed to the program, as they are not primarily undertaken to guide the rehabilitation program.

The cost of this cardiac rehabilitation program was calculated to be $A44,784 overall in 1997 (personal communication). This cost covered the costs of 216 attending patients during the year. The program was based upon six weeks of group exercise and education, conducted once per week, with each session lasting for two hours (45 to 60 minutes of exercise, 45 to 60 minutes of discussion). There were 20 to 30 patients attending each group session, with an average of 24 patients, together with some family members. The cost was $A207.33 per patient who attends the program, a cost of $34.56 per session. However, the costing is for program delivery. It does not fully cover the costs of co-ordination, patient assessment and communication. The weekly mean program costs were calculated to be $5,598.

It is not possible for this program to handle more patients without setting up a second parallel program. A second parallel program could be achieved at a lesser cost per patient, but at a significantly greater cost overall. It would, however, permit greater individual attention to patients. If the same number of patients were to attend twice

weekly for six weeks, again the cost per patient would be significantly increased, but it would be less than double the current cost.

The survey of model programs undertaken for these Best Practice Guidelines included the program at the above hospital[7]. The survey showed a similar degree of patient satisfaction with programs which were attended once, twice or three or more sessions per week. However, more patients who attended this once per week program considered that they would benefit from more contact with staff, more discussion time, more education, more social support and more exercise during the six week program. The implication is that the number of patients in each group was too great or, possibly, that a twice weekly program may achieve better satisfaction and, one assumes, greater benefits. In consequence, it may be reasonable to divide the single program into two parallel programs to reduce the number of patients attending each group session or to change to a twice weekly program. Either change would increase the overall cost towards $400 per patient. Further research into costing, cost benefit and cost effectiveness is required in these details of program planning, content and implementation.

The possibility of extending the overall duration of the program to eight weeks or more remains open. However, the great majority of patients claim satisfaction with six weeks. Extending the program duration to eight weeks could lead to possible adverse effects for some patients (for example, reduced perception of recovery, financial stress, job loss). Longer duration of the program does not appear to be a preferred option.

Costs per patient in other programs vary from those discussed above. The major difference in cost per patient depends upon the number of patients attending each class, while salary costs per hour remain similar for the conduct of each class. Thus, an education class of 10 patients may lead to costs per patient approaching twice that in a program where there are 20 patients per class. Another factor influencing cost is the time spent by the program co-ordinator assuring patient referral and attendance and the entry and discharge assessments of each patient.

In one hospital-based program, patients attend for six weeks twice weekly for both exercise and education groups (personal communication). Between 300 to 360 patients attend this program each year. There are usually up to 20 patients in each of two exercise classes, who come together as a group of up to 40 patients for the education group session. While patients are thereby offered twice as much education time, the number of patients in the education group may reduce the desired interactive nature of the presentation. The overall cost of the program has been calculated at approximately $90,000 per year, a cost of approximately $300 per patient or $25 per session per patient. This is likely to be as low a cost per patient as could be achieved, but this is because exercise groups are large and education groups are excessively large.

It appears reasonable to suggest a cost of $250 to $300 per patient for a six week program once per week, with two hour sessions (one hour of exercise, one hour of education), allowing for adequate time to be devoted to each patient at entry assessment and during the program. Similarly, it would seem reasonable to suggest a cost of $450 to $500 per patient for a six week program, conducted twice per week for two hours, without sessions being overloaded by numbers.

As indicated above and in Chapter 8, there is good evidence that rehabilitation exercise programs conducted twice per week are as effective as those conducted thrice per week. Once per week rehabilitation exercise classes may be as effective as twice or thrice per week, provided a suitable home walking program is advised[205].

There is no evidence to form an opinion regarding education classes being better conducted once per week or twice per week. There is a need for both sufficient exposure to information and sufficient opportunity for patient participation and understanding. As pointed out in Chapter 13, the benefits of interactive learning are greatest through small education groups. The size of the group and the skills of the facilitator may be more important for learning than the number and duration of classes made available to patients.

Thus, while smaller classes indicate greater cost per patient, it seems smaller classes may lead to better outcomes and consequent cost effectiveness than attempting to minimise costs per patient by having large numbers of patients per class.

Victorian private hospitals

Some private hospitals in Victoria conduct cardiac rehabilitation programs, each somewhat different from the others, but all meeting National Heart Foundation Minimal Standards (six sessions of exercise, six sessions of group education and discussion)[79]. Patients who belong to appropriate health funds have cardiac rehabilitation included in the contract agreement between the fund and the hospital reimbursement for management of their acute myocardial infarction, coronary bypass surgery or percutaneous transluminal coronary angioplasty. If not covered in this way, patients may pay on a sessional (up to 2 hours per session) basis without reimbursement.

Incorporating all possible expenditure at one such hospital for eight two hour sessions gave a calculated cost (excluding return on investment) of $347.06 per patient or $43.38 per patient per session.

Canada

The 1997 Victorian public hospital cost ($A34.56 per patient per attendance) and private hospital cost ($A43.38 per patient per attendance) parallels the cost of a Canadian program in 1991 terms of $Can 30.00 per patient per attendance[740]. In this

Canadian program, patients attend twice weekly for eight weeks, with a somewhat higher level of exercise and consequent additional monitoring but with significantly less educational component. The overall cost for that program was calculated to be $Can 480.00 per patient.

United States of America

Programs in the USA are usually conducted at a higher intensity of exercise and are considered to necessitate electrocardiographic or telemetered monitoring, together with closer supervision of the exercise. Hence costs are greater. Cardiac rehabilitation programs classically involve three exercise sessions per week and extend over 12 weeks (a total of 36 sessions per patient). Additionally, exercise tests are usually undertaken to determine training heart rate. The cost of the 36 session cardiac rehabilitation program in USA has been well reported[741,742]. The cost per patient has risen, together with other medical costs, from $US 1,280.00 in 1985 to $US 2,810.00 in 1995. (This cost includes the pre-requisite cost for an exercise stress test of $180.00 in 1985 with equivalent rise in costs to 1995). The addition of cardiac rehabilitation to standard hospital and post hospital care of patients with myocardial infarction or coronary bypass surgery increases the overall episode cost by only 2 to 3%[741,743].

United Kingdom

A survey of a sample of cardiac rehabilitation programs in the United Kingdom undertaken in 1997 reported an overall mean program cost of £33,000, a mean cost per patient of £360 and a mean cost per patient per session of £47 (but with a median cost of £26)[744]. The wide range of costing was largely related to patient throughput and hours of patient contact time. Most programs provided were, in general, similar to those in Australia[49] with services provided primarily by physiotherapists and nurses, with relatively little input from physicians and psychologists. It has been noted that, while guidelines and audit standards have been recommended[73], there remain significant deficiencies in attendance patterns, procedures, process and program audit[745]. In particular, there appeared to be insufficient attention to patient education and knowledge, psychological, social, occupational issues and outcomes. Further attention to these issues would somewhat increase program costs. It is accepted that hospital-based outpatient ambulatory cardiac rehabilitation programs are desirable to achieve seamless rehabilitation, extending from acute hospital care into long term community follow-up[746]. It is also recognised that the community aspect of cardiac rehabilitation and follow-up requires development and testing to determine which types of programs are most likely to prove effective in maintaining longterm care, patient quality of life and secondary prevention[746].

Comment

Costs of ambulatory cardiac rehabilitation programs conducted during convalescence vary between countries and between individual programs. The cost per patient clearly depends upon several factors. The most important of these are as follows:

- the number of sessions, each of approximately one hour of exercise and one hour of education (optimal 12 sessions in six weeks);
- the number of patients in each exercise group (optimal number 10–20 patients);
- the intensity of exercise and degree of monitoring (optimal monitoring by heart rate and rate of perceived exertion, not by technology);
- the number of patients in each education group (optimal number 10–20 patients plus family members);
- the cost of entry assessment (optimal duration half hour per patient);
- the cost of discharge assessment and program discharge review (optimal half hour duration excluding discharge exercise stress test which is optional);
- costs of co-ordination, referral, organisation and documentation.

Assessment of costs of programs similar to the above "optimal" program indicates approximately $40 per patient per session. That would mean a cost per patient of $480 for the 12 sessions extending over six weeks, each session lasting two hours in total.

These costs do not include the costs of the venue, equipment and overheads which are insignificant when compared with the above salary-based components. They also do not include costs for review of outcomes for patients, either by recall and face to face interview and checking or by telephone.

Further, the costing does not take into account the need for maintenance (phase 3) programs which should follow the ambulatory convalescent (phase 2) program. It should be noted that those programs showing the greatest cost savings have included both early ambulatory and maintenance programs. The cost of such maintenance programs is not adequately documented anywhere. Some model programs need to be established and evaluated. The evaluation should include a careful cost analysis.

Cost saving

Recommendation

Cardiac rehabilitation is recommended to produce significant direct cost saving through reduced hospital readmissions, hospital costs, disability pensions and support services, while improving quality and duration of life.

Strength of evidence = 2

The established benefits impinging on cost include reduced hospital readmissions[160,740,743,747] and reduced death rates in the ensuing one to 10 years[14,81,91]

greater work resumption with persistence in work for those in the workforce[121,174,182,748] improved independent functioning and overall quality of life[121].

Reduced hospital readmissions for heart failure and avoidance of transplantation amongst patients with congestive heart failure through participation in a cardiac rehabilitation program is definite[218]. Removal of patients with stable angina pectoris from waiting lists for coronary artery bypass surgery is possible[147]. Amongst patients after acute myocardial infarction, it is reasonable to accept the findings of multiple trials and of meta analyses[80,81] that a mortality reduction of approximately 20% occurs over the next three years following participation in a cardiac rehabilitation program.

The most favourable assessment of cost saving through cardiac rehabilitation has been the careful economic analysis of the controlled study from Sweden[160]. The saving in direct costs over the period of five years amongst men enrolled in the cardiac rehabilitation program was equivalent to $US 12,000.00 per patient (in 1988 terms). There were significant savings in hospital costs through reduced recurrent events, hospital attendances and hospital readmissions. A greater number of men in the rehabilitation group remained in employment, reducing the payment of disability and unemployment benefits, with great savings to the national insurance fund. Additionally, there was a significant reduction in mortality, statistically significant after 10 years[91]. Indirect cost benefits, social benefits and quality of life were not analysed.

Cost effectiveness

Recommendation

Multifactorial cardiac rehabilitation is recommended as a cost effective use of medical care resources.

Strength of evidence = 2

The dollar cost per year of life saved ($/LYS) has been calculated to be $US 2,130/YLS in 1985, rising to $US 4,950/YLS in 1995, the difference being driven by rising hospital and rehabilitation costs[741]. Such a low level of $/YLS places cardiac rehabilitation in the range of benefits similar to the $/YLS achieved through coronary angioplasty for severe angina in patients with single vessel disease[749] and conferring possibly greater benefits than coronary bypass surgery[749], or treatment with simvastatin for secondary prevention for patients with coronary artery disease[750,751], while being inferior in cost effectiveness to counselling in smoking cessation[749,752].

An economic evaluation based upon cost utility in terms of dollars/quality adjusted life years saved ($/QALYS) has been reported[740]. This study showed gains in $/QALYS similar to other major accepted interventions in patients with cardiovascular disease.

CHAPTER 20
RECOMMENDATIONS FOR FUTURE RESEARCH

As indicated throughout these Guidelines, further research is needed in many areas, including the following:

Exercise training

- Comparison of outcomes of outpatient exercise rehabilitation programs with frequency once, twice or three times per week.
- Investigation of outcomes of outpatient exercise rehabilitation programs of different durations (eg 4,6,8,12 weeks)
- Further investigation of the safety and efficacy of resistance training in higher risk and other cardiac groups

Education, counselling and behavioural interventions

- Comparison of different educational and counselling interventions to increase knowledge in cardiac patients
- Investigation of the efficacy of education groups in cardiac rehabilitation of different sizes, frequency, duration and structure
- Development and evaluation of interventions to reduce weight in overweight and obese cardiac patients
- Evaluation of interventions to promote maintenance of physical activity and fitness in cardiac patients
- Evaluation of the effectiveness of behavioural interventions in improving health behaviours of patients who have undergone coronary angioplasty (including reducing smoking and weight and increasing physical activity)
- Investigation of relapse prevention methods for smoking cessation and weight reduction in cardiac patients
- Investigation of the determinants and patterns of non-adherence in different cardiac patient groups and the evaluation of interventions to increase adherence

Psychosocial interventions

- Development of interventions to support spouses of cardiac patients in hospital and during convalescence
- Investigation of the effects upon cardiac patients and their families of very early discharge of patients from hospital

- Evaluation of stress management programs in cardiac rehabilitation
- The development of effective interventions to improve psychosocial functioning of patients and spouses

Vocational rehabilitation

- Development and evaluation of interventions to increase return to work and improve occupational adjustment following acute cardiac events

Programs for specific groups

- Development and evaluation of cardiac rehabilitation programs for patients of non-English speaking backgrounds
- Development and evaluation of cardiac rehabilitation programs for Aboriginal patients
- Further development and evaluation of cardiac rehabilitation programs for rural and remote patients
- Development and evaluation of cardiac rehabilitation programs for patients who have undergone coronary angioplasty and stent implantation
- Development and evaluation of cardiac rehabilitation programs for patients with stable angina
- Development and evaluation of cardiac rehabilitation programs for patients with unstable angina
- Development and evaluation of cardiac rehabilitation programs for patients with significant co-morbidity
- Investigation of the processes of recovery and outcomes of female cardiac patients
- Investigation of the needs of children with congenital heart disease and their carers
- Investigation of outcomes of group exercise, education and counselling programs in heart failure patients
- Investigation of outcomes of group exercise, education and counselling programs for elderly patients
- Investigation of outcomes of group exercise, education and counselling programs in patients with implantable defibrillators
- Investigation of the effectiveness of cardiac rehabilitation programs in patients with congenital heart disease, rheumatic heart disease and other forms of heart disease

Organisational issues

- Development and assessment of the effectiveness of cardiac rehabilitation programs based upon modules
- Development and evaluation of strategies to increase participation of patients and spouses in cardiac rehabilitation programs

- Investigation of patterns of attendance at programs and identification of predictors of nonattenders and dropouts
- Development of community-based programs to meet the needs of patients at different stages of recovery
- Comparison of costs and cost effectiveness of different models for cardiac rehabilitation programs
- Investigation of shared care approaches to secondary prevention in cardiac patients
- Development and evaluation of strategies to improve communication with general practitioners following the discharge of cardiac patients from hospital and from cardiac rehabilitation programs
- Comparison of the effectiveness of cardiac rehabilitation group programs conducted through general medical practice with those conducted by multidisciplinary teams
- Investigation and definition of core competencies of members of cardiac rehabilitation teams

Evaluation

- Development of sensitive instruments to assess psychological, social, occupational and interpersonal functioning in cardiac patients
- Development of more sensitive physical activity scales for cardiac patients
- Development of more sensitive dietary scales for cardiac patients
- Development of instruments to assess compliance in cardiac patients
- Development of predictors of outcomes of cardiac patients, using inhospital and convalescent data
- Development of multidimensional measures of quality of life in cardiac patients
- Investigation of the applicability of generic tools in cardiac populations
- Development and testing of key process and outcome indicators

Cost, cost saving and cost effectiveness

- Investigation of detailed current program costs
- Investigation of costs of suggested optimal program components
- Investigation of costs of suggested additional program modules
- Further study of cost savings and cost saving estimates, based upon computer modelled outcomes, determined by changed risk factor profiles, upon discharge from programs
- Cost effectiveness measures ($/YLS and $/QALYS) related to the effects of low cost, low technology programs of cardiac rehabilitation.

Others studies

- Investigation of the role of telephone follow-up and the use of telephonic networks to support cardiac patients, spouses and health professionals, especially in rural and remote areas
- Identification of effective components of multifactorial programs
- Further evaluation of simple low cost models of cardiac rehabilitation and secondary prevention applicable to Australia and other countries.

REFERENCES

1 World Health Organisation Expert Committee. Rehabilitation after cardiovascular diseases, with special emphasis on developing countries. Technical report series number 831. Geneva: World Health Organisation; 1993.

2 Wenger NK, Froelicher ES, Smith LK et al. Cardiac Rehabilitation. Clinical Practice Guideline No 17. Rockville, MD: US Department of Health and Human Services, Public Health Service, Agency for Health Care Policy and Research USA and the National Heart, Lung, and Blood Institute. AHCPR Pub No. 96-0672; 1995.

3 The World Health Report: conquering suffering, enriching humanity. Report of the Director-General. Geneva: World Health Organisation; 1997

4 The global burden of disease: A comprehensive assessment of mortality and disability from disease, injuries and risk factors in 1990 and projected to 2020. CJL Murray CJL and Lopez AD, editors. World Health Organisation, World Bank and Harvard School of Public Health. Cambridge, Mass: Harvard University Press; 1996.

5 Report on 1996 survey of Victorian cardiac rehabilitation programs. Melbourne: Heart Research Centre; 1999.

6 Report on attitudes of health care providers towards cardiac rehabilitation and secondary prevention services. Melbourne: Heart Research Centre; 1999.

7 A comparative study of four model cardiac rehabilitation and secondary prevention programs: a report on a pilot study. Melbourne: Heart Research Centre; 1999.

8 National Health and Medical Research Council of Australia Quality of Care and Health Outcomes Committee: Guidelines for the development and implementation of clinical practice guidelines. Canberra: Australian Government Publishing Service; 1995.

9 World Health Organisation Expert Committee. Rehabilitation of patients with cardiovascular diseases. Technical report series number 270. Geneva: World Health Organisation; 1964.

10 How to plan a cardiac rehabilitation program. Sydney: National Heart Foundation of Australia (NSW Division);1993.

11 Feigenbaum E, Carter E. Cardiac rehabilitation services. Health technology assessment report, 1987, no 6. Rockville, MD: US Department of Health and Human Services, Public Health Service, National Center for Health Services Research and Health Care Technology Assessment. DHHS publication No. PHS 88–3427. Aug. 1988.

12 Long-term comprehensive care of cardiac patients. Recommendations by the Working Group on Rehabilitation of the European Society of Cardiology. Eur Heart J 1992;13 Suppl C:1–45.

13 World Health Organisation. Needs and action priorities in cardiac rehabilitation and secondary prevention in patients with CHD: report on two consultations. Copenhagen: World Health Organisation; 1993.

14 Kallio V, Hamalainen H, Hakkila J, Luurila OJ. Reduction in sudden deaths by a multifactorial intervention programme after acute myocardial infarction. Lancet 1979;2:1091–4.

15 Haskell WL, Alderman EL, Fair JM, Maron DJ, Mackey SF, Superko HR, et al. 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 Intervention Project (SCRIP). Circulation 1994;89:975–90.

16 Hedback B, Perk J. 5-year results of a comprehensive rehabilitation programme after myocardial infarction. Eur Heart J 1987;8:234–42.

17 Lamm G, Denolin H, Dorossiev D, Pisa Z. Rehabilitation and secondary prevention of patients after acute myocardial infarction. Adv Cardiol 1982;31:107–11.

18 Shaw LW. Effects of a prescribed supervised exercise program on mortality and cardiovascular morbidity in patients after myocardial infarction: The National Exercise and Heart Disease Project. Am J Cardiol 1981;48:39–46.

19 Rechnitzer PA, Cunningham DA, Andrew GM, Buck CW, Jones NL, Kavanagh T. Relation of exercise to the recurrence rate of myocardial infarction in men: Ontario Exercise-Heart Collaborative Study. Am J Cardiol 1983;51:65–9.

20 Goldwater LJ, Bronstein LK, Dresky, B. Study of one hundred and seventy-five "cardiacs" without heart disease. JAMA 1952;148:89.

21 Goldwater LJ. Vocational rehabilitation of the cardiac. In: Warshaw LJ, editor. The heart in industry. New York: Hoeber; 1960.

22 Katz LN, Bruce RA, Plummer M, Hellerstein HK. Rehabilitation of the cardiac patient. Circulation 17;114–126:1958.

23 Dock W. The evil sequelae of complete bed rest. JAMA 1944;125:1083–5.

24 Levine SA, Lown B. "Armchair" treatment of acute coronary thrombosis. JAMA 1952;148:1365–9.

25 Hellerstein HK, Ford AB. Comprehensive care of the coronary patient. Circulation 1960;22:1166.

26 Cain HD, Frasher WD, Stivelman J. Graded activity for safe return to self-care after myocardial infarction. JAMA 1961;177:111–5.

27 Tobis JA, Zohman L. A rehabilitation program for inpatients with recent myocardial infarction. Arch Phys Med Rehabil 1968;49:443–8.

28 Wenger NK, Gilbert CA, Skoapa MZ. Cardiac conditioning after myocardial infarction: an early intervention programme. Cardiac Rehabilitation II 1971;17–23.

29 Naughton JP, Hellerstein HK, editors. Exercise testing and exercise training in coronary artery disease. New York: Acadenic Press; 1973.

30 Bruce RA. The benefits of physical training for patients with coronary heart disease. In: Ingelfinger et al , editors. Controversy in Internal Medicine II. Philadelphia: WB Saunders; 1974.

31 American Heart Association Committee Report. Standards for cardiovascular exercise treatment programmes. Circulation 1979;59:1084A–1094A.

32 DeBusk RF, Houston N, Haskell WL, Fry G, Parker M, Exercise training soon after myocardial infarction. Am J Cardiol 1979;44:1223–9.

33 Miller DH, Borer JS. Exercise testing early after myocardial infarction. Am J Med 1982;72: 427–38.

34 Goble AJ, Adey GM, Bullen JF. Rehabilitation of the cardiac patient. Med J Aust 1963;2: 975–982.

35 Seldon WA. Cardiac rehabilitation: report of first six months' experience in a rehabilitation unit. Med J Aust 1963;2:982–9.

36 Wynn A. Unwarranted emotional distress in men with ischaemic heart disease. Med J Aust 1967;2:847–51.

37 Miller GM. Cardiac work assessment in Queensland. Med J Aust 1967;2:711–7.

38 Jelinek VM, Ziffer RW, McDonald IG et al. Early exercise testing and mobilisation after myocardial infarction. Med J Aust 1977;2:589.

39 Hare DL, Fitzgerald H, Darcy F, Race E, Goble AJ. Cardiac rehabilitation based on group light exercise and discussion: an Australian hospital model. J Cardiopulm Rehabil 1995;15:186–92.

40 Worcester MC. Cardiac rehabilitation programmes in Australian hospitals. Canberra: National Heart Foundation of Australia; 1986.

41 Briffa T, Bunker S, Catford M, Humphries J, Inder K, O'Meara N, Whitelum D, Worcester M. 1992 survey of cardiac rehabilitation programs in Australian hospitals. Proceedings of the 3rd Annual Scientific Meeting of the Australian Cardiac Rehabilitation Association. Brisbane; 1993.

42 Frick MH, Katila N. Haemodynamic consequences of physical training after myocardial infarction. Circulation 1968;37:192–202.

43 Wilhelmsen L, Sanne H, Elmfeldt D, Grimby G, Tibblin G, Wedel H. A controlled trial of physical training after myocardial infarction: effects on risk factors, nonfatal reinfarction, and death. Prev Med 1975;4:491–508.

44 Kentala E. Physical fitness and feasibility of physical rehabilitation after myocardial infarction in men of working age. Ann Clin Res 1972;4 Suppl 9:1–85.

45 Marra S, Paolillo V, Spadaccini F, Angeleno PF. Long-term follow-up after a controlled randomized post-myocardial infarction rehabilitation programme: effects on morbidity and mortality. Eur Heart J 1985;6:656–63.

46 Bengtsson K. Rehabilitation after myocardial infarction: a controlled study. Scand J Rehabil Med 1983;15:1–9.

47 Jette, M, Landry G, Blumchen G. Cardiac rehabilitation in the Federal Republic of Germany: Klinik Roderbirken. J Cardiopulm Rehabil 1988;9:341–9.

48 Dubach P, Myers J, Dziekan G, Goerre S, Buser P, Laske A. Effect of residential cardiac rehabilitation following bypass surgery: observations in Switzerland. Chest 1995;108:1434–49.

49 Davidson C. Cardiac rehabilitation in the district hospital. In: Jones D and West R, editors. Cardiac rehabilitation (pp 144–166). London: BMJ Publishing Group; 1995.

50 Goble AJ, Worcester MC. The development of cardiac rehabilitation in Asia. Heartbeat (Bulletin of the World Heart Federation) 1998;3:1–2.

51 Worcester MC. Report on the development, implementation and evaluation of a five day training program for rural health workers. Melbourne: Heart Research Centre; 1995.

52 Mee V, Worcester M, Richmond K, Grigg L, Newman R, Roberts S, Tatoulis J, Goble A. Patterns of attendance at cardiac rehabilitation programs [abstract]. Proceedings of the Annual Scientific Meeting of the Cardiac Society of Australia and New Zealand. Aust NZ J Med 1998;28:136.

53 Bunker S. McBurney H, Aikman H. Cardiac rehabilitation: the extent, reasons and predictors of nonattendance (abstract). J Cardiopulm Rehabil 1998;5:350.

54 Thomas RJ, Miller NH, Lamendola C, Berra K, Hedback B, Durstine JL, et al. National survey on gender differences in cardiac rehabilitation programs: Patient characteristics and enrolment patterns. J Cardiopulm Rehabil 1996;16:402–12.

55 Evenson KR, Rosamond WD, Luepker RV. Predictors of outpatient cardiac rehabilitation utilization: The Minnesota Heart Survey Registry. J Cardiopulm Rehabil 1998;18:192–8.

56 Thompson DR, Bowman GS, Kitson Al, de Bono DP, Hopkins A. Cardiac rehabilitation services in England and Wales: a national survey. Int J Cardiol 1997; 59: 299–304.

57 Australian Bureau of Statistics. Deaths - Australia. ABS catalogue No. 3302.0. Canberra; 1996.

58 Australasian Faculty of Rehabilitation Medicine (Victorian Branch). Rehabilitation into the 21st century: A vision for Victoria: Melbourne; 1997.

59 National Heart Foundation of Australia. Heart and stroke facts: 1996 Report. Canberra: National Heart Foundation of Australia; 1996.

60 Health indicators: measures of health status in Victoria. Melbourne: Victorian Government Department of Human Services; 1996.

61 World Health Statistics Annual. Geneva: World Health Organisation; 1994.

62 Janus ED, Postiglione E, Singh RB, Lewis B. The modernisation of Asia: implications for coronary heart disease. Council of Arteriosclerosis of the International Society and Federation of Cardiology. Circulation 1996;94:2671–3.

63 Singh RB, Sharma JP, Rastogi, Niaz MA, Ghosh S, Beegom R, Sharma JP, et al. Social class and coronary disease in a rural population of north India: The Indian Social Class and Heart Survey. Eur Heart J 1977:18:588–95.

64 Singh RB, Ghosh S, Niaz MA, Gupta S, Bishnoi I, Sharma JP, et al. Epidemiologic study of diet and coronary risk factors in relation to central obesity and insulin levels in rural and urban populations of north India. Int J Cardiol 1995:47:245–55.

65 Australian Institute of Health and Welfare. Australia's Health 1996. Canberra: Australian Government Printing Service; 1996.

66 Goble A, Jackson B, Phillips P, Race E, Oliver RG, Worcester MC. The Family Atherosclerosis Risk Intervention Study (FARIS): risk factor profiles of patients and their relatives following an acute cardiac event. Aust NZ J Med 1997;27:568–77.

67 Wenger NK, Froelicher ES, Smith LK et al. Cardiac rehabilitation as secondary prevention. Clinical Practice Guideline. Quick Reference Guide for Clinicians, No. 17. Rockville, MD: US Department of Health and Human Services, Public Health Service. Agency for Health Care Policy and Research and National Heart, Lung and Blood Institute. AHCPR Pub. No 96-0673. October 1995.

68 American Association of Cardiovascular and Pulmonary Rehabilitation. Guidelines for cardiac rehabilitation programs. Champaign (IL): Human Kinetics Books;1991.

69 American Association of Cardiovascular and Pulmonary Rehabilitation. Guidelines for cardiac rehabilitation programs. 2nd ed. Champaign (IL): Human Kinetics Books; 1995.

70 Coats A, McGee HM, Stokes HC, Thompson DR, editors. British Association for Cardiac Rehabilitation. Guidelines for Cardiac Rehabilitation. On behalf of the British Association for Cardiac Rehabilitation. London: Blackwell Science; 1995.

71 American College of Sports Medicine. Guidelines for exercise testing and prescription. 5th ed. Philadelphia: Lea & Febiger; 1995.

72 Horgan J, Bethell H, Carson P, Davidson C, Julian D, Mayou RA, Natle R. Working party report on cardiac rehabilitation. Br Heart J 1992;67:412–8.

73 Thompson DR, Bowman GS, Kitson AL, de Bono DP, Hopkins SA. Cardiac rehabilitation in the United Kingdom: guidelines and audit standards. National Institute for Nursing, the British Cardiac Society and the Royal College of Physicians in London. Heart 1996;75:89–93.

74 American Heart Association. Cardiac rehabilitation programs: A statement for healthcare professionals from the American Heart Association. Circulation 1994;90:1602–10.

75 Smith SC, Blair SN, Criqui MH, Fletcher GF, Fuster V, Gersh BJ, et al. American Heart Association Consensus Panel Statement. Preventing heart attack and death in patients with coronary disease. Circulation 1995;92:2–4.

76 Cardiac rehabilitation services. American College of Physicians, Health and Policy Committee (position paper). Ann Intern Med 1988;109:671–3.

77 Ekelund LG, Ekelund CC. Cardiac rehabilitation today: programs, their effects and practical guidelines. Scand J Med Sci Sports 1992;2:190–6.

78 Kubler W, Niebauer J, Kreuzer. [Cost/benefit relations:evaluation of inpatient and ambulatory rehabilitation]. Z Kardiol 1994;83 Suppl 6:151–8.

79 Minimal standards for outpatient (phase 2) cardiac rehabilitation and cardiac rehabilitation policy statements. Canberra: National Heart Foundation of Australia; 1994.

80 Oldridge NB, Guyatt GH, Fischer ME, Rimm AA. Cardiac rehabilitation after myocardial infarction: combined experience of randomised clinical trials. JAMA 1988;260:945–50.

81 O'Connor GT, Buring JE, Yusuf S, Goldhaber SZ, Olmstead EM, Paffenbarger RS, Hennekens CH. An overview of randomized trials of rehabilitation with exercise after myocardial infarction. Circulation 1989;80:234–44.

82 Naylor CD. Meta-analysis and the meta-epidemiology of clinical research. BMJ 1997;315:617–9.

83 Egger M, Davey Smith G, Schneider M, Minder C. Bias in meta-analysis detected by a simple, graphical test. BMJ 1997;315:629–34.

84 Tramer MR, Reynolds DJ, Moore RA, McQuay HJ. Impact of covert duplicate publication on meta-analysis: a case study. BMJ 1997;315: 635–40.

85 Hlatky MA, Califf RM, Harrell FE, Lee KL, Mark DB, Pryor D. Comparisons of predictions based on observational data with the results of randomised controlled trials of coronary artery bypass surgery. J Am Coll Cardiol 1988;11: 237–45.

86 Schulz KF, Chalmers I, Hayes RJ, Altman DG. Empirical evidence of bias: dimensions of methodological quality associated with estimates of treatment effects in controlled trials. JAMA 1995;273:408–12.

87 Black N. Why we need observational studies to evaluate the effectiveness of health care. BMJ 1996;312:1215–8.

88 Roman O, Gutierrez M, Luksic I, Chavez E, Camuzzi AL, Villalon E, et al. Cardiac rehabilitation after acute myocardial infarction: 9-year controlled follow-up study. Cardiology 1983;70:223–31.

89 Hakkila J. Morbidity and mortality after myocardial infarction. Bibl Cardiol 1976;36:159–63.

90 Carson P, Phillips R, Lloyd M, Tucker H, Neophytou M, Buch NJ, et al. Exercise after myocardial infarction: a controlled trial. J R Coll Physicians Lond 1982;16:147–51.

91 Hedback B, Perk J, Wodlin P. Long-term reduction of cardiac mortality after myocardial infarction: 10-year results of a comprehensive rehabilitation programme. Eur Heart J 1993;14:831–5.

92 Rechnitzer PA, Pickard HA, Paivio AU, Yuhasz MS, Cunningham D. Long-term follow-up study of survival and recurrence rates following myocardial infarction in exercising and control subjects. Circulation 1972;45:853–7.

93 Blumenthal JA, Rejeski WJ, Walsh-Riddle M, Emery CF, Miller H, Roark S, et al. Comparison of high- and low-intensity exercise training early after acute myocardial infarction. Am J Cardiol 1988;61:26–30.

94 Goble AJ, Hare DL, Macdonald PS, Oliver RG, Reid MA, Worcester MC. Effect of early programmes of high and low intensity exercise on physical performance after transmural acute myocardial infarction. Br Heart J 1991;65: 126–31.

95 Blumenthal JA, Emery CF, Rejeski WJ. The effects of exercise training on psychosocial functioning after myocardial infarction. J Cardiopulm Rehabil 1988;8:183–93.

96 Worcester MC, Hare DL, Oliver RG, Reid MA, Goble AJ. Early programmes of high and low intensity exercise and quality of life after acute myocardial infarction. BMJ 1993;307:1244–7.

97 Oberman A, Fletcher GF, Lee J, Nanda N, Fletcher BJ, Jensen B, et al. Efficacy of high-intensity exercise training on left ventricular ejection fraction in men with coronary artery disease (The Training Level Comparison Study). Am J Cardiol 1995;76:643–7.

98 Stern MJ, Cleary P. National Exercise and Heart Disease Project: psychosocial changes observed during a low-level exercise program. Arch Intern Med 1981;141:1463–7.

99 Stern MJ, Gorman PA, Kaslow P. The group counseling v exercise therapy study: a controlled intervention with subjects following myocardial infarction. Arch Intern Med 1983;143:1719–25.

100 Kellermann JJ. Long-term comprehensive cardiac care - the perspectives and tasks of cardiac rehabilitation [editorial]. Eur Heart J 1993;14:1441–4.

101 Hung J, Gordon EP, Houston N, Haskell WL, Goris ML, DeBusk RF. Changes in rest and exercise myocardial perfusion and left ventricular function 3 to 26 weeks after clinically uncomplicated acute myocardial infarction: effects of exercise training. Am J Cardiol 1984;54:943–50.

102 Giannuzzi P, Tavazzi L, Temporelli PL, Corra U, Imparato A, Gattone M, et al. Long-term physical training and left ventricular remodeling after anterior myocardial infarction: results of the Exercise in Anterior Myocardial Infarction (EAMI) trial. EAMI study group. J Am Coll Cardiol 1993;22: 1821–9.

103 Schuler G, Hambrecht R, Schlierf G, Grunze M, Methfessel S, Hauer K, et al. Myocardial perfusion and regression of coronary artery disease in patients on a regimen of intensive physical exercise and low fat diet. J Am Coll Cardiol 1992;19:34–42.

104 DeBusk RF, Houston Miller N, Superko HR, Dennis CA, Thomas RJ, Lew HT, et al. A case-management system for coronary risk factor modification after acute myocardial infarction. Ann Intern Med 1994;120:721–9.

105 Hambrecht R, Niebauer J, Marburger C, Grunze M, Kalberer B, Hauer K, et al. Various intensities of leisure time physical activity in patients with coronary artery disease: effects on cardiorespiratory fitness and progression of coronary atherosclerotic lesions. J Am Coll Cardiol 1993;22:468–77.

106 Coats AJ, Adamopoulos S, Meyer TE, Conway J, Sleight P. Effects of physical training on chronic heart failure. Lancet 1990;335:63–6.

107 Meyer TR, Casadei B, Coats AJ, Davey PP, Adamopoulos S, Radaelli A, Conway J. Angiotensin-converting enzyme inhibition and physical training in heart failure. J Intern Med 1991;230:407–13.

108 Mayou R, MacMahon D, Sleight P, Florencio MJ. Early rehabilitation after myocardial infarction. Lancet 1981;2:1399–402.

109 Fletcher BJ, Dunbar SB, Felner JM, Jensen BE, Almon L, Cotsonis G, et al. Exercise testing and training in physically disabled men with clinical evidence of coronary artery disease. Am J Cardiol 1994;73:170–4.

110 Taylor CB, Houston-Miller N, Ahn DK, Haskell W, DeBusk RF. The effects of exercise training programs on psychosocial improvement in uncomplicated postmyocardial infarction patients. J Psychosom Res 1986;30:581–7.

111 Giannuzzi P, Temporelli PL, Tavazzi L, Corra U, Gattone M, Imparato A, et al. EAMI - exercise training in anterior myocardial infarction: an ongoing multicenter randomized study: preliminary results on left ventricular function and remodeling. The EAMI study group. Chest 1992;101 Suppl 5:315S–321S.

112 Grodzinski E, Jette M, Blumchen G, Borer JS. Effects of a four-week training program on left ventricular function as assessed by radionuclide ventriculography. J Cardiopulm Rehabil 1987;7:518–24.

113 Foster C, Pollock ML, Anholm JD, Squires RW, Ward A, Dymond DS, et al. Work capacity and left ventricular function during rehabilitation after myocardial revascularization surgery. Circulation 1984;69:748–55.

114 Froelicher V, Jensen D, Genter F, Sullivan M, McKirnan MD, Witztum K, et al. A randomized trial of exercise training in patients with coronary heart disease. JAMA 1984;252:1291–7.

115 May GA, Nagle FJ. Changes in rate-pressure product with physical training of individuals with coronary artery disease. Phys Ther 1984;64:1361–6.

116 Ornish D, Scherwitz LW, Doody RS, Kesten D, McLanahan SM, Brown SE, et al. Effects of stress management training and dietary changes in treating ischaemic heart disease. JAMA 1983;249:54–9.

117 Sebrechts CP, Klein JL, Ahnve S, Froelicher VF, Ashburn WL. Myocardial perfusion changes following 1 year of exercise training assessed by thallium-201 circumferential count profiles. Am Heart J 1986;112:1217–26.

118 Engblom E, Ronnemaa T, Hamalainen H, Kallio V, Vanttinen E, Knuts LR. Coronary heart disease risk factors before and after bypass surgery: results of a controlled trial on multifactorial rehabilitation. Eur Heart J 1992;13:232–7.

119 Newton M, Mutrie N, McArthur JD. The effects of exercise in a coronary rehabilitation programme. Scott Med J 1991; 36:38–41.

120 Nolewajka AJ, Kostuk WJ, Rechnitzer PA, Cunningham DA. Exercise and human collateralization: an angiographic and scintigraphic assessment. Circulation 1979;60:114–21.

121 Oldridge NB, Guyatt G, Jones N, Crowe J, Singer J, Feeny D, et al. Effects on quality of life with comprehensive rehabilitation after acute myocardial infarction. Am J Cardiol 1991;67:1084–9.

122 Oldridge NB, McCartney N, Hicks A, Jones NL. Improvement in maximal isokinetic cycle ergometry with cardiac rehabilitation. Med Sci Sports Exerc 1989;21:308–12.

123 Vanhees L, Fagard R, Thijs L, Amery A. Prognostic value of training-induced change in peak exercise capacity in patients with myocardial infarcts and patients with coronary bypass surgery. Am J Cardiol 1995;76:1014–9.

124 Froelicher V, Jensen D, Sullivan M. A randomized trial of the effects of exercise training after coronary artery bypass surgery. Arch Intern Med 1985;145:689–92.

125 Oldridge NB, Nagle FJ, Balke R, Corliss RJ, Kahn DR. Aortocoronary bypass surgery : Effects of surgery and 32 months of physical conditioning on treadmill performance. Arch Phys Med Rehabil 1978;59:268–75.

126 Horgan JH, Teo KK, Murren KM, O'Riordan JM, Gallagher T. The response to exercise training and vocational counselling in post myocardial infarction and coronary artery bypass surgery patients. Ir Med J 1980;73: 463–9.

127 Soloff PH. Medically and surgically treated coronary patients in cardiovascular rehabilitation: a comparative study. Int J Psychiatry Med 1979;9:93–106.

128 Hartung GH, Rangel R. Exercise training in post-myocardial infarction patients: comparison of results with high risk coronary and post-bypass patients. Arch Phys Med Rehabil 1981;62:147–50.

129 Wosornu D, Bedford D, Ballantyne D. A comparison of the effects of strength and aerobic exercise training on exercise capacity and lipids after coronary artery bypass surgery. Eur Heart J 1996;17:854–63.

130 DeBusk RF, Blomqvist CG, Kouchoukos NT, Luepkern RV, Miller HS, Moss AJ, et al. Identification and treatment of low-risk patients after acute myocardial infarction and coronary-artery bypass graft surgery. N Engl J Med 1986;314:161-6.

131 Convertino V, Hung J, Goldwater D, DeBusk RF. Cardiovascular responses to exercise in middle-aged men after 10 days of bedrest. Circulation 1982;65:134–40.

132 Kelemen MH. Resistance training safety and essential guidelines for cardiac and coronary prone patients. Med Sci Sports Exerc 1989;21:675–7.

133 Wilke NA, Sheldahl LM, Levandoski SG, Hoffman MD, Dougherty SM, Tristani FE. Transfer effect of upper extremity training to weight carrying in men with ischaemic heart disease. J Cardiopulm Rehabil 1991;11:365–72.

134 Butler RM, Palmer G, Rogers FJ. Circuit weight training in early cardiac rehabilitation. J Am Osteopath Assoc 1992;92:77–89.

135 McCartney N, McKelvie RS, Haslam DR, Jones NL. Usefulness of weightlifting training in improving strength and maximal power output in coronary artery disease. Am J Cardiol 1991;67:939–46.

136 Daub WD, Knapik GP, Black WR. Strength training early after myocardial infarction. J Cardiopulm Rehabil 1996;16:100–8.

137 Beniamini Y, Rubenstein JJ, Zaichkowsky LD, Crim MC. Effects of high-intensity strength training on quality-of-life parameters in cardiac rehabilitation patients. Am J Cardiol 1997;80:841–6.

138 Amos KR, Porcari JP, Bauer SR, Wilson PK. The safety and effectiveness of walking with ankle weights and wrist weights for patients with cardiac disease. J Cardiopulm Rehabil 1992;12:254–60.

139 Faigenbaum AD, Skrinar GS, Cesare WF, Kraemer WJ, Thomas HE. Physiologic and symptomatic responses of cardiac patients to resistance exercise. Arch Phys Med Rehabil 1990;71:395–8.

140 Featherstone JF, Holly RG, Amsterdam EA. Physiologic responses to weight lifting in coronary artery disease. Am J Cardiol 1993;71:287–92.

141 Schram V, Hanson P. Cardiovascular and metabolic responses to weight-loaded walking in cardiac rehabilitation patients. J Cardiopulm Rehabil 1988;8:28–32.

142 Sheldahl M, Wilke NA, Tristani FE, Kalbfleisch JH. Response of patients after myocardial infarction to carrying a graded series of weight loads. Am J Cardiol 1983;52:698–703.

143 Vermeulen A, Lie K, Durrer D. Effects of cardiac rehabilitation after myocardial infarction: changes in coronary risk factors and long-term prognosis. Am Heart J 1983;105: 789–801.

144 Ornish D, Brown SE, Scherwitz LW, Billings JH, Armstrong WT, Ports TA, et al. Can lifestyle changes reverse coronary artery disease? The Lifestyle Heart Trial. Lancet 1990;336:129–33.

145 Todd IC, Ballatyne D. Effect of exercise training on the total ischaemic burden: an assessment by 24 hour ambulatory electrocardiographic monitoring. Br Heart J 1992;68:560–6.

146 Erdman RA, Duivenvoorden HJ, Verhage F, Kazemier M, Hugenholtz PG. Predictability of beneficial effects in cardiac rehabilitation: randomized clinical trial of psychosocial variables. J Cardiopulm Rehabil 1986;6:206–13.

147 Cay EL. Outcome of psychological interventions in heart disease. In Proceedings of the Vth World Congress on Cardiac Rehabilitation. Broustet JP, editor. Andover UK: Intercept Ltd; 1993.

148 Newton M, Mutrie N, McArthur JD. The effects of exercise in a coronary rehabilitation programme. Scott Med J 1991;36:38–41.

149 Ott CR, Sivarajan ES, Newton KM, Almes MJ, Bruce RA, Bergner M, et al. A controlled randomized study of early cardiac rehabilitation: the Sickness Impact Profile as an assessment tool. Heart Lung 1983;12: 162–70.

150 Gulanick M. Is phase 2 cardiac rehabilitation necessary for early recovery of patients with cardiac disease? A randomized, controlled study. Heart Lung 1991;20:9–15.

151 Stewart KJ, Mason M, Kelemen MH. Three-year participation in circuit weight training improves muscular strength and self-efficacy in cardiac patients. J Cardiopulm Rehabil 1988;8:292–6.

152 Ben-Ari E, Kellermann JJ, Fisman EZ, Pines A, Peled B, Drory Y. Benefits of long-term physical training in patients after coronary artery bypass grafting - a 58-month follow-up and comparison with a nontrained group. J Cardiopulm Rehabil 1986;6:165–70.

153 Denollet J. Emotional distress and fatigue in coronary heart disease: The Global Mood Scale (GMS). Psychol Med 1993;23:111–21.

154 Denollet J. Sensitivity of outcome assessment in cardiac rehabilitation. J Consult Clin Psychol 1993;61:686–95.

155 Roviaro A, Holmes DS, Holmsten RD. Influence of a cardiac rehabilitation program on the cardiovascular, psychological and social functioning of cardiac patients. J Behav Med 1984;7:61–81.

156 Milani RV, Lavie CJ, Cassidy MM. Effects of cardiac rehabilitation and exercise training programs on depression in patients after major coronary events. Am Heart J 1996;132:726–32.

157 Bar FW, Hoppener P, Diederiks J. Cardiac rehabilitation contributes to the restoration of leisure and social activities after myocardial infarction. J Cardiopulm Rehabil 1992;12: 117–25.

158 Myrtek M. Life satisfaction, illness behaviour, and rehabilitation outcome: results of a one year follow-up study with cardiac patients. Int J Rehabil Res 1987;10:373–82.

159 Hertzeanu HL, Shemesh J, Aron LA, Aron AL, Peleg E, Rosenthal T, et al. Ventricular arrhythmias in rehabilitated and nonrehabilitated post-myocardial infarction patients with left ventricular dysfunction. Am J Cardiol 1993;71:24–7.

160 Levin LA, Perk J, Hedback B. Cardiac rehabilitation - a cost analysis. J Intern Med 1991;230:427–34.

161 Dennis C, Houston-Miller N, Schwartz RG, Ahn DK, Kraemer HC, Gossard D, et al. Early return to work after uncomplicated myocardial infarction: results of a randomized trial. JAMA 1988;260:214–20.

162 Engblom E, Hietanen EK, Hamalainen H, Kallio V, Inberg M, Knuts LR. Exercise habits and physical performance during comprehensive rehabilitation after coronary artery bypass surgery. Eur Heart J 1992;13:1053–9.

163 Oberman A, Cleary P, Larosa JC, Hellerstein HK, Naughton J. Changes in risk factors among participants in a long term exercise rehabilitation program. Adv Cardiol 1982;31:168–75.

164 Schuler G, Hambrecht R, Schlierf G, Niebauer J, Hauer K, Neuman J, et al. Regular physical exercise and low-fat diet: effects on progression of coronary artery disease. Circulation 1992;86:1–11.

165 Plavsic C, Turkulin K, Perman Z, Steinel S, Oreskovic A, Dimnik R, et al. The results of exercise therapy in coronary prone individuals and coronary patients. G Ital Cardiol 1976;6:422–32.

166 Watts GF, Lewis B, Brunt JN, Lewis ES, Coltart DJ, Smith LD, et al. Effects on coronary artery disease of lipid-lowering diet, or diet plus cholestyramine, in the St Thomas' Atherosclerosis Regression Study (STARS). Lancet 1992;339:563–9.

167 Nikolaus T, Schlierf G, Vogel G, Schuler G, Wagner I. Treatment of coronary heart disease with diet and exercise – problems of compliance. Ann Nutr Metab 1991;35:1–7.

168 Morris R, Digenio A, Padayachee GN, Kinnear B. The effect of a 6-month cardiac rehabilitation programme on serum lipoproteins and apoproteins A1 and B and lipoprotein a. S Afr Med J 1993;83:315–8.

169 Warner JG, Brubaker PH, Zhu Y, Morgan TM, Ribisi PM, Miller HS, et al. Long-term (5-year) changes in HDL cholesterol in cardiac rehabilitation patients: do sex differences exist? Circulation 1995;92:773–7.

170 King AC, Haskell WL, Young DR, Oka RK, Stefanick ML. Long-term effects of varying intensities and formats of physical activity on participation rates, fitness and lipoproteins in men and women aged 50 to 65 years. Circulation 1995;91:2596–604.

171 Sivarajan ES, Newton KM, Almes MJ, Kempf TM, Mansfield LW, Bruce RA. Limited effects of outpatient teaching and counselling after myocardial infarction: a controlled study. Heart Lung 1983;12:65–73.

172 Ben-Ari E, Rothbaum DA, Linnemeier TA, et al. Benefits of a monitored rehabilitation program versus physician care after emergency percutaneous transluminal coronary angioplasty: follow-up of risk factors and rate of restenosis. J Cardiopulm Rehabil 1989;7:281–5.

173 Hedback B, Perk J. Can high-risk patients after myocardial infarction participate in comprehensive cardiac rehabilitation? Scand J Rehabil Med 1990;22:15–20.

174 Ben-Ari E, Rothbaum DA, Linnemeier TA, Landin R, Tavel M, Steinmetz EF,et al. Return to work after successful coronary angioplasty: comparison between a comprehensive rehabilitation program and patients receiving usual care. J Cardiopulm Rehabil 1992;12:20–4.

175 Perk J, Hedback B, Jutterdal S. Cardiac rehabilitation: evaluation of long-term programme of physical training for out-patients. Scand J Rehabil Med 1989;21:13–7.

176 Milani RV, Littman AB, Lavie CJ. Depressive symptoms predict functional improvement following cardiac rehabilitation and exercise program. J Cardiopulm Rehabil 1993;13: 406–11.

177 Monpere C, Francois G, Brochier M. Effects of a comprehensive rehabilitation programme in patients with three-vessel coronary disease. Eur Heart J 1988;9 Suppl M:28–31.

178 Waites TF, Watt EW, Fletcher GF. Comparative functional and physiologic status of active and dropout coronary bypass patients of a rehabilitation program. Am J Cardiol 1983;51:1087–90.

179 Kinsey GM, Fletcher BJ, Rice CR, Watson PH, Fletcher GF. Coronary risk factor modification followed by home-monitored exercise in coronary bypass surgery patients: a four-year follow-up study. J Cardiopulm Rehabil 1989;9:207–12.

180 Shephard RJ, Corey P, Kavanagh T. Exercise compliance and the prevention of a recurrence of myocardial infarction. Med Sci Sports Exerc 1981;13:1–5.

181 Hedback BE, Perk J, Engvall J, Areskog NH. Cardiac rehabilitation after coronary artery bypass grafting: effects on exercise performance and risk factors. Arch Phys Med Rehabil 1990;71:1669–73.

182 Hedback B, Perk J, Engvall J. Predictive factors for return to work after coronary artery bypass grafting: the role of cardiac rehabilitation. Int J Rehabil Res 1992;15:148–53.

183 Kavanagh T, Yacoub MH, Mertens DJ, Kennedy J, Campbell RB, Sawyer P. Cardiorespiratory responses to exercise training after orthotopic cardiac transplantation. Circulation 1988;77:162–71.

184 Sivarajan ES, Bruce RA, Lindskog BD, Almes MJ, Belanger L, Green B. Treadmill test responses to an early exercise program after myocardial infarction: a randomized study. Circulation 1982;65:1420–8.

185 Hamalainen H, Luurila OJ, Kallio V, Arstila M, Hakkila J. Long-term reduction in sudden deaths after a multifactorial intervention programme in patients with myocardial infarction: 10-year results of a controlled investigation. Eur Heart J 1989;10:55–62.

186 Heath GW, Mahoney PM, Fure CW. Group exercise versus home exercise in coronary artery bypass graft patients: effects on physical activity habits. J Cardiopulm Rehabil 1987;7:190–5.

187 Ewart CK, Stewart KJ, Gillilan RE, Kelemen MH. Self-efficacy mediates strength gains during circuit weight training in men with coronary artery disease. Med Sci Sports Exerc 1986;18:531–40.

188 Risk Factor Prevalence Study Management Committee. Risk Factor Prevalence Study: Survey No 3 1989. NHF and AIH: Canberra; 1990.

189 US Dept of Health and Human Services. Healthy people 2000: National Health Promotion and Disease Prevention Objectives. Washington DC. US Dept of Health and Human Services 1991. DHHS publication PHS 95–50212.

190 Centers for Disease Control and Prevention. Prevalence of sedentary lifestyle- behavioral risk factor surveillance system. United States 1991. MMWR Morb Mortal Wekly Rep 1993;43:576–9.

191 Pate RR, Pratt M, Blair SN, Haskell WL, Macera CA, Bouchard C, et al. Physical activity and public health: a recommendation from the Centres for Disease Control and Prevention and the American College of Sports Medicine. JAMA 1995;273:402–7.

192 Van Camp SP, Peterson RA. Cardiovascular complications of outpatient cardiac rehabilitation programs. JAMA 1986;256: 1160–3.

193 Haskell WL. Cardiovascular complications during exercise training of cardiac patients. Circulation 1978;57:920–4.

194 Fletcher GF, Froelicher VF, Hartley LH, Haskell WL, Pollock ML. Exercise standards. A statement for health professionals from the American Heart Association. Circulation 1990;82:2286–322.

195 Borg G: Perceived exertion as an indicator of somatic stress. Scand J Rehabil Med 1970;2:92–8.

196 Franklin BA, Gordon S, Timmis GC. Amount of exercise necessary for the patient with coronary artery disease. Am J Cardiol 1992;69:1426–32.

197 Frick MH, Huttunen JK, Harkonen M. Impaired chronotropic response to beta stimulation in chronic coronary artery disease. Am J Med 1973;55:571–5.

198 Ellestad MH, Wan MKC. Predictive implications of stress testing: follow-up of 2700 subjects after maximum treadmill stress testing. Circulation 1975;51:363–9.

199 Powles ACP, Sutton JR, Wicks JR, Oldridge NB, Jones NL. Reduced heart rate response to exercise in ischemic heart disease: the fallacy of the target heart rate in exercise testing. Med Sci Sports Exerc 1979;11:227–33.

200 Karvonen M, Kentala K, Mustala O. The effects of training on heart rate: a longitudinal study. Ann Med Exp Biol Fenn 1957;35:307–15.

201 Foster C, Oldridge NB, Dion W et al. Time course of recovery during cardiac rehabilitation. J Cardiopulm Rehabil 1995;15:209–15.

202 Pollock ML, Graves JE, Swart DL, Lowenthal DT. Exercise training and prescription for the elderly. South Med J 1994;87:S88–95.

203 Pollock M, Gettman LR, Milesis CA, Bah MD, Durstine L, Johnson RB. Effects of frequency and duration of training on attrition and incidence of injury. Med Sci Sports 1997;9:31–6.

204 Dressendorfer RH, Franklin BA, Cameron JL, Trahan KJ, Gordon S, Timmis GC. Exercise training frequency in early post-infarction cardiac rehabilitation: influence on aerobic conditioning. J Cardiopulm Rehabil 1995;15:269–76.

205 Kugler J, Dimsdale JE, Hartley LH, Sherwood J. Hospital supervised vs home exercise in cardiac rehabilitation: effects on aerobic fitness, anxiety, and depression. Arch Phys Med Rehabil 1990;71:322–5.

206 King AC, Haskell WL, Taylor CB, Kraemer HC, DeBusk RF. Group vs home-based exercise training in healthy older men and women: a community-based clinical trial. JAMA 1991;266:1535–42.

207 DeBusk RF, Haskell WI, Miller NH, Berra K, Taylor CB, Berger WE, Lew H.. Medically directed at-home rehabilitation soon after uncomplicated acute myocardial infarction: a new model for patient care. Am J Cardiol 1985;55:251–7.

208 Miller NH. The use of the telephone in cardiac and pulmonary rehabilitation. J Cardiopulm Rehabil 1996;16:349–52.

209 Hamalainen H, Kallio V, Knuts LR, Arstila M, Aalto-Setala L, Harmala V, et al. Community approach in rehabilitation and secondary prevention after acute myocardial infarction: results of a randomized clinical trial. J Cardiopulm Rehabil 1991;11:221–6.

210 Morris JN, Clayton DG, Everitt MG, Semmence AM, Burgess EH. Exercise in leisure time: coronary attack and death rates. Br Heart J 1990;63:325–34.

211 Paffenbarger RS, Hyde RT, Wing AL, Hsieh C. Physical activity, all-cause mortality, and longevity of college alumni. N Engl J Med 1986;314:605–13.

212 Leon AS, Connett J, Jacobs DR, Raumamaa R. Leisure-time physical activity levels and risk of coronary heart disease and death. The Multiple Risk Factor Intervention Trial. JAMA 1987;258:2386–95

213 Blair SN, Kohl HE, Paffenbarger RS, Clark DG, Cooper KH, Gibbons LW. Physical fitness and all-cause mortality: a prospective study of healthy men and women. JAMA 1989;262:2395–401.

214 Shaper AG, Wannamathee G. Physical activity and ischaemic heart disease in middle-aged British men. Br Heart J 1991;66:384–94.

215 Balady GJ, Jette D, Scheer J, Downing J. Changes in exercise capacity following cardiac rehabilitation in patients stratified according to age and gender: results of the Massachusetts Association of Cardiovascular and Pulmonary Rehabilitation Multicenter Database. J Cardiopulm Rehabil 1996;16:38–46.

216 Digenio AG, Noakes TD, Cantor A, Groeneveld H, Daly L, Mavunda D, et al. Predictors of exercise capacity and adaptability to training in patients with coronary artery disease. J Cardiopulm Rehabil 1997;17:110–20.

217 Maines TY, Lavie CJ, Milani RV, Cassidy MM, Gilliland YE, Murgo JP. Effects of cardiac rehabilitation and exercise programs on exercise capacity, coronary risk factors, behavior and quality of life in patients with coronary artery disease. South Med J 1997;90:43–9.

218 Stevenson LW, Steimle AE, Fonarow G, Kermani M, Kermani D, Hamilton MA, et al. Improvement in exercise capacity of candidates awaiting heart transplantation. J Am Coll Cardiol 1995;25:163–70.

219 Detry JMR, Rousseau N, Vanderbroucke G, Kusumi F, Brasseur LA, Bruce RA. Increased arteriovenous oxygen difference after physical training in coronary heart disease. Circulation 1971;49:109–18.

220 Clausen JP. Circulatory adjustments to dynamic exercise and effect of physical training in normal subjects and in patients with coronary heart disease. Prog Cardiovas Dis 1976;18:459–95.

221 Sullivan MJ, Higginbotham MB, Cobb FR. Exercise training in patients with chronic heart failure delays ventilatory anaerobic threshold and improves submaximal exercise performance. Circulation 1989;79:324–9.

222 McKelvie R, Koon K, McCartney N, Humen D, Montague T, Yusuf S. Effects of exercise training in patients with congestive cardiac failure: a critical review. J Am Coll Cardiol 1995;25:789–96.

223 Belardinelli R, Georgiou D, Scocco V, Barstow TJ, Purcaro A. Low intensity exercise training in patients with chronic heart failure. J Am Coll Cardiol 1995;26:975–82.

224 Shemesh J, Grossman E, Peleg E, Steinmetz A, Rosenthal T, Motro M. Norepinephrine and atrial natriuretic peptide responses to exercise testing in rehabilitated and non rehabilitated men with ischemic cardiomyopathy after healing of anterior wall myocardial infafction. Am J Cardiol 1995;75:1072–4.

225 Kavanagh T, Myers MG, Baigrie RS, Mertens DJ, Sawyer P, Shephard RJ. Quality of life and cardiorespiratory function in chronic heart failure: effects of 12 months' aerobic training. Heart 1996;76:42–9.

226 Siscovick DS, Weiss NS, Dr PH, Fletcher RH, Lasky T. The incidence of primary cardiac arrest during vigorous exercise. N Engl J Med 1984;311:874–77.

227 Mittleman MA, Maclure M, Tofler GH, Sherwood JB, Goldberg RJ, Muller JE. Triggering of acute myocardial infarction by heavy exertion: protection against triggering by regular exertion. Determinants of Myocardial Infarction Onset Study Investigators. N Engl J Med 1993;329:1677–83.

228 Blair SN, Kohl HW, Barlow CE, Paffenbarger RS, Gibbons LW, Macera CA. Changes in physical fitness and all-cause mortality: a prospective study of healthy and unhealthy men. JAMA 1995;273:1093–8.

229 Wolk MJ, Scheidt S, Killip T. Heart failure complicating acute myocardial infarction. Circulation 1972, 1125–38.

230 The Multicenter Postinfarction Research Group. Risk stratification and survival after myocardial infarction. N Engl J Med 1983;309:331–6.

231 Nicod P, Gilpin E, Dittrich H, Chappuis F, Ahnve S, Engler R, et al. Influence on prognosis and morbidity of left ventricular ejection fraction with and without signs of left ventricular failure after acute myocardial infarction. Am J Cardiol 1988;61:1165–71.

232 Gottlieb S, Moss AJ, McDermott M, Eberly S. Interrelation of left ventricular ejection fraction, pulmonary congestion and outcome in acute myocardial infarction. Am J Cardiol 1992;69:977–84.

233 Ekstrand K, Bostrom PA, Lilja B, Hansen O, Arborelius M. Submaximal early exercise test compared to clinical findings for evaluation of short- and long-term prognosis after the first myocardial infarction. Eur Heart J 1997;18:822–34.

234 Bigger JT, Weld FM, Rolnitzky LM. Prevalence, characteristics and significance of ventricular tachycardia (three or more complexes) detected with ambulatory electrocardiographic recording in the late hospital phase of acute myocardial infarction. Am J Cardiol 1981;48:815–23.

235 Gill JB, Cairns JA, Roberts RS, Costantini L, Sealey BJ, Fallen EF, et al. Prognostic importance of myocardial ischaemia detected by ambulatory monitoring early after acute myocardial infarction. N Engl J Med 1996;334:65–70.

236 Pepine CJ, Sharaf B, Andrews TC, Forman S, Geller N, Knatterud G, et al. Relation between clinical, angiographic and ischemic findings at baseline and ischemia-related adverse outcomes at 1 year in the Asymptomatic Cardiac Ischemic Pilot study. ACIP Study Group. J Am Coll Cardiol 1997;29:1483–9.

237 Yang JC, Wesley RC, Froelicher VF. Ventricular tachycardia during routine treadmill testing. Arch Intern Med 1991;151:349–53.

238 Moss AJ, Goldstein RE, Hall WJ, Bigger JT, Fleiss JL, Greenberg H, et al. Detection and significance of myocardial ischemia in stable patients after recovery from an acute coronary event. Multicenter Myocardial Ischemia Research Group. JAMA 1993;269:2379–85.

239 Shaw LJ, Peterson ED, Kesler K, Hasselblad V, Califf RM. A meta analysis of predischarge risk stratification after acute myocardial infarction with stress electrocardiographic, myocardial perfusion, and ventricular function imaging. Am J Cardiol 1996;78:1327–37.

240 Schwartz KM, Turner JD, Sheffield LT, Roitmen DI, Kansal S, Papapietro SE, et al. Limited exercise testing after myocardial infarction: correlation with early coronary and left ventricular angiography. Ann Intern Med 1981;94:727–34.

241 Weld FM, Chu KL, Bigger JT, Rolnitzky LM. Risk stratification with low level exercise testing two weeks after acute myocardial infarction. Circulation 1981;64:306–14.

242 Deedwania PC, Amsterdam EA, Vagelos RH. Evidence-based, cost-effective risk stratification and management after myocardial infarction. California Cardiology Working Group on Post-MI Management. Arch Intern Med 1997;157:273–80.

243 Currie P, Ashby D, Saltissi S. Prognostic value of ambulatory ST segment monitoring compared with exercise testing at 1–3 months after acute myocardial infarction. Eur Heart J 1994;15:54–60.

244 Mickley HJ, Nielsen JR, Berning J, Junker A, Moller M. Prognostic significance of transient myocardial ischaemia after first acute myocardial infarction: five year follow up study. Br Heart J 1995;73:320–6.

245 Mulcahy D, Husain S, Zalos G, Rehman A, Andrew NP, Schenke WH, et al. Ischemia during ambulatory monitoring as a prognostic indicator in patients with stable coronary artery disease. JAMA 1997;277:318–24.

246 Mahmarian JJ, Steingart RM, Forman S, Sharaf BL, Coglianese ME, Miller DD, et al. Relation between ambulatory electrocardiographic monitoring and myocardial perfusion imaging to detect coronary artery disease and myocardial ischemia: an ACIP ancillary study. The Asymptomatic Cardiac Ischemia Pilot (ACIP) Investigators. J Am Coll Cardiol 1997;29:764–9.

247 Tibbits PA, Evaul JE, Goldstein RE, Boccuzzi SJ, Therneau TM, Parker R, Wong D. Serial acquisition of data to predict one-year mortality rate after acute myocardial infarction. Am J Cardiol 1987;60:451–5.

248 Myers MG, Baigrie RS, Chariat ML, Morgan CD. Are routine non-invasive tests useful in prediction of outcome after myocardial infarction in elderly people? Lancet 1993;342:1069–72.

249 Norris RM, Barrie PWT, Caughey DE, Lee AJ, Scott PJ. A new coronary prognostic index. Lancet 1969;1:274–8.

250 Cleempoel H, Vainsel H, Bernard R, Dramaix M, Lenaers A, VanKuyk M, et al. Predictors of early death after acute myocardial infarction: two months follow-up. Eur Heart J 1986;7:305–11.

251 Parsons RW, Jamrozik KD, Hobbs MST, Thompson PL. Early identification of patients at low risk of death after myocardial infarction and potentially suitable for early hospital discharge. BMJ 1994;308:1006–10.

252 Silver MT, Rose GA, Paul SD, O'Donnell CJ, O'Gara PT, Eagle KA. A clinical rule to predict preserved left ventricular ejection fraction in patients after myocardial infarction. Ann Intern Med 1994;121:750–6.

253 Narins CR, Zareba W, Moss AJ, Goldstein RE, Hall WJ. Clinical implications of silent versus symptomatic exercise-induced myocardial ischaemia in patients with stable coronary disease. J Am Coll Cardiol 1997;29:756–63.

254 Fubini A, Cecchi E, Bobbio M, Spinnler MT, Bergerine S, DiLeo M, et al. Value of exercise stress test, radionuclide angiography and coronary angiography in predicting new coronary events in asymptomatic patients after a first episode of myocardial infarction. Int J Cardiol 1992;34:319–25.

255 Mangione S, Nieman LZ. Cardiac auscultatory skills of internal medicine and family practice trainees: a comparison of diagnostic proficiency. JAMA 1997;278:717–22.

256 Conn EH, Williams RS, Wallace AG. Exercise responses before and after physical conditioning in patients with severely depressed left ventricular function. Am J Cardiol 1982;49:296–300.

257 Meyer K, Schwaibold M, Westbrook S, Beneke R, Hajric R, Gornandt L, et al. Effects of short-term exercise training and activity restriction on functional capacity in patients with severe chronic congestive heart failure. Am J Cardiol 1996;78:1017–22.

258 Minotti JR, Johnson EC, Hudson TL, Zuroske G, Murata G, Fukushima E, et al. Skeletal muscle response to exercise training in heart failure. J Clin Invest 1990;86:751–8.

259 Mayhew A, Moher D, Dafoe W. The effect of cardiac rehabilitation in patients with congestive heart failure: a meta-analysis. Can J Cardiol 1997;13:167B.

260 Scalvini S, Marangoni S, Volterrani M, Schena M, Quadri A, Levi GF. Physical rehabilitation in coronary patients who have suffered from episodes of cardiac failure. Cardiology 1992;80:417–23.

261 Wilson JR, Groves J, Rayos G. Circulatory status and response to cardiac rehabilitation in patients with heart failure. Circulation 1996;94:1567–72.

262 Hare DL, Krum H, Karrasch JA, Hamer AWF, Howes LG, Jackson B, et al, for the Quinapril Australasian Dosing Study Investigators. Depressed mood and chronic heart failure [abstract]. Aust NZ J Med 1997;27:105.

263 Mayou R, Blackwood R, Bryant B, et al. Cardiac failure: symptoms and functional status. J Psychosom Res 1991;35:399–407.

264 Dracup K, Walden JA, Stevenson LW, Brecht ML. Quality of life in patients with advanced heart failure. J Heart Lung Transplant 1992;11:273–79.

265 Degre SG, Niset GL, Desmet JM, Ibrahim T, Stoupel E, Le Clerc JL, Primo G. Cardiorespiratory response to early exercise testing after orthotopic cardiac transplantation. Am J Cardiol 1987;60:926–8.

266 Keteyian S, Ehrman J, Fedel F, Rhoads K. Heart rate-perceived exertion relationship during exercise in orthotopic heart transplant patients. J Cardiopulm Rehabil 1990;10:287–93.

267 Daida H, Squires RW, Allison TG, Johnson BD, Gau GT. Sequential assessment of exercise tolerance in heart transplantation compared with coronary artery bypass surgery after phase II cardiac rehabilitation. Am J Cardiol 1996;77:696–700.

268 Lord SW, Brady S, Holt ND, Mitchell L, Dark JH, McComb JM. Exercise response after cardiac transplantation: correlation with sympathetic reinnervation. Heart 1996;75:40–3.

269 Baroud I, Niset G, Vachiery JL, Antoine M, Degre S. Long-term follow-up of heart transplant patients. Acta Cardiol 1996;51:315–25.

270 Bussieres LM, Pflugfelder PW, Taylor AW, Noble EG, Kostuk WJ. Changes in skeletal muscle morphology and biochemistry after cardiac transplantation. Am J Cardiol 1997;79:630–4.

271 Wood PD, Stephanick ML, Dreon D, Frey-Hewitt B, Garay SC, Williams PT, et al. Changes in plasma lipids and lipoproteins in overweight men during weight loss through dieting as compared with exercise. N Engl J Med 1988;319:1173–9.

272 Balady GJ, McInnis KJ. Cardiac rehabilitation in obese patients [editorial]. Chest 1996;109:3–4.

273 Ades PA, Waldmann ML, Gillespie C. A controlled trial of exercise training in older coronary patients. J Gerontol A Biol Sci Med Sci 1995;50A:M7–11.

274 Lavie CJ, Milani RV, Littman AB. Benefits of cardiac rehabilitation and exercise training in secondary coronary prevention in the elderly. J Am Coll Cardiol 1993;22:678–83.

275 Lavie CJ, Milani RV. Effects of cardiac rehabilitation programs on exercise capacity, coronary risk factors, behavioral characteristics and quality of life in a large elderly cohort. Am J Cardiol 1995;76:177–9.

276 Ades PS, Waldmann ML, Polk D, Coflesky JT. Referral patterns and exercise response in the rehabilitation of female coronary patients ≥ 62 years. Am J Cardiol 1992;69:1422–5.

277 Allen JK, Redman BK. Cardiac rehabilitation in the elderly: improving effectiveness. Rehabil Nurs 1996;21:182–6, 195.

278 Wenger NK, Speroff L, Packard B. Cardiovascular health and disease in women. N Engl J Med 1993;329:247–255.

279 King KB, Clark PC, Hicks GL. Patterns of referral and recovery in women and men undergoing coronary artery bypass grafting. Am J Cardiol 1992;69:179–182.

280 Cannistra LB, Balady GJ, O'Malley CJ, Weiner DA, Ryan TJ. Comparison of the clinical profile and outcome of women and men in cardiac rehabilitation. Am J Cardiol 1992;69:1274–9.

281 Peberdy MA, Ornato JP. Coronary artery disease in women. Heart Disease and Stroke 1992;1:315–9.

282 Rankin SH. Differences in recovery from cardiac surgery. A profile of male and female patients. Heart Lung 1990;19:481–5.

283 Lavie CJ, Milani RV. Benefits of cardiac rehabilitation and exercise training in elderly women. Am J Cardiol 1997;79:664–6.

284 Schuster P, Wright C, Tomich P. Gender differences in the outcomes of participants in home programs compared to those in structured cardiac rehabilitation programs. Rehabil Nurs 1995;20:93–101.

285 Harlan WR, Sandler SA, Lee KL, Lam LC, Mark DB. Importance of baseline functional and socioeconomic factors for participation in cardiac rehabilitation. Am J Cardiol 1995;76:36–9.

286 McGee HM, Horgan JH. Cardiac rehabilitation programmes: are women less likely to attend? BMJ 1992;305:283–4.

287 O'Callaghan WG, Teo KK, O'Riordan J, Webb H, Dolphin T, Horgan JH. Comparative response of male and female patients with coronary artery disease to exercise rehabilitation. Eur Heart J 1984;5:649–51.

288 Ades PA, Waldmann ML, McCann WJ, Weaver O. Predictors of cardiac rehabilitation participation in older coronary patients. Arch Intern Med 1992;152:1033–5.

289 Scanlon TJ, Godfrey S. Cardiac rehabilitation programmes. BMJ 1992;305:649–50.

290 Moore SM, Kramer FM. Women's and men's preferences for cardiac rehabilitation program features. J Cardiopulm Rehabil 1996;16:163–8.

291 Froelicher ES. Patient and family education in advanced cardiovascular disease. In Proceedings of the Vth World Congress of Cardiac Rehabilitation. Broustet JP, editor. Andover UK: Intercept Ltd; 1993.

292 Foley JL, Sivarajan ES, Woods NF. Differences between men and women in recovery from myocardial infarction. Circulation 1983;68 Suppl III:124.

293 Pashkow FJ. Cardiac rehabilitation: not just exercise anymore. Cleve Clin J Med 1996;63:116–23.

294 Barbarowicz P, Nelson M, DeBusk RF, Haskell WL. A comparison of in-hospital education approaches for coronary bypass patients. Heart Lung 1980;9:127–34.

295 Garding BS, Kerr JC, Bay K. Effectiveness of a program of information and support for myocardial infarction patients recovering at home. Heart Lung 1988;17:355–62.

296 Young DT, Kottke TE, McCall MM, Blume D. A prospective controlled study of hospital myocardial infarction rehabilitation. J Cardiac Rehab 1982;2:32–40.

297 Beckie T. A supportive-educative telephone program: impact on knowledge and anxiety after coronary artery bypass graft surgery. Heart Lung 1989;18:46–55.

298 Linde BJ, Janz NM. Effect of a teaching program on knowledge and compliance of cardiac patients. Nurs Res 1979;28:282–6.

299 Thomas JJ. Comparison of patient education methods: Effects on knowledge of cardiac rehabilitation principles. Occup Therapy J Res 1996;16:166–78.

300 Morley D, Ribisi PM, Miller HS Jr. A comparison of patient education methodologies in outpatient cardiac rehabilitation. J Cardiac Rehabil 1984;4:434–9.

301 Murdagh CL. Effects of nurses' knowledge of teaching-learning principles on knowledge of coronary care unit patients. Heart Lung 1980;9:1073–8.

302 Marshall J, Penckofer S, Llewellyn J. Structured postoperative teaching and knowledge and compliance of patients who had coronary artery bypass surgery. Heart Lung 1986;15:76–82.

303 Knapp D, Hansen M, Rogowski B, Pollock M. Education of cardiac surgery patients: A comparison of the effectiveness of nurse educators and primary nurses. J Cardiopulm Rehabil 1985;5:429–34.

304 Boyd MD, Feldman RHL. Health information seeking and reading and comprehension abilities of cardiac rehabilitation patients. J Cardiac Rehabil 1984;4:343–7.

305 Scalzi CC, Burke LE,Greenland S. Evaluation of an inpatient educational program for coronary patients and families. Heart Lung 1980;9:846–53.

306 Mayou R, Williamson B, Foster A. Attitudes and advice after myocardial infarction. BMJ 1976;1:1577–9.

307 Murray PJ. Rehabilitation information and health beliefs in the post-coronary patients: Do we meet their information needs? J Adv Nurs 1989;14:686–93.

308 Doehrman SR. Psycho-social aspects of recovery from coronary heart disease: a review. Soc Sci Med 1977;11:199–218.

309 Worcester MC. Processes and patterns of recovery following myocardial infarction. PhD thesis. Melbourne. 1979.

310 van Elderen, van Kemanzde T, Maes S, Van den Broek Y. Effects of a health education programme with telephone follow-up during cardiac rehabilitation. Br J Clin Psychol 1994;33:367–78.

311 Dunn SM, Beeney LJ, Hoskins PL, Turtle JR. Knowledge and attitude change as predictors of metabolic improvement in diabetes education. Soc Sci Med 1990;31:1135–41.

312 Mahler HI, Kulik JA. Health care involvement preferences and social-emotional recovery of male coronary artery bypass patients. Health Psychol 1991;10:399–408.

313 Hanisch P. Informational needs and preferred time to receive information for phase II cardiac rehabilitation patients: what CE instructors need to know. J Contin Educ Nurs 1993;24:82–9.

314 Taylor CB, Housten-Miller N, Killen JD, DeBusk RF. Smoking cessation after acute myocardial infarction: Effects of a nurse-managed intervention. Ann Intern Med 1990;113:118–23.

315 Heller RF, Knapp JC, Velenti LA, Dobson AJ. Secondary prevention after acute myocardial infarction. Am J Cardiol 1993;72:759–62.

316 Horlick L, Cameron R, Firor W, Bhalerao U, Baltzan R. The effects of education and group discussion in the post myocardial infarction patient. J Psychosom Res 1984;28:485–92.

317 Burt A, Illingworth D, Shaw TRD, Thornley P, White P, Turner R. Stopping smoking after myocardial infarction. Lancet 1974;1:34.

318 Fuller-Bey G. Antismoking counseling: an important part of cardiac rehabilitation. Can Nurse 1983;79:17–20.

319 Burling TA, Singleton EG, Bigelow GE, Baile WF, Gottlieb SH. Smoking following myocardial infarction: a critical review of the literature. Health Psychol 1984;3:83–96.

320 Oldridge NB. Compliance with exercise programmes. In; Pollock MLK, Schmidt DH, editors. Heart disease and rehabilitation. Boston:Houghton Mifflin Co;1979.

321 Mullen PD, Mains DA, Velex R. A meta-analysis of controlled trials of cardiac patient education. Patient Ed Counsel 1992;19:143–62.

322 Fiore MC, Jorenby DE, Baker TB, Kenford SL. Tobacco dependence and the nicotine patch. Clinical guidelines for effective use. JAMA 1992;268:2687–94.

323 Barnard ND, Scherwitz LW, Ornish D. Adherence and acceptability of a low-fat, vegetarian diet among patients with cardiac disease. J Cardiopulm Rehabil 1992;12:423–31.

324 Friedman M, Thoresen CE, Gill JJ et al. Alteration of type A behaviour and its effect on cardiac recurrences in post myocardial infarction patients: summary results of the Recurrent Coronary Prevention Project. Am Heart J 1986;112:663–5.

325 Karvetti RL, Hamalainen H. Long-term effect of nutrition education on myocardial infarction patients: a 10-year follow-up study. Nutr Metab Cardiovasc Dis 1993;3:185–92.

326 Rahe RH, Ward HW, Hayes V. Brief group therapy in myocardial infarction rehabilitation: three- to four-year follow-up of a controlled trial. Psychosom Med 1979;41:229–42.

327 Stefanick ML, Mackey S, Sheehan M, Ellsworth N, Haskell WL, Wood PD. Effects of diet and exercise in men and postmenopausal women with low levels of HDL cholesterol and high levels of LDL cholesterol. N Engl J Med 1998;339:12–20.

328 Ribiero JP, Hartley LH, Sherwood J, Herd JA. The effectiveness of a low lipid diet and exercise in the management of coronary artery disease. Am Heart J 1984;108:1183–9.

329 National High Blood Pressure Education Program. The fifth report of the Joint National Committee on Detection, Evaluation and Treatment of High Blood Pressure. NIH Publication no. 93-1088. Bethesda (MD): National Institutes of Health, National Heart, Lung, and Blood Institute; 1993.

330 Staessen J, Fagard R, Amery A. The relationship between body weight and blood pressure. J Human Hypertension 1988;2:207–17.

331 The Multiple Risk Factor Intervention Trial (MRFIT). A national study of primary prevention of coronary heart disease. JAMA 1976;235:825–7.

332 Puddey I, Parker M, Beilin LJ, Vandongen R, Masarei JRL. Effects of alcohol and caloric restrictions on blood pressure and serum lipids in overweight men. Hypertension 1992;20:533–41.

333 Midgley JP, Matthew AG, Greenwood CMT, Logan AG. Effect of reduced dietary sodium on blood pressure. A meta-analysis of randomized controlled trials. JAMA 1996;275:1590–7.

334 Wood PD, Stefanick ML, Williams PT, Haskell WL. The effects on plasma lipoprotein of a prudent weight-reducing diet, with or without exercise, in overweight men and women. N Engl J Med 1991;325:461–6.

335 Dattilo AM, Kris-Etherton PM. Effects of weight reduction on blood lipids and lipoprotein: a meta-analysis. Am J Clin Nutr 1992;56:320–8.

336 Brownell KD, Jeffery RW. Improving long-term weight loss: pushing the limits of treatment. Behav Ther 1987;18:353–74.

337 Munro BH, Creamer AM, Haggerty MR, Cooper FS. Effect of relaxation therapy on post-myocardial infarction patients' rehabilitation. Nurs Res 1988;37:231–5.

338 Smith LK, Layton K, Newmark JL, Diethrich EB. An intensive cardiovascular rehabilitation program for patients with disabling angina and diffuse coronary artery disease. J Cardiopulm Rehabil 1987;7:425–9.

339 Linden W, Stossel C Maurice J. Psychosocial interventions for patients with coronary artery disease. Arch Intern Med 1996; 156:745–52.

340 Burgess AW, Lerner DJ, D'Agostino RB, Vokonas PS, Hartman CR, Gaccione P. A randomized control trial of cardiac rehabilitation. Soc Sci Med 1987;24:359–70.

341 Pozen MW, Stechmiller JA, Harris W, Smith S, Fried DD, Voigt GC. A nurse rehabilitator's impact on patients with myocardial infarction. Med Care 1977;15:830–7.

342 Oldenburg B, Martin A, Greenwood J, Bernstein L, Allen R. A controlled trial of a behavioural and educational intervention following coronary artery bypass surgery. J Cardiopulm Rehabil 1995;15:39–46.

343 Jones DA, West RR. Psychological rehabilitation after myocardial infarction: multicentre randomised controlled trial. BMJ 313;1996:1517–21.

344 Engblom E, Hamalainen H, Ronnemaa T, Vanttinen E, Kallio V, Knuts LR. Cardiac rehabilitation and return to work after coronary artery bypass surgery. Qual Life Res 1994;3:207–13.

345 Dracup K. A controlled trial of couples group counseling in cardiac rehabilitation. J Cardiopulm Rehabil 1985;5:436–42.

346 Mayou R. A controlled trial of early rehabilitation after myocardial infarction. J Cardiac Rehabil 1983;3:397–402.

347 Naismith LD, Robinson JF, Shaw GB, MacIntyre MJ. Psychological rehabilitation after myocardial infarction. BMJ 1979;1:439–42.

348 Campbell NC, Thain J, Deans HG, Ritchie LD, Rawles JM, Squair JL. Secondary prevention clinics for coronary heart disease: randomised trial of effect on health. BMJ 1998;316:1434–7.

349 Taylor CB, Miller NH, Smith PM, DeBusk RF. The effect of a home-based, case-managed, multifactorial risk-reduction program on reducing psychological distress in patients with cardiovascular disease. J Cardiopulm Rehabil 1997;17:157–62.

350 Gruen W. Effects of brief psychotherapy during the hospitalization period on the recovery process in heart attacks. J Consult Clin Psychol 1975;43:223–32.

351 Thompson DR, Meddis R. A prospective evaluation of in-patient counselling for first time myocardial infarction men. J Psychosom Res 1990;34:237–48.

352 Lewin B, Robertson IH, Cay EL, Irving JB, Campbell M. Effects of self-help post-myocardial-infarction rehabilitation and adjustment and use of health services. Lancet 1992;339:1036–40.

353 Frasure-Smith N, Lesperance F, Prince RH et al. Randomised trial of home-based psychosocial nursing intervention for patients recovering from myocardial infarction. Lancet 1997;350:473–9.

354 Denollet J, Brutsaert DL. Enhancing emotional well-being by comprehensive rehabilitation in patients with coronary heart disease. Eur Heart J 1995;16:1070–8.

355 Dracup K, Moser DK, Marsden C, Taylor SE, Guzy PM. Effects of a multidimensional cardiopulmonary rehabilitation program on psychosocial function. Am J Cardiol 1991;68:31–4.

356 Adsett CA, Bruhn JG. Short-term group psychotherapy for post-myocardial patients and their wives. Can Med Assoc J 1968;99:577–84.

357 Daumer R, Miller P. Effects of cardiac rehabilitation on psychosocial functioning and life satisfaction of coronary artery disease clients. Rehabil Nurs 1992;17:69–72.

358 Frasure-Smith N, Prince R. The Ischemic Heart Disease Life Stress Monitoring Program: impact on mortality. Psychosom Med 1985;51:431–45.

359 Mayou R. Rehabilitation after heart attack should be more flexible and integrated with cardiac aftercare and primary care. BMJ 1996;313:1498–9.

360 Schleifer SJ, Marcari-Hinson MM, Coyle DA et al. The nature and course of depression following myocardial infarction. Arch Intern Med 1989;149:1785–9.

361 Lewin RJP, Thompson DR, Johnston DW, Mayou RA. Cardiac Rehabilitation [letter]. Lancet 1997;350:1400.

362 McGee HM, Horgan JH. Cardiac Rehabilitation [letter]. Lancet 1997;350:1400–1.

363 Krampen G, Ohm D. Effects of relaxation training during rehabilitation of myocardial infarction patients. Int J Rehab Res 1984;7:68–9.

364 Langosch W, Seer P, Brodner G, Kallinke D, Kulick B, Heim F. Behavior therapy with coronary heart disease patients: results of a comparative study. J Psychosom Res 1982;26:475–84.

365 van Dixhoorn J, Duivenvoorden HJ, Pool J, Verhage F. Psychic effects of physical training and relaxation therapy after myocardial infarction. J Psychosom Res 1990;34:327–37.

366 Trzcieniecka-Green A, Steptoe A. The effects of stress management on the quality of life of patients following acute myocardial infarction or coronary bypass surgery. Eur Heart J 1996;11:1663–70.

367 Friedman M, Rosenman RH. Type A behavior and your heart. New York. Alfred A Knopf. 1974.

368 Rosenman RH, Brand RJ, Sholtz RJ, Friedman M. Multivariate prediction of coronary heart disease during 8.5-year follow-up in the Western Collaborative Group Study. Am J Cardiol 1976;37:903–10.

369 Jenkins LS. Self-efficacy: New perspectives in caring for patients recovering from myocardial infarction. Prog Cardiovasc Nurs 1987;2:32–5.

370 Haynes SG, Feinleib M, Kannel WB. The relationship of psychosocial factors to coronary heart disease in the Framingham Study. 8 year incidence of CHD. Am J Epidemiol 1980;111: 37–40.

371 The Review Panel on Coronary-Prone Behavior and Coronary Heart Disease, American Heart Association, Inc. Coronary-prone behavior and coronary heart disease: A critical review. Circulation 1981;63:1200–15.

372 Ragland DR, Brand RJ. Type A behavior and mortality from coronary heart disease. N Engl J Med 1988;318:65–9.

373 Shekelle RB, Hulley SB, Neaton JD, Billings JH, Borhani NO, Gerace TA, et al. The MRFIT behavior pattern study II: Type A behavior and incidence of coronary heart disease. Am J Epidemiol 1985;122:559–70.

374 Gutmann MC, Knapp DN, Pollock ML. Schmidt DH, Simon K, Walcott G. Coronary artery bypass patients and work status. Circulation 1982;66:III33–42.

375 Engblom E, Korpilahti K, Hamalainen H, Ronnemaa T, Puukka P. Quality of life and return to work 5 years after coronary artery bypass surgery. Long-term results of cardiac rehabilitation. J Cardiopulm Rehabil 1997;17:29–36.

376 Mark DB, Lam Lai Choi, Lee KL et al. Identification of patients with coronary disease at high risk for loss of employment: a prospective validation study. Circulation 1992;86.1485–94.

377 Rost K, Smith R. Return to work after an initial myocardial infarction and subsequent emotional distress. Arch Intern Med 1992;152:381–5.

378 Hlatky MA, Haney T, Barefoot JC, Califf RM, Mark DB, Pryor DB, Williams RB. Medical, psychological and social correlates of work disability among men with coronary artery disease. Am J Cardiol 1986;58:911–5.

379 Ewart CK, Taylor CB, Reese LB, DeBusk RF. Effects of early post myocardial infarction exercise testing on self-perceptions and subsequent physical activity. Am J Cardiol 1983;51:1076–80.

380 Taylor CB, Bandura A, Ewart CK, Miller NH, DeBusk RF. Exercise training to enhance wives' confidence in their husbands' cardiac capability soon after clinically uncomplicated acute myocardial infarction. Am J Cardiol 1985;55:635–8.

381 Sheldahl LM, Wilke NA, Tristani FE. Exercise prescription for return to work. J Cardiopulm Rehabil 1985;5:567–75.

382 Garrity TF. Vocational adjustment after first myocardial infarction; comparative assessment of several variables suggested in the literature. Soc Sci Med 1973;7:705–17.

383 Petrie KJ, Weinman J, Sharpe N, Buckley J. Role of patients' view of their illness in predicting return to work and functioning after myocardial infarction: longitudinal study. BMJ 1996;312:1191–4.

384 Shanfield SB. Return to work after an acute myocardial infarction: a review. Heart Lung 1990;19:109–15.

385 Maeland JG, Havik OE. The effects of an in-hospital teaching program for myocardial infarction patients. Scand J Rehabil Med 1987;19:57–65.

386 Hentinen M. Teaching and adaptation of patients with myocardial infarction. Int J Nurs Stud 1986;23:125–38.

387 Raleigh EH, Odtohan BC. The effect of a cardiac teaching program on patient rehabilitation. Heart Lung 1987;16:311–7.

388 Recommendations for cardiac rehabilitation. National Heart Foundation of Australia. Canberra. 1998.

389 Maeland JG, Havik OE. Measuring cardiac health knowledge. Scand J Caring Sci 1987;1:23–31.

390 Goble AJ. Folklore and disability in heart disease. National Heart Foundation. Notes on Cardiovascular Diseases 1969;5:1–4.

391 Thompson PL, Wark J, Garland S. The heart patient and doctor/patient communication. Med J Aust 1976;1:166–7.

392 Wilhelmsson C, Vedin JA, Elmfeldt D et al. Smoking and myocardial infarction. Lancet 1975;1:415–20.

393 Sparrow D, Dawber TR, Colson T. The influence of cigarette smoking on prognosis after a first myocardial infarction. J Chron Dis 1978;31:425–32.

394 Mulcahy R. Influence of cigarette smoking on morbidity and mortality after myocardial infarction. Br Heart J 1983;49:410–5.

395 Cavender JB, Rogers WJ, Fisher LD et al for the CASS Investigators. Effects on smoking on survival and morbidity in patients randomized to medical or surgical therapy in the coronary artery surgery study (CASS): 10-year follow-up. J Am Coll Cardiol 1992;20:287–94.

396 Wannamathee SG, Shaper AG, Whincup PH, Walker M. Smoking cessation and the risk of stroke in middle-aged men. JAMA 1995;274:155–60.

397 Taylor CB, Housten-Miller N, Haskell WL, DeBusk RF. Smoking cessation after acute myocardial infarction: The effects of exercise training. Addic Behav 1988;13:331–5.

398 Hasdai D, Garratt KN, Grill DE, Mathew V, Lerman A, Gau GT, Holmes DR Predictors of smoking cessation after percutaneous coronary revascularization. Mayo Clin Proc 1998;73:205–9.

399 Siegel D, Grady D, Browner WS, Hulley SB. Risk factor modification after myocardial infarction. Ann Intern Med 1988;109:213–8.

400 Tang JL, Law M, Wald N. How effective is nicotine replacement therapy in helping people to stop smoking? BMJ 1994;308;21–6.

401 Gourlay SG, McNeil JJ. Antismoking products. Med J Aust 1990;153:699–707.

402 De Lorgeril M, Salen P, Martin J-L et al. Effect of a Mediterranean type of diet on the rate of cardiovascular complications in patients with coronary artery disease: insights into the cardioprotective effect of certain nutriments. J Am Coll Cardiol 1996;28:1103–8.

403 Avogaro P, Birrolo BG, Cazzalato G et al. Variations in apolipoptroteins B and A during the course of myocardial infarction. Eur J Clin Invest 1978;8:121–9.

404 Brownell KD, Cohen LR. Adherence to dietary regimens. 2: Components of effective interventions. Behav Med 1995;20:155–64.

405 Sacks FM, Pfeffer MA, Moye LA et al, for the Cholesterol and Recurrent Events (CARE) Trial Investigators. The effect of pravastatin on coronary events after myocardial infarction in patients with average cholesterol levels. N Engl J Med 1996;335:1001–9.

406 The Long-Term Intervention with Pravastatin in Ischaemic Disease (LIPID) Study Group. Prevention of cardiovascular events and death with pravastatin in patients with coronary heart disease and a broad range of initial cholesterol levels. N Engl J Med 1998;339:1349–57.

407 Blankenhorn DH, Nessim SA, Johnson RL, Sanmarco ME, Azen SP, Cashin-Hemphill L. Beneficial effects of combined colestipol-niacin therapy on coronary atherosclerosis and coronary venous bypass grafts. JAMA 1987;257:3233–40.

408 Brown G, Albers JJ, Fisher LD, et al. Regression of coronary artery disease as a result of intensive or lipid-lowering therapy in men with high levels of apolipoprotein B. N Engl J Med 1990;323:1289–98.

409 Kane JP, Mallory MJ, Ports TA, Phillips NR, Diehl JC, Havel RJ. Regression of coronary atherosclerosis during treatment of familial hypercholesterolemia with combined drug regimens. JAMA 1990;264:3007–12.

410 MAAS Investigators. Effect of simvastatin on coronary atheroma: the Multicentre Anti-Atheroma Study (MAAS). Lancet 1994;344:633–8.

411 Scandinavian Simvastatin Survival Study Group. Randomised trial of cholesterol lowering in 4444 patients with coronary heart disease: the Scandinavian Simvastatin Survival Study (4S). Lancet 1994;344:1383–9.

412 Staessen J, Bulpitt C, Clement et al. Relation between mortality and treated blood pressure in elderly patients with hypertension: report of the European Working Party on High Blood Pressure in the Elderly. BMJ 1989;298:1512–6.

413 Wong ND, Cupples LA, Ostfeld AM, Levy D, Kannel WB. Risk factors for long-term coronary prognosis after initial myocardial infarction: The Framingham Study. Am J Epidemiol 1989;130:469–80.

414 Flack JM, Neaton J, Grimm R et al, for the Multiple Risk Factor Intervention Trial Research Group. Blood pressure and mortality among men with prior myocardial infarction. Circulation 1995;92:2437–45.

415 Kannel WB, Sorlie P, Castelli WP, McGee D. Blood pressure and survival after myocardial infarction: The Framingham Study. Am J Cardiol 1980;45:326–30.

416 Langford HG, Stamler J, Wasserthiel-Smoller S, Prineas RJ. All cause mortality in the Hypertension Detection and Follow-up Program: findings for the whole cohort and for persons with less severe hypertension with and without other traits related to the risk of mortality. Prog Cardiovasc Dis 1986;29:29–54.

417 The 1988 Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure. Arch Intern Med 1988;148:1023–38.

418 Gustafsson F, Torp-Pedersen C, Kober L, Hildebrandt P, on behalf of the TRACE study group, Frederiksberg Univ Hosp, Frederiksberg, Denmark. Effect of angiotensin converting enzyme inhibition after acute myocardial infarction in patients with arterial hypertension. J Hypertens 1997;15:793–8.

419 Kostis JB, Davis BR, Cutler J, Grimm RH, Berge KG, Cohen JD, et al. Prevention of heart failure by antihypertensive drug treatment in older persons with isolated systolic hypertension. SHEP Cooperative Research Group. JAMA 1997;278:212–6.

420 Appel LJ, Moore TJ, Obarzanek E et al for the DASH Collaborative Research Group, Johns Hopkins University, Baltimore, MD. A clinical trial of the effects of dietary patterns on blood pressure. N Engl J Med 1997;336:1117–24.

421 Hansson L, Zanchetti A, Carruthers SG, for the HOT Study Group. Effects of intensive blood-pressure lowering and low-dose aspirin in patients with hypertension: principal results of the Hypertension Optimal Treatment (HOT) randomised trial. Lancet 1998;351:1755–62.

422 Manson JE, Willett WC, Stampfer MJ et al. Body weight and mortality among women. N Engl J Med 1995;333:677–85.

423 Stamler J, Vaccaro O, Neaton JD et al. Diabetes, other risk factors, and 12-year cardiovascular mortality for men screened in the Multiple Risk Factor Intervention Trial. Diabetes Care 1993;16:434–44.

424 Liao Y, Cooper RS, Ghali JK et al. Sex differences in the impact of coexistent diabetes on survival in patients with coronary heart disease. Diabetes Care 1993;16:608–713.

425 Hartz AJ, Rupley DC, Kalkhoff RD, Rimm AA. Relationship of obesity to diabetes: influence of obesity and body fat distribution. Prev Med 1983;12:351–87.

426 Bjorntorp P. Abdominal obesity and the development of non-insulin-dependent diabetes mellitus. Diabetes/Metab Rev 1988;4:615–22.

427 Denke MA, Sempos CT, Grundy SM. Excess body weight: an underrecognized contributor to high blood cholesterol levels in white American men. Arch Intern Med 1993;153:1093–103.

428 Pavlou KN, Krey S, Steffe WP. Exercise as an adjunct to weight loss and maintenance in moderately obese subjects. Am J Clin Nutr 1989;49:1115–23.

429 Wing RR, Epstein LH, Bayles MP, Kriska AM, Nowalk MP, Gooding W. Exercise in a behavioural weight control programme for obese patients with type 2 (non-insulin-dependent) diabetes. Diabetologia 1998;31:902–9.

430 Kriska AM, Bennett PH. An epidemiological perspective of the relationship between physical activity and NIDDM: from activity to assessment to intervention. Diabetes/Metab Rev 1992;8:355–72.

431 Horton ES. Exercise and decreased risk of NIDDM. N Engl J Med 1991;325:196–8.

432 Rauramaa R. Relationship of physical activity, glucose tolerance and weight management. Prev Med 1984;13:37–46.

433 Ravussin E, Lillioja S, Knowler WC et al. Reduced rate of energy expenditure as a risk factor for body-weight gain. N Engl J Med 1988;318:467–72.

434 Ravussin E, Bogardus C. Relationship of genetics, age, and physical fitness to daily energy expenditure and fuel utilization. Am J Clin Nutr 1989;49 Suppl 2:968–75.

435 Lightman SW, Pisarska K, Berman ER et al. Discrepancy between self-reported and actual caloric intake and exercise in obese subjects. N Engl J Med 1992;327:1893–7.

436 Welle S, Forbes GB, Statt M, Barnard RR, Amatruda JM. Energy expenditure under free-living conditions in normal-weight and overweight women. Am J Clin Nutr 1992;55:14–21.

437 American Heart Association. Statement on exercise: benefits and recommendations for physical activity programs for all Americans. A statement for health professionals by the committee on exercise and cardiac rehabilitation of the Council on Clinical Cardiology [position statement]. Circulation 1992;86:350–44.

438 Ekelund LG, Haskell WL, Johnson JL, Whaley FS, Criqui MH, Sheps DS. Physical fitness as a predictor of cardiovascular mortality in asymptomatic North American men: The Lipid Research Clinics Mortality Follow-up Study. N Engl J Med 1988;319:1379–84.

439 Slattery ML, Jacobs DR. Physical fitness and cardiovascular disease mortality. The US Railroad Study. Am J Epidemiol 1988;127:571–80.

440 Blair SN, Kohl HW, Gordon NF. How much physical activity is good for health? Ann Rev Pub Health 1992;13:99–126.

441 Klatsky AL, Friedman GD, Sjegelaub AB, Gerard MJ. Alcohol consumption and blood pressure: Kaiser-Permanente multiphasic health examination data. N Engl J Med 1977;296:1194–9.

442 Puddey IB, Beilin LJ, Vamdongen R. Regular alcohol use raises blood pressure in treated hypertensive subjects: a randomised controlled trial. Lancet 1987;i:647–51

443 Ueshima H, Mikawa K, Baba S, et al. Effect of reduced alcohol consumption on blood pressure in untreated hypertensive men. Hypertens 1993;21:243–52.

444 Weissfeld JL, Johnston EH, Brock BM, Hawthorne VM. Sex and age interactions in the association between alcohol and blood pressure. Am J Epidemiol 1988;128:559–69.

445 Gould L, Gopolaswamy C, Yang D, et al. Effect of oral alcohol on left ventricular ejection fraction, volumes and segmental wall motion in normals and in patients with recent myocardial infarction. Clin Cardiol 1985;8:576–82.

446 Davidson DM. Cardiovascular effects of alcohol. West J Med 1989;151:430–9.

447 Lieber CS. To drink or ot to drink? N Engl J Med 1984;310:846–8.

448 Pattison EM. The alcoholic patient: clinical approaches. Psychosomatics 1986;27:762–70.

449 Marmot M, Brunner E . Alcohol and cardiovascular disease: the status of the U shaped curve. BMJ 1991;303:565–8.

450 Rimm EB, Giovannucci EL, Willett WC et al. Prospective study of alcohol consumption and risk of coronary disease in men. Lancet 1991;338:464–8.

451 Gronbaek M, Deis A, Sorensen TIA et al. Influence of sex, age, body mass index, and smoking on alcohol intake and mortality. BMJ 1994;308:302–6.

452 Klatsky AL, Armstrong MA, Friedman GD. Risk of cardiovascular mortality in alcohol drinkers, ex-drinkers and nondrinkers. Am J Cardiol 1990;66:1237–42.

453 Intersalt Cooperative Research Group. Intersalt: an international study of electrolyte excretion and blood pressure: results for 24-hour urinary sodium and potassium excretion. BMJ 1988;297:319–28.

454 Hollenberg NK, Williams GH. Sodium-sensitive hypertension. Implications of pathogeneses for therapy. Am J Hypertens 1989;2:809–15.

455 MacGregor GA, Marcandu ND, Sagnella GA, Singer DRJ, Cappuccio FP. Double blind study of three sodium intakes and long-term effects of sodium restriction in essential hypertension. Lancet 1989;I:1244–7.

456 Law MR, Frost CD, Wald NJ. By how much does dietary salt reduction lower blood pressure? I - analysis of observational data among populations. BMJ 1991;302:811–8.

457 Elliott P, Stamler J, Nichols R, et al, for the Intersalt Cooperative Research Group. Intersalt revisited: further analyses of 24 hour sodium excretion and blood pressure within and across populations. BMJ 1996;312:1249–53.

458 Australia's health 1998. The sixth biennial health report of the Australian Institute of Health and Welfare. Australian Institute of Health and Welfare. 1998

459 Stampfer MJ, Colditz GA. Estrogen replacement and coronary heart disease: A quantitative assessment of the epidemiologic evidence. Prev Med 1991;20:47–63.

460 Grady D, Rubin SM, Petitti DB et al. Hormone therapy to prevent disease and prolong life in postmenopausal women. Ann Intern Med 1992;117:1016–37.

461 Barrett-Connor E, Bush TL. Estrogen and coronary heart disease in women. JAMA 1991;265:1861–7.

462 Henderson BE, Ross RK, Paganini-Hill A. Decreased mortality in users of estrogen replacement therapy. Arch Intern Med 1991;51:65–78.

463 Hunt K, Vessey M, McPherson K, Coleman M. Long-term surveillance of mortality and cancer incidence in women receiving hormone replacement therapy. Br J Obstet Gynaecol 1987;94:620–35.

464 Psaty BM, Heckbert SR, Atkins D, et al. The risk of myocardial infarction associated with the combined use of estrogens and progestins in postmenopausal women. Arch Intern Med. 1994;154:1333–9.

465 Jensen J, Riis B, Strom V, et al. Continuous oestrogen progestogen treatment and serum lipoproteins in postmenopausal women. Br J Obstet Gynaecol 1987;94:130–5.

466 Barzel US. Estrogens in the prevention and treatment of post-menopausal osteoporosis: A review. Am J Med 1988;85:847–50.

467 Compston JE. Osteoporosis - a review. Clin Endocrinol 1990;33:653–82.

468 Smith D, Prentice R, Thompson D, et al. Association of exogenous estrogens and endometrial cancer. N Engl J Med 1975;293:1167–70.

469 Colditz GA, Hankinson SE, Hunter DJ et al. The use of estrogens and progestins and the risk of breast cancer in postmenopausal women. N Engl J Med 1995; 332:1589–93.

470 The Writing Group for the PEPI Trial. Effects of estrogen or estrogen/progestin regimens on heart disease risk factors in postmenopausal women: The Postmenopausal Estrogen/Progestin Interventions (PEPI) Trial. JAMA 1995;273:199–208.

471 Grodstein F, Stampfer MJ. Estrogen replacement therapy and cardiovascular disease. Menopausal Medicine 1994;2:1–4.

472 Rose G. Familial patterns in ischaemic heart disease Br J Prev Soc Med 1964;18:75–80.

473 Slack J, Evans KA. The increased risk of death from ischaemic heart disease in first degree relatives of 121 men and 96 women with ischaemic heart disease. J Med Genet 1966;3:239–57.

474 Thordarson O, Fridriksson S. Aggregation of deaths from ischaemic heart disease among first and second degree relatives of 108 males and 42 females with myocardial infarction. Acta Med Scand 1979;205:493–500.

475 Rissanen AM. Familial occurrence of coronary heart disease: effect of age at diagnosis. Am J Cardiol 1979;44:60–6.

476 ten Kate LP, Boman H. Daiger SP, Motulsky AG. Familial aggregation of coronary heart disease and its relation to known genetic risk factors. Am J Cardiol 1982;50:945–53.

477 Deutscher S. Ostander LD, Epstein FH. Familial factors in premature heart disease - a preliminary report from the Tecumsch Community Health Study. Am J Epidemiol 1970;91:233–7.

478 Myers RH, Kiely DK, Cupples LA, Kannel WB. Parental history is an independent risk factor for coronary artery disease: the Framingham Study. Am Heart J 1990;120:963–9.

479 Garrison RJ, Castelli WP, Feinleib M et al. The association of total cholesterol, triglycerides and plasma lipoprotein cholesterol levels in first degree relatives and spouse pairs. Am J Epidemiol 1979;110:313–21.

480 Hunt SC, Hasstedt SJ, Kuida H, Stults BM, Hopkins PN, Williams RR. Genetic heritability and common environmental components of resting and stressed blood pressures, lipids, and body mass index in Utah pedigrees and twins. Am J Epidemiol 1989;129:625–38.

481 Brenn T. Adult family members and their resemblance of coronary heart disease risk factors: The Cardiovascular Disease Study in Finnmark. Eur J Epidemiol 1997;13:623–30.

482 von Arbin M, Britton M, de Faire U. Mortality and recurrences during eight years following stroke. J Intern Med 1992;231:43–8.

483 Manson JE, Colditz GA, Stampfer MJ et al. A prospective study of maturity-onset diabetes mellitus and risk of coronary heart disease and stroke in women. Arch Intern Med 1991;151:1141–7.

484 Weiner DA, Ryan TJ, Parsons L et al. Significance of silent myocardial ischaemia during exercise testing in patients with diabetes mellitus: A report from the Coronary Artery Surgery Study (CASS) registry. Am J Cardiol 1991;68:729–34.

485 Prochaska JO, DiClemente CC. Transtheoretical therapy: Toward a more integrative model of change. Psychotherapy Theory, Research and Practice 1982;19:276–88.

486 Hotz SB, Allston JA, Birkett NJ, Baskerville B, Dunkley G. Fat related dietary behaviour: behavioural science concepts for public health practice. Can J Public Health 1995;86:114–9.

487 Fishbein M, Middelstadt SE. Using the theory of reasoned action to develop educational interventions: Applications to illicit drug use. Health Education Research 1987;2:361–71.

488 Newton KM, Sivarajan ES, Clarke JJ. Patient perceptions of risk factor changes and cardiac rehabilitation outcomes after myocardial infarction. J Cardiac Rehabil 1985;5:159–68.

489 Fitzgerald ST, Becker DM, Celentano DD, Swank R, Brinker J. Return to work after percutaneous transluminal coronary angioplasty. Am J Cardiol 1989;64:1108–12.

490 Allen JK, Becker DM, Swank RT. Factors related to functional status after coronary artery bypass surgery. Heart Lung 1990;19:337–43.

491 Hellman EA. Use of the stages of change in exercise adherence model among older adults with a cardiac diagnosis. J Cardiopulm Rehabil 1997;17:145–55.

492 Crawford S. Promoting dietary change. Can J Cardiol 1995;11:14A–15A.

493 Milani RV, Lavie CJ, Cassidy MM. Effects of cardiac rehabilitation and exercise training programs on depression in patients after major coronary events. Am Heart J 1996;132:726–32.

494 Mallaghan N, Pemberton J. Some behavioural changes in 493 patients after an acute myocardial infarction. Br J Prev Soc Med 1977;31:86.

495 Henkin Y, Garber DW, Osterlund LC, Darnell BE. Saturated fats, cholesterol, and dietary compliance. Arch Intern Med 1992;152: 1167–74.

496 Simons LA, Levis G, Simons J. Apparent discontinuation rates in patients prescribed lipid-lowering drugs. Med J Aust 1996;164:208–11.

497 Horwitz RI, Viscoli CM, Berkman L, Donaldson RM, Horwitz SM, Murray CJ, Ransohoff DF, Sindelar J. Treatment adherence and risk of death after a myocardial infarction. Lancet 1990;336:5420–5.

498 Gallagher EJ, Viscoli CM, Horwitz RI. The relationship of treatment adherence to the risk of death after myocardial infarction in women. JAMA 1993;270:742–4.

499 Stern TA. The management of depression and anxiety following myocardial infarction. Mount Sinai J Med 1985;52:623–33.

500 Lloyd GC, Cowley RH. Distress or illness? A study of psychological symptoms after myocardial infarction. Br J Psychiatry 1983;142:120–5.

501 Cay EL, Vetter N, Philip AE, Dugard P. Psychological status during recovery from an acute heart attack. J Psychosom Res 1972;16:425–35.

502 Taylor CB, DeBusk RF, Davidson DM, Houston N, Burnett K. Optimal methods for identifying depression following hospitilization for myocardial infarction. J Chronic Dis 1981;34:1–7.

503 Cassem HN, Hackett TP. Psychological rehabilitation of myocardial infarction patients in the acute phase. Heart Lung 1973;2:382–8.

504 Wishnie HA, Hackett TP, Cassem NH. Psychological hazards of convalescence following myocardial infarction. JAMA 1971;215:1292–6.

505 Dellipiani AW, Cay EL, Philip AB et al. Anxiety after a heart attack. Br Heart J 1976;38:752–7.

506 Ahern DK, Gorkin L, Anderson JL et al. Biobehavioral variables and mortality or cardiac arrest in the Cardiac Arrhythmia Pilot Study (CAPS). Am J Cardiol 1990;66:59–62.

507 Carney RM, Rich MW, Freedland KE, Saini J et al. Major depressive disorder predicts cardiac events in patients with coronary artery disease. Psychosom Med 1988;50:627–33.

508 Aromaa A, Raitsalo R, Reunanen A et al. Depression and cardiovascular diseases. Acta Psychiatr Scand 1994;377:77–82.

509 Garrity TF, Klein RF. Emotional response and clinical severity as early determinants of six-month mortality after myocardial infarction. Heart Lung 1975;4:730–4.

510 Allison TG, Williams DE, Miller TD et al. Medical and economic costs of psychologic distress in patients with coronary artery disease. Mayo Clin Proc 1995;70:734–42.

511 American Psychiatric Association Committee on Nomenclature and Statistics: Diagnostic and Statistical Manual of Mental Disorders III-R (revised). Washington DC: American Psychiatric Association; 1980.

512 Goble AJ, Biddle N, Worcester MC. Depression after acute cardiac illness. Qual Life Cardiovasc Care 1989; Summer:60–5.

513 Hackett TP, Cassem NH. Coping with cardiac diseases. Advances in Cardiology 1982;31:212–7.

514 Froese A, Hackett TP, Cassem NH, et al. Trajectories of anxiety and depression in denying and non-denying acute myocardial infarction patients during hospitalization. J Psychosom Res 1974;18:413–20.

515 Crowe JM, Runions J, Ebbesen L, Oldridge N, Streiner DL. Anxiety and depression after acute myocardial infarction. Heart Lung 1996;25:98–107.

516 Oldridge N, Streiner D, Hoffman R, Guyatt G. Profile of mood states and cardiac rehabilitation after acute myocardial infarction. Med Sci Sports Exerc 1995;27:900–5.

517 Laerum E, Johnsen N, Smith P, Larsen S. Myocardial infarction may induce positive changes in life-style and in the quality of life. Scand J Prim Health Care 1988;6:67–71.

518 Hackett TP. Depression following myocardial infarction. Psychomatics 1985;26 Suppl 2:23–8.

519 Stern MJ, Pascale L. McLoone JB. Psychosocial adaptation following an acute myocardial infarction. J Chronic Dis 1976;29:530–26.

520 Stern MJ, Pascal L, Ackerman A. Life adjustment post myocardial infarction: determining predictive variables. Arch Intern Med 1977;137:1680–5.

521 Hamilton GA, Seidman RN. A comparison of the recovery period for women and men after an acute myocardial infarction. Heart Lung 1993;22:308–15.

522 Loose MS, Fernhall B. Differences in quality of life among male and female cardiac rehabilitation participants. J Cardiopulm Rehabil 1995;15:225–31.

523 Brezinka V, Kittel F. Psychosocial factors of coronary heart disease in women: a review. Soc Sci Med 1996;42:1351–65.

524 Moore SM. A comparison of women's and men's symptoms during home recovery after coronary artery bypass surgery. Heart Lung 1995;24:495–501.

525 Ladwig KH, Breithardt G, Borggrefe M. Post-infarction depression and incomplete recovery 6 months after acute myocardial infarction. Lancet 1994;343:20–3.

526 Croog SH, Levine S, Lurie Z. The heart patient and the recovery process. Soc Sci Med 1974;2:111–64.

527 Frasure-Smith N, Lesperance F, Talajic M. Depression following myocardial infarction: impact on 6-month survival. JAMA 1993;270:1819–25.

528 Frasure-Smith N, Lesperance F, Talajic M. Depression and 18-month prognosis after myocardial infarction. Circulation 1995;91:999–1005.

529 Barefoot JC, Helms MJ, Mark DB, et al. Depression and long-term mortality risk in patients with coronary artery disease. Am J Cardiol 1996;78:613–7.

530 Brown GW, Harris T. Social origins of depression: a study of psychiatric disorder in women. London: Tavistock Publications. 1978.

531 Groden BM, Brown RIF. Differential psychological effects of early and late mobilisation after myocardial infarction. Scand J Rehab Med 1970;2:60–4.

532 Parkes CM. Psychosocial transitions: a field for study. Soc Sci Med 1971;5:101–15.

533 Meagher DM, Gregor F, Stewart M. Dyadic social-support for cardiac surgery patients – a Canadian approach. Soc Sci Med 1987;25:833–7.

534 McGee H, Graham T, Newton H, Hargan JH. The involvement of the spouse in cardiac rehabilitation. Irish J Psychol 1994;15:203–18.

535 Ruberman W, Weinblatt E, Goldberg JD, Chandhary BS. Psychosocial influences on mortality after myocardial infarction. N Engl J Med 1984;311:522–59.

536 Case RB, Moss AJ, Case N, et al. Living alone after myocardial infarction: impact on prognosis. JAMA 1992;267:515–9.

537 Williams RB, Barefoot JC, Califf RM, Haney TL, et al. Prognostic importance of social and economic resources among medically treated patients with angiographically documented coronary artery disease. JAMA 1992;267:520–4.

538 Berkman LF, Leo-Summers L, Horwitz RI Emotional support and survival after myocardial infarction: A prospective, population-based study of the elderly. Ann Intern Med 1992;117:1003–9.

539 Tennant CC, Palmer KJ, Langeluddeke PM, Jones MP, Nelson G. Life event stress and myocardial reinfarction: a prospective study. Eur Heart J 1994;15:472–8.

540 Wingate S. Quality of life for women after a myocardial infarction. Heart Lung 1995;24:467–73.

541 Medalie JH, Goldbourt U. Angina pectoris amoung 10,000 men II. Psychosocial and other risk factors as evidenced by a multivariate analysis of a five year incidence study. Am J Med 1976;60:910–21.

542 Levine JB, Covino NA, Slack WV et al. Psychological predictors of subsequent medical care among patients hospitalized with cardiac disease. J Cardiopulm Rehabil 1996;16:109–16.

543 Tofler GH, Muller JE, Stone PH, et al. Comparison of long-term outcome after acute myocardial infarction in patients never graduated from high school with that in more educated patients. Am J Cardiol 1993;71:1031–5.

544 Marmot MG, Bosma H, Hemingway H, Brunner E, Stansfeld S. Contribution of job control and other risk factors to social variations in coronary heart disease incidence. Lancet 1997;350:2335–39.

545 Bosma H, Marmot MG, Hemingway H, Nicholson A, Brunner EJ, Stanfield S. Low job control and risk of coronary heart disease in the Whitehall II (prospective cohort) study. BMJ 1997;314:558–65.

546 Haan MN, Kaplan GA, Camacho T. Poverty and health: prospective evidence from the Alameda County Study. Am J Epidemiol 1987;125:989–98.

547 Welin L, Tibblin G, Svardsudd K, et al. Prospective study of social influences on mortality. The study of men born in 1913 and 1923. Lancet 1985;1:915–9.

548 Kulik JA, Mahler HI. Social support and recovery from surgery. Health Psychol 1989;8:221–38.

549 Hackett TP. The use of groups in the rehabilitation of the postcoronary patient. Adv Cardiol 1978; 24:127–35.

550 Schnall PL, Pieper C, Schwartz JE. The relationship between 'job strain', workplace diastolic blood pressure, and left ventricular mass index: results of a case-control study. JAMA 1990;263:1929–35.

551 Pieper C, LaCroix AZ, Karasek RA. The relation of psychosocial dimensions of work with coronary heart disease risk factors: a meta-analysis of five United States data bases. Am J Epidemiol 1989;129:483–94.

552 Karasek R, Baker D, Marxer F, et al. Job decision latitude, job demands and cardiovasular disease: a prospective study of Swedish men. Am J Public Health 1981;71:694–705.

553 Siegriest J . Adverse health effects of high effort low reward conditions. J Occup Heath Psych 1996;1:27–41.

554 Everson SA, Kauhanen J, Kaplan GA et al. Hostility and increased risk of mortality and acute myocardial infarction: the mediating role of behavioral risk factors. Am J Epidemiol 1997;146:142–52.

555 Reed DM, LaCroix AZ, Karasek RA, Miller DeW, MacLean C. Occupational strain and the incidence of coronary heart disease. Am J Epidiomol 1989;129:495–502.

556 Hlatky MA, Lam LC, Lee KL et al. Job strain and the prevalence and outcome of coronary artery disease. Circulation 1995;92:327–33.

557 Lynch J, Krause N, Kaplan GA, Salonen R, Salonen JT. Workplace demands, economic reward, and progression of carotid atherosclerosis. Circulation 1997;96:302–7.

558 Friedman M, Thoresen CE, Gill JJ et al. Alteration of Type A Behavior and reduction in cardiac recurrences in postmyocardial infarction patients. Am Heart J 1984;108:237–48.

559 Brackett CD, Powell LH. Psychosocial and physiological predictors of sudden cardiac death after healing of acute myocardial infarction. Am J Cardiol 1988;61:979–83.

560 Barefoot JC, Peterson BL, Harrell FE et al. Type A behaviour and survival: a follow up study of 1,467 patients with coronary artery disease. Am J Cardiol 1989;64:427–32.

561 Case RB, Heller SS, Case NB, Moss QJ. Multicenter Post-Infarction Research Group. Type A-B behavior and survival after acute myocardial infarction. N Engl J Med 1985;312:737–41.

562 Ivancevich JM, Matteson MT. T ype A behaviour and the healthy individual. Br J Med Psychol 1988;61:37–56.

563 Cohen L, Ardjoen RC, Sewpersad KSM. Type A behaviour pattern as a risk factor after myocardial infarction: a review. Psychology and Health 1997;12:619–32.

564 Shekelle RB, Gale M, Ostfeld AM et al. Hostility, risk of coronary heart disease, and mortality. Psychosom Med 1983;45:109–14.

565 Williams RB. Psychological factors in coronary artery disease: epidemiologic evidence. Circulation 1987;86:117–23.

566 Koskenvuo M, Paprio J, Rose RJ et al. Hostility as a risk factor for mortality and ischemic heart disease in men. Psychosom Med 1988;50:330–40.

567 Dembroski TM, MacDougall JM, Haney TL et al. Components of type A, hostility, and anger in relationship to angiographic findings. Psychosom Med 1985;47:219–33.

568 Dembroski TM, MacDougall JM, Costa PT et al. Components of hostility as predictors of sudden death and myocardial infarction in the Multiple Risk Factor Intervention Trial. Psychosom Med 1989;51:514–22.

569 Barefoot JC, Dahlstrom WG, Williams RB. Hostility, CHD incidence and total mortality: A 25 year follow-up study of 255 physicians. Psychosom Med 1983;45:59–63.

570 Everson SA, Lynch JW, Chesney MA et al. Interaction of workplace demands and cardiovascular reactivity in progression of carotid atherosclerosis: population based study. BMJ 1997;314:553–8.

571 Newens AJ, Bond S, Priest J, McColl E. Nurse involvement in cardiac rehabilitation prior to hospital discharge. J Clin Nurs 1995;4:390–6.

572 Hentinen M. Need for instruction and support of the wives of patients with myocardial infarction. J Adv Nurs 1983;8:519–24.

573 Bedsworth JA, Molen MT. Psychological stress in spouses of patients with myocardial infarction. Heart Lung 1982;11:450–6.

574 Bramwell L. Wives' experiences in the support role after husbands' first myocardial infarction. Heart Lung 1986;15:578–85.

575 Wiklund I, Sanne H, Vedin JA, Wilhelmsson C. Psychosocial outcome one year after a first myocardial infarction. J Psychosom Res 1984;28:309–21.

576 Schott T, Badura B. Wives of heart attack patients: the stress of caring. In: Anderson R & Bury M, editors. Living with chronic illness. The experience of patients and their families.(pp117–136), London: Unwin Hyman; 1988.

577 Skelton M, Dominian J. Psychological stress in wives of patients with myocardial infarction. BMJ 1973;2:101–3.

578 Nyamathi AM. The coping responses of female spouses of patients with myocardial infarction. Heart Lung 1987;16:86–92.

579 Mayou RA, Foster A, Williamson B. The psychological and social effects of myocardial infarction on wives. BMJ 1978;1:699–701.

580 Coyne JC, Smith DAF. Couples coping with a myocardial infarction: a contextual perspective on wives' distress. J Pers Soc Psychol 1991;61:404–12.

581 Stanley M, Frantz R. Adjustment problems of patients undergoing coronary artery bypass graft surgery during early convalescence. Heart Lung 1988;17:677–82.

582 Engleman RM. Mechanisms to reduce hospital stays. Ann Thorac Surg 1996;61:S26–9.

583 Radley A, Green R, Radley M. Impending surgery: the expectations of male coronary patients and their wives. Int Rehabil Med 1987;8:154–61.

584 Thompson DR, Meddis R. Wives' responses to counselling early after myocardial infarction. J Psychosom Res 1990;34:249–58.

585 Finlayson A, McEwen J. Coronary heart disease and patterns of living. London :Croom Helm;1977.

586 Campbell TL. Research reports. Families after a heart attack. Family Systems Medicine 1993;11:105–10.

587 Sikorski JM. Knowledge, concerns and questions of wives of convalescent coronary artery bypass graft surgery patients. J Cardiac Rehabil 1985;5:74–85.

588 Davidson DM. The family and cardiac rehabilitation. J Family Practice 1979;8:253–61.

589 Stern MJ, Pascale L. Psychosocial adaptation postmyocardial infarction: the spouse's dilemma. J Psychosom Res 1979;23:83–7.

590 Daltroy LH, Godin G. The influence of spousal approval and patient perception on cardiac patient participation in exercise programs. J Cardiopulm Rehabil 1989;9:363–7.

591 Clarke DE, Walker JR, Cuddy TE. The role of perceived overprotectiveness in recovery 3 months after myocardial infarction. J Cardiopulm Rehabil 1996;16:372–7.

592 Baggs J, Karch A. Sexual counselling of women with coronary heart disease. Heart Lung 1987;16:154–8.

593 Papadopoulos C, Beaumont C, Shelley, SI, Larrimore P. Myocardial infarction and sexual activity of the female patient. Arch Intern Med 1983;143:1528–30.

594 Mann S, Yates JE, Raftery EB. The effects of myocardial infarction on sexual activity. J Cardiac Rehabil 1981;1:187–93.

595 Kolman PB. Sexual dysfunction in the postmyocardial infarction patient. J Cardiac Rehabil 1984;4:334–40.

596 Rosal MC, Downing J, Littman AB, Ahern DK. Sexual functioning post-myocardial infarction: effects of beta-blockers, psychological status and safety information. J Psychosom Res 1994;38:655–67.

597 Hayaki J, Brownell KD. Behaviour change in practice: group approaches. Int J Obes Relat Metab Disord 1996;20:S27–30.

598 Olsen MN. Research notes-ways to achieve quality in school classrooms. Phi Delta Cappan; 1971.

599 Knowles MS. The modern practice of adult education: From pedagogy to andragogy. New York: Cambridge;1980.

600 Glassman E. Teaching biochemistry in cooperative learning groups. Biochemical Education 1978;6:35.

601 Rankin SH, Stallings KD. Patient education issues, principles, practices. Philadelphia: JB Lippincott; 1990.

602 Knowles MD. The adult learner: A neglected species. 4th edition. Houston:Gulf; 1990.

603 Thomas JJ. Cardiac inpatient education: The impact of educational methodology on self-efficacy. J Cardiopulm Rehabil 1993;13: 398–405.

604 Lindsay C, Jennrich JA, Biemolt M. Programmed instruction booklet for cardiac rehabilitation teaching. Heart Lung 1991;20:648–53.

605 Hawley DJ. Psycho-educational interventions in the treatment of arthritis. Baillieres Clin Rheumatol 1995;9:803–23.

606 Stanton BA, Jenkins CD, Denlinger P, Savageau JA, Weintraub MM, Goldstein RL. Predictors of employment status after cardiac surgery. JAMA 1983; 249:907–11.

607 Cay EL, Vetter N, Philip A, Dugard P. Return to work after a heart attack. J Psychosom Res 1973;17:231–43

608 Maeland JG, Havik JG. Psychological predictors for return to work after a myocardial infarction. J Psychom Med 1987;31:471–81.

609 Gundle MJ, Reeves BR, Tate S, Raft D, McLaurin LP. Psychosocial outcome after coronary artery surgery. Am J Psychiatry 1980;137:1591–4.

610 Liddle HV, Jones PD, Gould B, Clayton PD. The rehabilitation of patients following coronary revascularization surgery: social and economic aspects. In Walter PJ, editor. Return to work after coronary artery bypass surgery: psychosocial and economic aspects. Berlin: Springer-Verlag; 1985.

611 Wilke NA, Sheldahl LM. Use of simulated work testing in cardiac rehabilitation: a case report. Am J Occup Therapy 1985;39:327–30.

612 Gaw-Ens B,Laing GP. Risk factor reduction behaviours in coronary angioplasty and myocardial infarction patients. Can J Cardiovasc Nurs 1994;5:4–12.

613 Versaci F, Gaspardone A, Tomai F, Crea F, Chiariello L, Gioffre PA. A comparison of coronary artery stenting with angioplasty for isolated stenosis of the proximal left anterior descending coronary. N Engl J Med 1997;336:817–22.

614 Sirnes PA, Golf S, Myreng Y et al. Stenting in chronic coronary occlusion (SICCO): A randomised controlled trial of adding stent implantation after successful angioplasty. J Am Coll Cardiol 1996;28:1444–51.

615 Savage MP, Douglas JS, Fischman DL et al. for the Saphenous Vein De Novo Trial Investigators. Stent placement compared with balloon angioplasty for obstructed coronary bypass grafts. N Engl J Med 1997;337:740–7.

616 Pocock SJ, Henderson RA, Rickards AF, Hampton JR, King SB, Hamm CW, et al. Meta-analysis of randomised trials comparing coronary angioplasty with bypass surgery. Lancet 1995;346:1184–9.

617 First-year results of CABRI (Coronary Angioplasty versus Bypass Revascularisation Investigation). CABRI trial participants. Lancet 1995;346:1179–84.

618 Sim I, Gupta M, McDonald K, Bourassa MG, Hlatky MA. A meta-analysis of randomized trials comparing coronary artery bypass grafting with percutaneous transluminal coronary angioplasty in multivessel coronary artery disease. Am J Cardiol 1995;76:1025–9.

619 Tooth L, McKenna K. Cardiac patient teaching: application to patients undergoing coronary angioplasty and their partners. Pat Ed Counsel 1995;25:1–8.

620 Mark DB, Lam L, Lee KL, et al. Effects of coronary angioplasty, coronary bypass surgery and medical therapy on employment in patients with coronary artery disease: a prospective comparison study. Arch Intern Med 1994;120:111–7.

621 McKenna KT, Bett JHN, McEniery PT, et al. Percutaneous transluminal coronary angioplasty: clinical and quality of life outcomes one year later. Aust NZ J Med 1994;24:15–21.

622 World Health Organisation/Council on Geriatric Cardiology Task Force on Heart Failure Education. Concise Guide to the Management of Heart Failure. Geneva: WHO; 1997.

623 World Health Organisation/Council on Geriatric Cardiology Task Force on Heart Failure Education. A patient's guide to control of heart failure. Geneva: WHO; 1997.

624 Worcester MC, Roberts S, Gilbert E, Ciotta A, Richmond K. Report on reasons for nonattendance at, and dropout from, cardiac rehabilitation programs. Heart Research Centre. Melbourne; 1999.

625 Hogg RS. Variability in behavioural risk factors for heart disease in an Australian Aboriginal community. J Biosocial Science 1994;26:539–51.

626 Smith RM, Spargo R, Hunter E et al. Prevalence of hypertension in Kimberley Aborigines and its relationship to ischaemic heart disease. Med J Aust 1992;156:557–66.

627 National Health Priority Areas Report: Cardiovascular health. Canberra: Department of Health and Family Services; 1998.

628 Carapetis JR, Wolff DR, Currie BJ. Acute rheumatic fever and rheumatic heart disease in the Top End of Australia's Northern Territory. Med J Aust 1996;164:146–9.

629 Welty TK, Coulehan JL. Cardiovascular disease among American Indians and Alaska Natives. Diabetes Care 1993;16:277–83.

630 Klain MG, Coulehan JL, Arena VC et al. More frequent diagnosis of acute myocardial infarction among Navajo Indians. Am J Public Health 1988;78:1351–2.

631 Howard BV, Lee ET, Cowan LD, Fabsitz RR, Howard WJ, Oopik AJ, et al. Coronary heart disease prevalence and its relation to risk factors in American Indians. The Strong Heart Study. Am J Epidemiol 1995;142:254–68.

632 Lee ET, Cowan LD, Welty TK, Sievers M, Howard WJ, Oopik A, et al. All-cause mortality and cardiovascular disease mortality in three American Indian populations, aged 45–74 years, 1984–1988. The Strong Heart Study.

633 Lee ET, Howard BV, Savage PJ, Cowan LD, Fabsitz RR, Oopik AJ, et al. Diabetes and impaired glucose tolerance in three American Indian populations aged 45–74years. The Strong Heart Study. Diabetes Care 1995;18:599–610.

634 Welty TK, Lee ET, Yeh J, Cowan LD, Go O, Fabsitz RR, et al. Cardiovascular disease risk factors among American Indians. The Strong Heart Study. Am J Epidemiol 1995;142:269–87.

635 Young TK, Moffatt MEK, O'Neil JD. Cardiovascular disease in a Canadian Arctic population. Am J Public Health 1993;83:881–7.

636 Girle L. A guide to the management of diabetes for dietitians: Aboriginals and Torres Strait Islanders. Unpublished manuscript. Queensland Department of Health. 1992.

637 Judd J. Developing drug education in Aboriginal schools in the Northern Territory. Drug Educ J Aust 1990;4:73–9.

638 Gracey M. Aborigines and health. Med J Aust 1985;143:S43–44.

639 Newman B. Primary health care by Aboriginals for Aboriginals. Aust Nurses J 1987;9:45–7.

640 Directory of cardiac rehabilitation programs. Canberra: National Heart Foundation of Australia; 1998.

641 Promoting heart health. Canberra: National Heart Foundation of Australia;1998.

642 Lockhart LL, Isles CG, McMeekan K, Cross SJ, Mark J, Tait GW. Cardiac rehabilitation in Dumphries and Galloway: a model for rural areas? Coronary Health Care 1997;1:138–44.

643 Battye K, Bichel C, Kelly K. Development of a primary care model for cardiac rehabilitation and secondary prevention. Proceedings of the 5th National Rural Health Conference. Adelaide, Australia; 1995.

644 Blair TP, Bryant FJ, Bocuzzi S. Treatment of hypercholesterolemia by a clinical nurse using a stepped-care protocol in a nonvolunteer population. Arch Intern Med 1988;148:1046–8.

645 Balas EA, Jaffrey F, Kuperman GJ et al. Electronic communication with patients. Evaluation of distance medicine technology. JAMA 1997;278:152–9.

646 Wasson J, Gaudette C, Whaley F, Sauvigne A, Baribeau P, Welch HG. Telephone care as a substitute for routine clinic follow-up. JAMA 1992;267:1788–93.

647 Hoebel FC. Brief family-interactional therapy in the management of cardiac-related high-risk behaviors. J Family Practice 1976;3:613–8.

648 Croog SH, Fitzgerald EF. Subjective stress and serious illness of a spouse: wives of heart patients. J Health Soc Behav 1978;19:166–78.

649 Finlayson A. Social networks as coping resources: lay help and consultation patterns used by women in husbands' post-infarction career. Soc Sci Med 1976;10:97–103.

650 Newens A, Bond S, McColl E. The experience of women during their partners' hospital stay after MI. Nurs Stand 1995;10:27–9.

651 Holub N, Eklund P, Keenan P. Family conferences as an adjunct to total coronary care. Heart Lung 1975;4:767–9.

652 Radley A, Green R. Bearing illness: Study of couples where the husband awaits coronary graft surgery. Soc Sci Med 1986;23:577–85.

653 Doerr BC, Jones JW. Effect of family preparation on the state anxiety level of the CCU patient. Nursing Research 1979;28:315–9.

654 McGann M. Group sessions for the families of post coronary patients. Superv Nurse 1976;7:17–9.

655 Dracup K, Guzy P, Taylor SE, Barry J. Cardiopulmonary resuscitation (CPR) training: Consequences for family members of high-risk cardiac patients. Arch Intern Med 1986;146:1757–61.

656 Gattiker H, Goins P, Dennis C. Cardiac rehabilitation: Current status and future directions. Western J Med 1992;156;183–8.

657 Horgan J, McGee HM. Cardiac rehabilitation: future directions. In Jones D, West R, editors. Cardiac rehabilitation. London: BMJ Publishing Group; 1995.

658 Furnham A, Pendleton D, Manicon C. The perception of different occupations within the medical profession. Soc Sci Med 1981;15E:289–300.

659 Westbrook M. Professional stereotypes: how occupational therapists and nurses perceive themselves and each other. Aust Occup Ther J 1978;25:12.

660 Helm M, Ellson J. Cardiac rehabilitation: occupational therapy enhancement of an existing cardiac outpatient rehabilitation programme. Br J Occup Ther 1988;51:385–9.

661 Sokol B. Intervention with heart attack patients and families. Social Casework 1983;64:162–8.

662 Sulman J, Verhaeghe G. Myocardial infarction patients in the acute care hospital: a conceptual framework for social work intervention. Social Work in Health Care 1985;11:11–20.

663 McKendry N, Logan R. Cardiac rehabilitation: the role of the social worker. NZ Med J 1979;90:111–2.

664 Blumenthal JA, Califf R. Williams S, Hindman M. Continuing medical education cardiac rehabilitation: A new frontier for behavioral medicine. J Cardiac Rehabil 1983;3:637–56.

665 Chesney MA. Biobehavioural treatment approaches for cardiovascular disorders. J Cardiopulm Rehabil 1985;5:226–32.

666 Nichols KE. Psychological care by nurses, paramedical and medical staff: essential developments for the general hospitals. Br J Med Psychol 1985;58:231–240.

667 Maes S. Psychosocial aspects of cardiac rehabilitation in Europe. Br J Clin Psychol 1992;31:473–83.

668 Mulcahy R. Do different kinds of social and cultural settings require different kinds of rehabilitation programmes? In; Mathes P, Halhuber MJ, editors. Controversies in cardiac rehabilitation. Berlin : Springer-Verlag; 1982.

669 Thompson SC, Schwankovsky L, Pitts J. Counselling patients to make lifestyle changes: the role of physician self-efficacy, training and beliefs about causes. Fam Pract 1993;10:70–5.

670 Wiggers JH, Sanson-Fisher R. General practitioners as agents of health risk behaviour change: Opportunities for behavioural science in patient smoking cessation. Behav Change 1994;11:167–76.

671 Holka BS. Patient-clinician interactions and compliance. In; Haynes RB, Taylor DW, Sackett DL, editors. Compliance in health care. Baltimore: Johns Hopkins University Press; 1979.

672 Tesar GE, Hackett TP. Psychiatric management of the hospitalized cardiac patient. J Cardiopulm Rehabil 1985;5:219–25.

673 Lloyd GC, Cowley RH. Distress or illness? A study of psychological symptoms after myocardial infarction. Br J Psychiatry 1983;142:120–5.

673 Orchard WH. Anxiety in patients with coronary disease. National Heart Foundation of Australia Notes of Cardiovascular Diseases. Melbourne: National Heart Foundation of Australia; 1964.

674 How to plan a cardiac rehabilitation program. National Heart Foundation of Australia. Second edition. Canberra. 1997.

675 Beitman BD, Mukerji V, Flaker G, Basha IM. Panic disorder, cardiology patients and atypical chest pain. Psychiatric Clinics of North America 1988;11:387–97.

676 Richardson A, Williams S, Elwood M, Bahr M, Medlicott T. Participation in breast cancer screening: randomised controlled trials of doctors' letters and of telephone reminders. Aust J Public Health 1994;18:290–2.

677 Pell J, Pell A, Morrison C, Blatchford O, Dargie H. Retrospective study of influence of deprivation on uptake of cardiac rehabilitation. BMJ 1996;313:267–8.

678 Lawson-Matthew PJ, Wilson AT, Woodmansey PA, Channer KS. Unsatisfactory management of patients with myocardial infarction admitted to general medical wards. J R Coll Physicians Lond 1994;28:49–51.

679 Oldridge N, Streiner D. The health belief model: Predicting compliance and dropout in cardiac rehabilitation. Med Sci Sports Exerc 1990;22:678–83.

680 Brubaker PH, Warner JG, Rejeski WJ, Edwards DG, Matrazzo BA, Ribisl PM, et al. Comparison of standard and extended length participation in cardiac rehabilitation on body composition, functional capacity and blood lipids. Am J Cardiol 1996;78:769–73.

681 Pashkow P, Ades PA, Emery CF, Frid DJ, Houston-Miller N, Peske G, et al. Outcome measurement in cardiac and pulmonary rehabilitation. AACVPR Outcomes Committee. American Association of Cardiovascular and Pulmonary Rehabilitation. J Cardiopulm Rehabil 1995;15:394–405.

682 Guyatt G, Sullivan M, Thompson P et al. The 6-minute walk: A new measure of exercise capacity in patients with chronic heart failure. Can Med Assoc J 1985;132:919–23.

683 Guyatt GH. Measurement of health related quality of life in heart failure. Irish J Psychol 1994;15:148–63

684 Cipkin D, Scriven J, Crake T, Poole-Wilson P: Six-minute walking test for assessing exercise capacity in chronic heart failure. BMJ 1986;292:653–5.

685 Singh SJ,Morgan MDL, Scott S, Walters D, Hardman AE. Development of a shuttle walking test of disability in patients with chronic airways obstruction. Thorax 1992;47:1019–24.

686 Hlatky M, Boineau R, Higgenbotham M, et al: A brief self-administered questionnaire to determine functional capacity (The Duke Activity Status Index). Am J Cardiol 1989;64:651–4.

687 Rankin SL, Briffa TG, Morton AR, Hung J. A Specific Activity Questionnaire to measure the functional capacity of cardiac patients. Am J Cardiol 1996;77:1220–3.

688 Harvey R, Doyle E, Ellis K. Major changes made by the Criteria Committee of the New York Heart Association. Circulation 1974;49:390.

689 Campeau L. Grading of angina pectoris. Circulation 1976;54:522.

690 Spertus JA, Winder JA, Dewhurst TA et al. Development and evaluation of the Seattle Angina Questionnaire: a new functional status measure for coronary artery disease. J Am Coll Cardiol 1995;25:333–41.

691 Rector TS, Kubo SH, Cohn JN. Patients' self-assessment of their congestive heart failure: content, reliability and validity of a new measure, the Minnesota Living with Heart Failure Questionnaire. Heart Failure 1987;3:198–209.

692 Oldridge NB. Outcome assessment in cardiac rehabilitation: health-related quality of life and economic evaluation. J Cardiopulm Rehabil 1997;17:179–94.

693 Ware JE, Sherbourne CD. The MOS 36-Item Short-Form Health Survey (SF-36). I.Conceptual framework and item selection. Med Care 1992;30:473–83.

694 Tarlov AR, Ware JE, Greenfield S, Nelson EC, Perrin E, Zubkoff M. The Medical Outcomes Study: an application of methods for monitoring the results of medical care. JAMA 1989;262:925–30.

695 Jette DU, Downing J. Health status of individuals entering a cardiac rehabilitation program as measured by the Medical Outcomes Study 36-item Short Form Survey (SF-36). Phys Ther 1994;74:521–7.

696 Oldridge NB, Gottlieb M, Guyatt GH, Jones NL, Feeny D, Streiner D. Predictors of health-related quality of life with cardiac rehabilitation after acute myocardial infarction. J Cardiopulm Rehabil 1998;18:95–103.

697 Bunker S, Cotz J, McBurney H, McCrae S. Health outcomes in cardiac rehabilitation using the Medical Outcomes Study Short Form 36 to measure the health status of patients at entry to and exit from outpatient cardiac rehabilitation [abstract]. Proceedings of the Managing and Measuring Health Outcomes Conference: Canberra, Australia; 1997.

698 Hunt S, McEwen J, McKenna S. A quantitative approach to perceived health. J Epidemiol Community Health 1980;34:281–95.

699 Caine N, Harrison SCW, Sharples LD, Wallwork J. Prospective study of life before and after coronary artery bypass grafting. BMJ 1991;302:511–6.

700 Skinner JS, Albers CJ, Hall RJC, Adams PC. Comparison of Nottingham Health Profile (NHP) scores with exercise duration and measures of ischaemia during treadmill exercise testing in patients with coronary artery disease. Eur Heart J 1995;16:1561–5.

701 Dempster M, Bradley J, Wallace E, McCoy P. Measuring quality of life in cardiac rehabilitation: comparing the Short Form 36 and the Nottingham Health Profile. Coronary Health Care 1997;1:211–7.

702 McNair D, Lorr M, Droppleman L. Profile of Mood States. San Diego, CA: Education and Industrial Testing Service; 1971.

703 Dimsdale JE, Hackett TP. Effect on denial on cardiac health and psychological assessment. Am J Psychiatry 1982;139:1477–80.

704 Shephard RJ, Kavanagh T, Klavora P. Mood state during postcoronary cardiac rehabilitation. J Cardiopulm Rehabil 1985;5:480–4.

705 Gibson B, Gibson J, Bergner M et al. The Sickness Impact Profile: development of an outcome measure of health care. Ann Intern Med 1975;65:1304–10.

706 Ott CR, Sivarajan ES, Newton KM et al. A controlled randomized study of early cardiac rehabilitation: The Sickness Impact Profile as an assessment. Heart Lung 1983;12:162–70.

707 Derogatis LR. The Psychosocial Adjustment to Illness Scale (PAIS). J Psychosom Res 1986;30:77–91.

708 Raft D, McKee DC, Popio KA, Haggerty JJ. Life adaptation after percutaneous transluminal coronary angioplasty and coronary artery bypass grafting. Am J Cardiol 1985;56:395–8.

709 Heller RF, Lim L, Valenti L, Knapp J. A randomised controlled trial of community based counselling among those discharged from hospital with ischaemic heart disease. Aust NZ J Med 1995;25:362–4.

710 Denollet J. Health complaints and outcome assessment in coronary heart disease. Psychosom Med 1994;56:463–74.

711 Hare DL, Davis CR. Cardiac Depression Scale: validation of a new depression scale for cardiac patients. J Psychosom Res 1996;40:379–86.

712 Spielberger C, Gonsuch R, Luschene R. Manual for the State-Trait Anxiety Inventory. Palo Alto, CA: Consulting Psychologist Press; 1970.

713 Egan V, Miller E, McLennan I. Does the personal questionnaire provide a more sensitive measure of cardiac surgery related-anxiety than a standard pencil and paper checklist? Personality and Individual Differences 1998; 24:465–73.

714 Burker EJ, Blumenthal JA, Feldman M, Burnett R, White W, Smith LR, et al. Depression in male and female patients undergoing cardiac surgery. Br J Clin Psychol 1995; 34:119–28.

715 Zigmond AS, Snaith RP. The Hospital Anxiety and Depression Scale. Acta Psych Scand 1983;67:361–70.

716 Duits AA, Duivenvoorden HJ, Boeke M, Taams MA, Mochtar B, Krauss XH, et al. The course of anxiety and depression in patients undergoing coronary artery bypass graft surgery. J Psychosom Res 1998;45:127–38.

717 O'Rourke A, Lewin B, Whitecross S, Pacey W. The effects of physical exercise training and cardiac education on levels of anxiety and depresion in the rehabilitation of coronary artery bypass patients. Int Disabil Stud 1990;12:104–6.

718 Beck AT, Ward CH, Mendelson M, Mock JE, Erbaugh J. An inventory for measuring depression. Arch Gen Psychiatry 1961;4:561–71.

719 Crowe JM, Runions J, Ebbesen L, Oldridge N, Streiner DL. Anxiety and depression after acute myocardial infarction. Heart Lung 1996;25:98–107.

720 Timberlake N, Klinger P, Smith P, Venn G, Treasure T, Harrison M, Newman SP. Incidence and patterns of depression following coronary artery bypass graft surgery. J Psychosom Res 1997;43:197–207.

721 Zung WWK. A self-rating depression scale. Arch Gen Psychiatry 1965;12:63–70.

722 Radloff L. The CES-D scale: a self-report depression scale for research in the general population. Appl Psych Measurement 1977;1:385–401.

723 Krug SE, Scheier IH, Cattell RB. Handbook for the IPAT Anxiety Scale. Institute for Personality and Ability Testing. Champaign (IL): The Institute; 1976.

724 Krug SE, Laughlin JE. Handbook for the IPAT Depression Scale information. Champaign (IL): Institute for Personality and Ability Testing; 1976.

725 McCormack HM, De L Horne DJ, Sheather S. Clinical applications of visual analogue scales: a critical review. Psychol Med 1988;18:1007–19.

726 Gurland BJ, Yorkston NJ, Stone AR, Frank JD, Fleiss JL. The structured and scaled interview to assess maladjustment. I. Description, rationale and development. II. Factor analysis, reliability and validity. Arch Gen Psychiatry 1972;27:259–67.

727 Weissman MM. The assessment of social adjustment a review of techniques. Arch Gen Psychiatry 1975;32:357–65.

728 Sarason IG, Johnson JH, Siegel JM. Assessing the impact of life changes: development of the Life Experiences Survey. J Consult Clin Psychol 1975;46:932.

729 Hathaway SR, McKinley JC. The Minnesota Multiphasic Personality Inventory manual. Minneapolis: University of Minnesota Press; 1943.

730 Murphy MC, Fishman J, Shaw RE. Education of patients undergoing coronary angioplasty: factors affecting learning during a structured education program. Heart Lung 1989;18:36–45.

731 Havik OE, Maeland JG. Patterns of emotional reactions after a myocardial infarction. J Psychosom Res 1990;34:271–85.

732 Tooth L, McKenna K, Maas F, McEniery P. The effects of pre-coronary angioplasty education and counselling on patients and their spouses: a preliminary report. Patient Education and Counseling 1997;32:185–96.

733 Robinson P, McBurney H, Bunker S. The development of the Victorian Cardiac Rehabilitation Questionnaire [abstract]. Proceedings of the 4th Annual Scientific Meeting of the Australian Cardiac Rehabilitation Association: Adelaide, Australia; 1994.

734 Rabkin SW, Chen Y, Leiter L, Liu L, Reeder BA. Risk factor correlates of body mass index. Canadian Heart Health Surveys Research Group. CMAJ 1997;157 Suppl 1:S26–31.

735 Wetzler HP, Cruess DF. Self-reported physical health practices and health care untilization : findings from the National Health Interview Survey. Am J Public Health 1985;75:1329–30.

736 Dobson, A, Blijlevens, R, Alexander, HM, Croce, N, Heller, R, Higginbotham N, et al. Short Fat Questionnaire: a self-administered measure of fat-intake behaviour. Aust J Public Health 1993 17 144–9

737 Haynes RB, Taylor DW, Sackett DL, editors. Compliance in health care. Baltimore: Johns Hopkins Press; 1979.

738 Trotter L, Mullins R, editors. Quit evaluation studies. Centre for Behavioural Research in Cancer, Anti-Cancer Council of Victoria for the Victorian Smoking and Health Program. Melbourne: Anti-Cancer Council of Victoria; 1998.

739 StrecherVJ, DeVellis BM, Becker MH, Rosenstock IM. The role of self efficacy in achieving health behaviour change. Health Education Quarterly 1986;13:73–92.

740 Oldridge N, Furlong W, Feeny D et al. Economic evaluation of cardiac rehabilitation soon after myocardial infarction. Am J Cardiol 1993;72:154–61.

741 Ades PA, Pashkow FJ, Nestor JR. Cost-effectiveness of cardiac rehabilitation after myocardial infarction. J Cardiopulm Rehabil 1997;17:222–31.

742 Byl N, Reed P, Franklin B, Gordon S. Cost of phase II cardiac rehabilitation: implications regarding ECG monitoring practices [abstract]. Circulation 1988;78 Suppl 11:136.

743 Ades PA. Decreased medical costs after cardiac rehabilitation. A case for universal reimbursement. J Cardiopulm Rehabil 1993;13:75–7.

744 Gray A, Bowman GS, Thompson DR. The role of cardiac rehabilitation services in England and Wales. J R Coll Physicians Lond 1997;31:57–61.

745 Lewin RJ, Ingleton R, Newens AJ, Thompson DR. Adherence to cardiac rehabilitation guidelines: a survery of rehabilitation programmes in the United Knigdom. BMJ 1998; 316:1354–5.

746 de Bono DP. Models of cardiac rehabilitation. Multidisciplinary rehabilitation is worthwhile, but how is it best delivered? [editorial]. BMJ 1998;316:1329–30.

747 Bondestam E, Breikss A, Hartford M. Effects of early rehabilitation on consumption of medical care during the first year after acute myocardial in patients ≥ 65 years of age. Am J Cardiol 1995;75:767–71.

748 Picard MH, Dennis C, Schwartz RG, Ahn DK, Kraemer HC, Berger WE, et al. Cost-benefit analysis of early return to work after uncomplicated acute myocardial infarction. Am J Cardiol 1989;63:1308–14.

749 Kupersmith J, Holmes-Rovner M, Hogan A, Rovner D, Gardiner J. Cost effectiveness analysis in heart disease. Part I: General principles. Prog Cardiovasc Dis 1994;37:161–84.

750 Goldman L, Weinstein MC, Goldman PA, Williams LW. Cost-effectiveness of HMG-CoA reductase inhibition for primary and secondary prevention of heart disease. JAMA 1991;265:1145–51.

751 Kinosian B, Glick H, Schwartz JS. Scandinavian Simvastatin Survival Study (4S): cost effectiveness (CE) of cholesterol lowering treatment [abstract]. J Am Coll Cardiol 1996;27:165A.

752 Krumholz HM, Cohen BJ, Tsevat J, Pasternak RC, Weinstein MC. Cost effectiveness of a smoking cessation program after myocardial infarction. J Am Coll Cardiol 1993;22:1667–72.

GLOSSARY

ACE inhibitor (angiotensin-converting enzyme inhibitor)
A drug used in treatment of hypertension and heart failure.

Acute myocardial infarction (AMI)
A heart attack in which there occurs death of heart muscle due to blockage of a coronary artery.

Adherence
The continued maintenance of a prescribed or recommended behaviour, regimen 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 the term "aerobic". The term has in the past been applied to high intensity exercise, but it has now been broadened to include any exercise that leads to increased oxygen uptake.

Ambulatory ECG (Holter recording)
A continuous record of the electrocardiograph during normal daily living, usually through a day or more.

Ambulatory cardiac rehabilitation program
An outpatient program conducted during early convalescence up to about three months after discharge from hospital. "Ambulatory" is preferable to the term "phase 2" to describe programs conducted during convalescence.

Aneurysm
A sac formed due to weakness in the wall of an artery, a vein or a heart chamber in which bulging or dilatation occurs.

Angina pectoris
Pain or discomfort in the chest due to inadequacy of blood supply to meet the demands of the heart muscle commonly during effort or emotion and which is eased by rest.

Angiography
The process whereby blood vessels are outlined using X-ray examination after injection of fluid which is opaque to X-rays.

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

Atherosclerosis
The condition in which there occur plaques containing cholesterol and other materials which 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.

Best practice
Best practice refers to optimal standards of care, reflected in the achievement of the best possible outcomes, processes and structures. Best practice guidelines identify benchmarks for providing optimal health services, thus contributing to quality assurance. Implicit in the concept of best practice is the requirement that the recommended practices should be cost effective.

Beta blocker (b-adrenergic receptor blocking agent)
A drug which antagonises the effects of 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 from the main pumping chamber of the heart (the left 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.

Cardiac arrest
Cessation of heart action due to ventricular fibrillation or ventricular standstill (cessation of all heart pumping activity and failed ventricular activity).

Cardiac catheterisation
Passage of a catheter into the heart through an artery or vein under X-ray control, used for cardiac diagnosis.

Cardiac mortality
Death due to heart disease, often expressed as percentage of death rates or rate of deaths per 100,000 of population.

Cardiomyopathy
Disease of the heart muscle commonly of unknown or obscure origin, not due to coronary heart disease, high blood pressure or valvular disease. The term, however, is sometimes used to explain heart muscle disease secondary to these known causes.

Cardiovascular disease (CVD)
All diseases of the heart and blood vessels. These include coronary heart disease, rheumatic heart disease, cardiomyopathy, hypertensive and other forms of heart disease and of blood vessel disease, including stroke.

Cardiovascular mortality
Death due to any disease of the heart and blood vessels.

Cholesterol
A fatty substance found in all animal tissue. It is a normal ingredient of all cells. It is transported in the blood, linked to a protein which makes it soluble in the blood (lipoprotein). High levels of cholesterol lead to deposition within the linings of the arteries, thereby producing atherosclerosis.

Chronotropic dysfunction
Reduced response of the heart rate to exercise or other stress. This impaired increment in heart rate response is most commonly found in patients after acute myocardial infarction and in elderly patients.

Client
A person receiving attention or advice from a professional practitioner. Thus, a physician's patient may also be a social worker's client. A term preferred by many when referring to a patient who has been discharged from hospital and is receiving attention or advice in a community setting.

Cognitive behaviour therapy
A psychotherapeutic approach used to change maladaptive behaviour through replacing dysfunctional and negative thoughts and beliefs with adaptive ones.

Comorbidity
A disease, disorder or disability which co-exists with other diseases or disabilities.

Compliance
Acceptance of, and adherence to, a prescribed or advised behaviour, regimen or medication. The terms "compliance" and "adherence" are sometimes used interchangeably.

Convalescence
The period of recovery from an illness, usually considered to be from hospital discharge to resumption of normal or acceptable functioning. In cardiac rehabilitation programs this has traditionally between six to 12 weeks.

Coronary angiography
Technique whereby the coronary arteries are outlined by fluid which is opaque to X-rays.

Coronary artery bypass graft surgery (CABGS)
The bypassing of a narrowing or obstruction in a coronary artery. This may be by using portion of a vein removed from the leg or elsewhere, by using an artery from within the chest wall (an internal mammary artery) or by using an artery from the forearm or elsewhere (a free arterial graft).

Coronary artery disease (CAD)
The condition in which there is atherosclerotic irregularity and narrowing within the coronary arteries due to atherosclerosis.

Coronary heart disease (CHD)
Heart disease resulting from the atherosclerotic narrowings of coronary artery disease.

Coronary occlusion
The process of obstruction or blocking of a coronary artery, usually by a blood clot (coronary thrombosis).

Cost benefit
The gain (by some measure of outcome) arising from a defined expenditure.

Cost effectiveness
The relative gain (by some measure of outcome) whereby the cost benefit of one form of intervention may be compared with another.

Counselling
Providing advice, support and consultation.

Didactic
An adjective describing the delivery of information in a formal lecture format.

Diuretic
A drug which leads to the passing of additional urine via the kidneys, used in the treatment of hypertension and heart failure.

Dyspnoea
Awareness of difficulty in breathing or the noticing of laboured breathing.

Echocardiography
The use of ultrasound to detect and record the structures and the motion of those structures and to measure cardiac chamber size, shape and wall thickness while also being used to assess movement of blood in the heart.

Education
Systematic instruction. This may be by free discussion, by structured interactive group work, by lecture or by visualisation or reading of information.

Ejection fraction
Measure of the pumping capacity of the left ventricle of the heart. It is the difference between the end-diastolic volume and the end-systolic volume of the left ventricle divided by the left ventricular end-diastolic volume.

Electrocardiogram (ECG or EKG)
A graphic record of the electrical activity of the heart obtained with an electrocardiograph.

Ergometer
Equipment such as a stationary cycle, treadmill or steps used to measure the amount and physiological effects of exercise.

Ergometry
The process of measuring the physiological effect of exercise.

Exercise test (stress test)
A test in which the patient exercises on a treadmill, cycle or other equipment for monitoring of heart rate, blood pressure, electrocardiogram or consumption of oxygen.

Exercise training
A program of repeated exercise undertaken at a guided or prescribed intensity and frequency over a period of time, usually several weeks. The exercise training is based upon so-called aerobic or dynamic exercise, designed to improve physical performance at both maximal and submaximal levels. Such exercise may be of low, moderate or high intensity. Exercise training may also include resistance training involving the use of muscular effort against resistance, with the aim of increasing muscular strength

Fibrillation
Extremely rapid irregular twitching of muscle resulting in atrial fibrillation or ventricular fibrillation.

Heart failure (congestive heart failure)
Failure of the heart to maintain adequate blood flow to the tissues, with retention of fluid and congestion of the lungs, legs or other parts of the body.

Heart rate
Number of heart beats per minute.

High density lipoprotein (HDL cholesterol)
A lipid and protein complex for transport of cholesterol, triglycerides and other fats from the tissues to the liver. (High levels are protective against atherosclerosis.)

Hypercholesterolaemia
Excessive elevation of the cholesterol level in the blood.

Hyperlipidaemia
Excessive level of cholesterol, triglycerides or other lipid fractions in the blood.

Hypertension
Abnormally raised blood pressure within the arteries (high blood pressure) .

Hypotension
Abnormally low blood pressure.

Implantable cardiac defibrillator
An electronic device which senses rapid ventricular tachycardia or ventricular fibrillation and then delivers an electric countershock to the heart to break the potentially lethal arrhythmia.

Interactive education
A process of teaching and learning through discussion and bidirectional questions and answers.

Ischaemic heart disease (IHD)
Commonly used as an alternative term to coronary heart disease implying that the coronary heart disease is symptomatic or overt, through angina pectoris, unstable angina pectoris, myocardial infarction or other measures of myocardial ischaemia.

Kilocalorie
A unit of energy. The energy required to raise the temperature of one litre of water by one degree Centigrade (also referred to as one Calorie which equals 1000 lesser calories).

Kilojoule
Unit of energy used as a measure alternative to Kilocalorie. One Kilojoule = 1000 Joules. One Joule is derived from an electrical unit- the amount of heat generated by a current of one ampère acting for one second against a resistance of one ohm. Used as a unit of available food energy or expended energy one Kilocalorie is approximately 4.2 Kilojoules.

Left ventricular function
The pumping function of the left ventricle, that being the high pressure chamber which pumps blood into the arterial circulation.

Lipid
Fatty substances, normally water insoluble, but made soluble through combination with protein molecules.

Lipoprotein
Complex of lipid and protein molecules which transport lipids (cholesterol and triglycerides) being soluble within the blood.

Low density lipoprotein (LDL)
Complex of lipid and protein molecules transporting cholesterol from the liver to the tissues. (High levels contribute to and worsen atherosclerosis.)

Maintenance program
A program which provides longterm support from the time of discharge from an ambulatory program. "Maintenance" program is preferable to the term "phase 3" program.

MET
Metabolic equivalent. A measure of oxygen uptake through the lungs. Levels of activity may be categorised in METs. One MET is the amount of oxygen taken up by a normal adult sitting at rest. It is equivalent to approximately 3.5mL of oxygen/kg/min.

Meta-analysis
The process whereby results of randomised clinical trials using similar design, with similar outcome measures from a similar intervention (or the same intervention) are aggregated to permit statistical analysis of large number of subjects.

Multidisciplinary
The application of, or pertaining to, or arising through, many professional disciplines.

Multifactorial
The application of, or pertaining to, or arising through more than one intervention conducted during the same period.

Myocardial infarction
The process of death or of damage to heart muscle, arising through coronary artery occlusion.

Myocardium
Heart muscle.

Myocardial ischaemia
Inadequate blood supply to the heart muscle.

Pacemaker
An electronic device which senses cessation of cardiac electrical impulse and introduces an alternative electrical impulse to induce cardiac muscle contraction.

Percutaneous transluminal coronary angioplasty (PTCA)
A procedure whereby a coronary artery stenosis is opened to enlarge the lumen in the artery through pressure applied from a balloon attached to an angioplasty catheter inserted into the coronary artery.

Radionuclide ventriculography (RNVG)
The assessment of chamber size (usually left ventricle) and performance by intravenous radioisotope injection.

Rate pressure product (double product)
The product of systolic blood pressure multiplied by heart rate. An index of cardiac work which is an indirect index of myocardial oxygen requirement.

Resuscitation
The process of restoration of consciousness or life in an unconscious or dying person. This is usually in the form of cardiopulmonary resuscitation (CPR).

Restenosis
The recurrence of narrowing of an artery occurring after the correction of the narrowing.

Revascularisation
The restoration of adequate blood flow usually to heart muscle. The commonest techniques for revascularisation are CABGS and PTCA.

Rheumatic heart disease
Diseases of the heart valves and heart muscle caused by rheumatic fever. Rheumatic fever occurs, in susceptible persons, through an abnormal response to infection, usually of the throat, with a particular bacterium (Group A, beta haemolytic streptococcus).

Risk factors
These are variables or states which are characteristically associated with an increased rate of subsequent disease.

Self-efficacy
Self-confidence or a belief that one is competent and able to achieve a desired goal.

Shared care
The delivery of co-ordinated health care by more than one health professional or group of professionals (eg physician, nurse practitioner and dietitian).

Stenosis
A narrowing within a blood vessel or other tube.

Stent
The open mesh tube inserted into an artery to hold the artery open following, or as part of, PTCA or other angioplasty.

ST segment displacement
A shift from the normal baseline of the ST segment in the electrocardiogram. This occurs during the period of repolarisation and is often an indication of ischaemia.

Tachycardia
Rapid heart action. This may be regular and normal (sinus tachycardia), arise from the atrium (atrial tachycardia, flutter or fibrillation), from the conducting system (supraventricular tachycardia) or from the ventricles (ventricular tachycardia).

Target heart rate
The heart rate to which one may aim during exercise training. It is usually derived from the peak rate achieved during a symptom limited maximal exercise test.

Thrombolytic therapy
Pharmacological intervention to dissolve blood clots within the vascular system. Streptokinase (SK) and tissue type plasminogen activator (TPA) are commonly used.

Triglyceride
Fat consisting of glycerol and three fatty acids.

Unstable angina
Chest pain which occurs at rest, is prolonged or appears abruptly for the first time, but which does not denote the occurrence of acute myocardial infarction.

Ventricular dysfunction
Abnormality of the pumping function of (usually) the left ventricle of the heart.

Ventricular fibrillation
Rapid irregular, totally inefficient chaotic contractions resulting in cardiac arrest (apparent cessation of heart action).

Ventricular tachycardia
Rapid heart action due to an abnormal rapid contraction pattern arising within the ventricles.

ACKNOWLEDGEMENTS

Production of these Best Practice Guidelines for Cardiac Rehabilitation and Secondary Prevention was funded by the Victorian Department of Human Services as part of the Cancer and Heart Offensive.

The authors gratefully acknowledge the assistance and support of Mr Martin Turnbull, Mrs Margaret Smyth and Mrs Susan Tabak of the Public Health and Development Division of the Victorian Department of Human Services during the production of these Guidelines.

They also wish to record their grateful thanks to project co-investigators, Dr Michael Jelinek and Dr Ian McDonald, for their significant contributions toward this project.

Valuable comments on the final draft were made by Dr Helen McBurney, Mr Tom Briffa and Mr Steve Bunker, as well as other members of the Consultative Committee. The contribution of Ms Janet Compton, who facilitated the focus groups, is also appreciated.

Several others assisted with the background research for this document or provided clerical assistance. They include Mrs Elaine Race, who co-ordinated the surveys undertaken as part of the development of the Guidelines, Ms Emma Gilbert, Ms Julie Humphreys, Mrs Christine Eichler, Ms Sharon Johnson, Ms Biljana Krsmanovic and Ms Julie Webb-Pullman.

Mrs Carol McManus was responsible for typing many drafts and editing the final manuscript. Her contribution is gratefully acknowledged.

The members of the Consultative committee, who are listed below, made constructive comments and provided ongoing support during the development of the Guidelines.

CONSULTATIVE COMMITTEE

Mr Garth Birdsey
Pharmacy Department, Geelong Hospital, Geelong

Ms Therese Bowden
Castlemaine Community Health Centre, Castlemaine

Mr Tom Briffa
Exercise physiologist, NHMRC Clinical Trials Centre, Sydney, New South Wales

Mr Steve Bunker
Rehabilitation Manager, National Heart Foundation (Vic Div), Melbourne

Ms Peta Cadd
Co-ordinator, Community Care, Epworth Hospital, Melbourne

Ms Janet Compton
Manager, Physiotherapy Department, Alfred Health Care Group, Melbourne

Mr Raoul Copolov
Heartbeat Victoria Inc, Melbourne

Mrs Anne Cross
Cardiac Rehabilitation Co-ordinator, Bairnsdale Regional Health Service, Bairnsdale

Professor Peter Disler
Medical Director of Rehabilitation, Essendon & District Memorial Hospital, Melbourne

Mr Don Ewart
Heartbeat Victoria Inc, Melbourne

Dr Elton Fagan
Cardiologist, Alfred Health Care Group, Melbourne

Dr Alan Goble
Cardiologist, Heart Research Centre, Melbourne

The positions listed are those held during the early stages of the project when meetings took place.

Mrs Suzanne Hooper
Cardiac Rehabilitation Co-ordinator, Knox Private Hospital, Melbourne

Dr Michael Jelinek
Cardiologist, St Vincent's Hospital, Melbourne

Dr Dianne Keenan
General practitioner, Northland Shopping Centre Medical Clinic, Melbourne

Ms Kathryn Kelly
Cardiac Rehabilitation Co-ordinator, The Royal Melbourne Hospital, Melbourne

Mr Leigh Kinsman
Clinical nurse educator, Bendigo Health Care Group, Bendigo

Dr Helen McBurney
Manager, Physiotherapy Department, La Trobe University, Melbourne

Dr Ian McDonald
Director, Centre for the Study of Clinical Practice, St Vincent's Hospital, Melbourne

Mrs Elaine Race
Research Co-ordinator, Heart Research Centre, Melbourne

Mr Robert Roe
Department of Learning Assessment and Special Education, Faculty of Education, The University of Melbourne, Melbourne

Ms Sally Stewart
Social Worker, Royal Melbourne Hospital, Melbourne

Ms Margarite Vale
Dietitian, St Vincent's Hospital, Melbourne

Ms Lynda Vamvoukis
Public Health Unit, Victorian Department of Human Services, Melbourne

Mr Bill Whitehead
National Director, Heart Support Australia, Echuca

Ms Paula Williams
Cardiac Rehabilitation Co-ordinator, Donvale Rehabilitation Hospital, Melbourne

Dr Marian Worcester
Director, Heart Research Centre, Melbourne

The positions listed are those held during the early stages of the project when meetings took place.