UNIT 2 CARDIAC REHABILITATION

Structure

2.0 OBJECTIVES

After going through this unit, you should be able to:

- identify the eligible candidate for cardiac rehabilitation and benefit of it;
- describe the effect on survival, lipid metabolism, weight, blood pressure and psychocological well being; and
- describe the safety, level and frequency of rehabilitation programme.

2.1 INTRODUCTION

Cardiac rehabilitation services are comprehensive, long-term programs involving medical evaluation, prescribed exercise, cardiac risk factor modification, education, and counseling. These programs are designed to limit the physiologic and psychological effects of cardiac illness, reduce the risk for sudden death or reinfarction, control cardiac symptoms, stabilize or reverse the atherosclerotic process, and enhance the psychosocial and vocational status of selected patients.

The interventions involve two parallel applications: (1) exercise training, and (2) education, counseling, and behavioral interventions. Cardiac rehabilitation is a continuous process that has been arbitrarily divided into three phases. It begins as soon as possible after a cardiovascular event, usually within 24 to 48 hours, and continues as Phase I of the process while the patient is in the hospital. Phase II consists of planned cardiac rehabilitation programs that are generally administered during the six months following discharge from the hospital. This phase generally involves the prescription of a supervised, planned program to increase the functional capacity of the patient to allow the individual to resume normal life activities. The patient's progress is monitored at appropriate times by means of standard cardiac function tests. Phase III consists of a lifelong program committed to encourage exercise and a healthful lifestyle to minimize recurrence of cardiac problems.

2.2 ELIGIBILITY AND BENEFITS

Cardiac rehabilitation services are prescribed for patients who:

1) Have had a myocardial infarction.

2) Have had coronary bypass surgery and the patients who undergo percutaneous transluminal coronary angioplasty (PTCA) and other transcatheter procedures.

3) Have chronic stable angina pectdris.

4) Heart failure.In the USA it is estimated 4.7 million patients with heart failure may also be eligible,

The services are in three phases beginning during hospitalization, followed by a supervised ambulatory outpatient program lasting 3-6 months, and continuing in a lifetime maintenance stage in which physical fitness and risk factor reduction are accomplished in a minimally supervised or unsupervised setting.

The most substantial benefits include:

- 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.

Check Your Progress 1

1) Name three categories of patients who may be eligible for cardiac rehabilitation.

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2) Mention any three areas of benefit with rehabilitation programmes.

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2.3 METABOLIC REQUIREMENTS FOR TYPES OF EXERCISE

A relative scale of energy requirements related to heart function necessary for performing vaiious daily activities has been used to describe the functional status of cardiac patients. A MET is an energy unit defined as the use of 3.5 mL of oxygen per minute per kilogram of body weight. For example, approximately 3 METs are required for walking, sitting, or other ordinary activities necessary for an individual to be self-sufficient. Patients with a functional capacity of 7-9

METs have the capability of undertaking vigorous activities such as sawing wood, mountain climbing, and heavy calisthenics and of resuming their normal pre-cardiac—event activities. Generally, any cardiac patient minimally attains the ability to exercise to 3 METs without cardiac symptoms before leaving the hospital. Most patients entering the Phase II cardiac rehabilitation program have the ability to carry out activities requiring more METs.

Check Your Progress 2

What is meant by the term MET in exercise physiology? How many METs are required for ordinary sitting activity?

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2.4 CARDIAC REHABILITATION AND ITS VARIOUS EFFECTS

A survival benefit cannot be attributed solely to exercise training because many studies involved multifactorial interventions. Meta-analysis of the randomized controlled trials of exercise rehabilitation in patients following myocardial infarction establishes a reduction in mortality approximating 25 per cent at three year follow-up. This reduction in mortality approaches that resulting from pharmacologic management of patients following myocardial infarction with beta-blocking drugs or patients with left ventricular systolic dysfunction with angiotensin-converting enzyme (ACE) inhibitor therapy. The reduction in cardiovascular mortality was 26 per cent in multifactorial randomized trials of cardiac rehabilitation and 15 per cent in trials that involved only an exercise intervention.

Cardiac rehabilitation exercise training is not recommended as a sole intervention for lipid modification because of its inconsistent effect on lipid and lipoprotein levels. Optimal lipid management requires specifically directed dietary and, as medically indicated, pharmacologic management, in addition to cardiac rehabilitation exercise training.

Nine randomized controlled trials reported changes in HDL cholesterol levels. Two documented statistically significant increases in HDL levels favoring intervention versus control patients; both were multifactorial studies.

Twelve randomized controlled trials reported changes in triglyceride levels. Seven documented significantly lower triglyceride levels in rehabilitation versus control , patients; five of these were multifactorial studies.

Cardiac rehabilitation exercise training as a sole intervention has an inconsistent effect on controlling overweight and is not recommended as a sole intervention for this risk factor. Optimal management of overweight requires multifactorial rehabilitation including nutritional education and counseling and behavioral modification in addition to exercise training.

Rehabilitative exercise training, when a component of multifactorial intervention, appears to have a beneficial effect in improving body weight or other measures of excess body mass or percentage of body fat.

Rehabilitative exercise training as a sole intervention has no demonstrable effect in lowering blood pressure levels. Multifactorial cardiac rehabilitation, including

exercise training, has an inconsistent effect in lowering blood pressure levels; major confounding variables include the use of antihypertensive medication and medication changes.

Review of the scientific evidence suggests that exercise-based cardiac rehabilitation has only modest effects in reducing blood pressure levels. The generalizability of these data is limited by the small numbers of women who were enrolled in these studies. The hallmark feature is that no study was specifically designed to address hypertension control in patients with elevated blood pressures participating in exercise-based cardiac rehabilitation. The confounding effects on blood pressure change of weight reduction, dietary habits, and anti-hypertensive medications was not addressed in any of the studies. It is unlikely that hypertensive patients with coronary disease would be provided solely exercise training without other appropriate therapies such as weight reduction, sodium restriction, moderation or abstinence from alcohol, or pharmacologic therapy, although these components may have been directed by the patient's treating physician.

Type-A behavior pattern has received more attention than any other behavioral or psychological variable as a risk factor for CHD. Individuals who exhibit Type-A behavior pattern display a variety of traits and behavioral dispositions, including hard-driving competitiveness, a persistent sense of time urgency, and easily evoked hostility. A relative absence of these behavioral features characterizes the converse, Type-B behavior pattern. In 1981, a review panel assembled by NHLBI concluded that Type-A behavior pattern is an independent risk factor for CHD in employed, middle-aged U.S. citizens.

Depression is reported to precede inyocardial infarction in 33-50 per cent of patients. Higher rates of myocardial infarction have been reported among depressed than non-depressed psychiatric patients. Examination of 283 hospitalized patients with myocardial infarction showed that 18 per cent had major depression and an additional 27 per cent had symptoms of depression.

Cardiac rehabilitation exercise training with and without other cardiac rehabilitation services generally results in improvement in measures of psychological status and functioning. Exercise training as a sole intervention does not consistently result in improvement in measures of anxiety and depression. Exercise training is recommended to enhance measures of psychological functioning, particularly as a component of multifactorial cardiac rehabilitation.

Cardiac rehabilitation exercise training, either alone or as a component of multifactorial rehabilitation, often results in improvement in various measures of psychological status and functioning. This evidence from the scientific literature is consistent with the widespread belief among cardiac rehabilitation professionals that cardiac rehabilitation exercise training improves the sense of well-being among participants. The evidence particularly supports improvement among individuals with high levels of distress at the time of entry into the study. The instruments used to measure psychological outcomes differed widely and are those often designed to measure abnormal responses and changes in patients with psychological or psychiatric illness; even with use of these instruments, improvement in psychological status was documented in patients not specifically targeted because of psychological illness. Patients tended to perceive themselves as improving in a number of psychosocial domains, although these perceptions may not have been objectively documented. More sensitive tests may have to be developed to better ascertain changes in cardiac patients without specific psychiatric illness, and those data are very limited for elderly patients.

Check Your **Progress 3**

What is the effect of exercise training on HDL cholesterol levels?

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2.5 REHABILITATION PROGRAMME

Education, counseling, and behavioral interventions are important elements of cardiac rehabilitation. In this guideline, "education" is defined as systematic instruction, and "counseling" is defined as providing advice, support, and consultation. "Behavioral interventions" refer to systematic instruction in techniques to modify health-related behaviors. Patients with cardiovascular disease have to learn to manage their illness and prevent or retard progression or induce regression of atherosclerosis. This management focuses on techniques of lifestyle changes, guided by health professionals.

A multifactotial risk-reduction model developed by the Stanford Coronary Risk Intervention Project showed that individualized changes in lifestyle and medical treatment reduced the risks of disease progression and coronary events in patients with coronary heart disease. The risk-reduction goals, which were consistent with national guidelines, encompassed body weight, blood pressure, lipid levels, nutrition, and physical activity . Over a four-year follow-up period, patients assigned to this model of care, as compared with patients who received usual care, had a 30 per cent reduction in saturated-fat intake, a four per cent reduction in the body-mass index, a 22 per cent reduction in LDL cholesterol levels, a 12 per cent increase in HDL cholesterol levels, and a 20 per cent improvement in exercise capacity. The rate of disease progression, assessed by angiographic evaluation of coronary lesions, was reduced in the intervention group, and the lesions were more likely to regress in this group. The rates of major clinical cardiac events and hospitalization were also significantly decreased in the intervention group. The following general scheme is followed:

Inpatient

Smoking cessation and prevention; Assessment of physical activity, Outpatient referral.

Outpatient

Evaluation: Medical history; Risk factors; Stress testing; Vocational counseling.

prescribed Exercise: On site or at home; Aerobic training; Resistance exercise.

Modification of Risk Factors: Education; Nutritional counseling; Exercise; Medication.

Specification of Long Term Goals: Physical; Vocational; Psychological; Clinical.

Safety, Intensity Level and Frequency of Exercise Training

The level and frequency and type of exercise should be determined for each individual patient by the team taking into consideration the risk stratification, stress testing, age, physical disabilities and other factors.

Safety

The safety of cardiac rehabilitation exercise training is inferred from aggregate analysis of clinical experience. None of the more than three dozen randomized controlled trials of cardiac rehabilitation exercise training in patients with CHD, involving over 4,500 patients, described an increase in morbidity or mortality in rehabilitation compared with control patient groups.

Intensity Level

The effects of lower versus higlier intensities of exercise training on exercise tolerance were evaluated in five randomized controlled trials. Reports from the same study population found no significant differences in exercise tolerance between lower and higher intensity exercise training.

Until recently, patients were traditionally advised to exercise to a target heart rate range between 70 and 85 per cent of the highest level safely achieved at exercise testing.

However, exercise training intensities in the 50-70 per cent heart rate range have been shown to effect comparable improvement in functional capacity and endurance, may provide greater safety during unsupervised exercise, and are likely to promote long-term adherence to exercise.

Lower intensity exercise training also increases both the applicability to and the acceptance of exercise training by larger numbers of coronary patients, particularly unfit and elderly patients and those with low exercise capacities.

Studies have reported statistically significant improvement in exercise tolerance after exercise training compared with baseline. The use of beta-blocking drugs in patients following myocardial infarction did not impair improvement in exercise tolerance following cardiac rehabilitation exercise training.

Exercise rehabilitation decreases angina pectoris in patients with coronary disease and decreases symptoms of heart failure in patients with left ventricular systolic dysfunction. Exercise training is recommended as an integral component of the symptomatic management of these patients.

Don't over do it: You should start slow and progress gradually. If you are injured you should rest until you are recovered. Know the difference between injured and sore. Inability to finish, nausea, and trouble sleeping are all signs of over doing it.

Have fun: Choose something that you enjoy. Emphasize the 'want' rather than the 'should' when you exercise.

Find a friend: Exercising by yourself will work, but the combined motivation of a friend will prevent you from skipping as many days.

Make it important: Make exercise a priority rather than an extra. If you include it as part of your daily schedule it will get done. Do it at the same time every day.

Points to **Remember**

- Work out only when you feel well.

  Wait at least one hour and preferably two or more after eating before exercising.
- Adjust to changing weather conditions.
- Take advantage of your exercise time, dont waste it.
- Dress accordingly and find supportive footwear.
- Monitor your heart rate if you can and keep it within your range.

Guidelines **for Safe** Exercise

Frequency – 3-5 times a week.

a Duration – 20-60 minutes.

- Intensity (how hard) – within what has been prescribed for you. This is usually based on your prescribed target heart rate. Please note that this does not apply to persons on heart rate lowering'drugs like beta-bloclters and some calcium channel blockers like diltiazem.

Calculating Your Target Heart **Rate**

1) 220 – age = MHR (maximum heart rate)

2) MHR x 0.6 = _____ (this is the low end of your target HR)

3) MHR x 0.8 = _____ (this is the upper end of your target HR)

Example: If you are 40 years old, your MHR is 220 - 40 = 180.

180 x 0.6 = 108

180 x 0.8 = 144

Therefore, your Target Heart Rate is between 108 and 144 beats per minute.

Prescribed Grades **of Exercise**

1) Age less than 65 and not overweight

   Moderate intensity aerobic; 75-85 per cent maximal heart rate; Walking, jogging, cycling; 3-4 days a week; 30-45 min-continuous or interval.

2) Age >65 years

   Low intensity aerobic and resistance; 65-75 per cent of maximal heart rate; Walking, cycling; 3-4 days per week; 30 min (can be intennittent).

3) Overweight

   Moderate-high intensity aerobic; 65-80 per cent heart rate;Walking; 5-6 days per week; 45-60 minutes.

4) Age >65, physically disabled or overweight

   Optimise: Use resistance exercise where feasible (Table 2.1).

Frequency

For many low-risk coronary patients, particularly those following myocardial revascularization procedures, rehabilitation often begins shortly after discharge

from the hospital; many enter immediately what has traditionally been considered a Phase III program, that is, without intervening supel-vision in a Phase II component.

Approximately 70 per cent of current survivors of myocardial infarction under age 70 years and many patients following uncomplicated myocardial

Table 2.1: Exercise Prescription According to the Characteristics of the Patient

Characteristic	Training Regimen	Intensity	Type of Exercise	Frequency of ... (No./Wk)	Duration of Each Session (Min.)
Age <65 yr, not over weight	Height-intensity aerobic	75-85% of maximal heart rate	Walking, jogging, cycling, rowing	3 or 4	30-45 (continuous or interval)
Age >65 yr	Low-intensity aerobic and resistance	65-75% of maximal heart rate	Walking, cycling, rowing	3 or 4	30 (may be intermittent)
Overweight	Aerobic-high caloric expenditure	65-80% of maximal heart rate	Walking	5 or 6	45-60
Age> 65 yr and disabled, engaged in physical work, or overweight	Resistance	50-75% of single repetition maximal lift	Weight machine and dumbbells, with the focus on upper legs, shoulders, and arms	2 or 3	10-20 (10 repetitions of each of 5 to 7 exercise)

revascularization procedures are at low risk for proximate cardiovascular events following discharge from the hospital (free of myocardial ischemia at exercise testing, significant ventricular arrhythmia, and/or significant left ventricular systolic dysfunction).For these carefully selected low-risk patients, both medically directed home exercise and supervised exercise training have resulted in comparable improvements in functional capacity, without reported complications of home exercise training. These alternate approaches (home-based programs) to rehabilitative care include planned communication and management by rehabilitation nurses and other specially trained personnel.

At the opposite end of the disease severity spectrum are elderly coronary patients; those with significant comorbidity; high-risk patients with continuing ischemia, compensated heart failure, or serious arrhythmias; those with complications of myocardial infarction or CABG; and those with severe angina pectoris. These patients require closer surveillance of their exercise training for extended time periods The requirements, duration, and complexity of exercise surveillance are based on the patients clinical and risk factor status, as well as the patient's needs for exercise training.

The optimal approach combines a home-based walking program with intermittent monitored exercise sessions at the cardiac-rehabilitation center, exercise counseling, and periodic reassessment of risk factors. Older patients and those with severe deconditioning who may need more complex regimens of

interval and resistance training benefit from on-site supervision of exercise. As with weight-loss programs, a detailed exercise diary of home-based exercise increases compliance.

The frequency of exercise training in the 35 randomized controlled trials varied between two and seven times per week. **The most common frequency was three times per week** The weekly frequency of exercise did not relate to improvement in exercise tolerance.

Check Your Progress 4

1) What are some of the factors considered when advising an exercise programme for a cardiac patient?

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2) How do you calculate a target heart rate?

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26 LET US SUM UP

Cardiac rehabilitation is necessary for a wide variety of patients including those who have had a myocardial infarction, undergone interventions like heart surgery or angioplasty or those in heart failure.

It includes advice on like style changes, identification of and control of risk factors, pharmacotherapy, psychosocial counseling and prescribed exercise programmes which are individualized. Collectively, improvements have been noted in survival, exercise tolerance, blood pressure control and other measured parameters.

2.7 ANSWERS TO CHECK YOUR PROGRESS

Cheek Your Progress 1

1) a Have had a myocardial infarction,

- Have had coronary bypass surgery and the patients who undergo percutaneous transluminal corollary angioplasty (PTCA) and other transcatheter procedures,
- Have chronic stable angina pectoris, and
- Heart failure.

2) - 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.

Check Your Progress 2

A MET is an energy unit defined as the use of 3.5 mL of oxygen per minute per kilogram of body weight. Approximately 3 METs are required for sitting, or other ordinary activities necessary for an individual to be self-sufficient.

Check Your Progress 3

Exercise raises HDL cholesterol levels.

Check Your Progress 4

1) The level and frequency and type of exercise should be determined for each individual patient by the team taking into consideration the risk stratification, stress testing, age, physical disabilities and other factors.

2) Calculating Your Target Heart Rate

   1) 220 – age = MHR (maximum heart rate)

   2) MHR x 0.6 = ... (this is the low end of your target HR)

   3) MHR x 0.8 = ... (this is the upper end of your target HR)

2.8 FURTHER READINGS

1) Kirklin/Barratt - *Boyes Cardiac Surgery,* 3rd Edition, Churchill Livingston, for Illustrations no. 6-16 and statistics of results and follow-up.

2) *Braunwald's Heart Disease,* 7th Edition, Elsevier Saunders.

3) *Guidelines jor the Management of Patients with Valvular Heart Disease,* Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines, Circulation 1998; 98: 1949-1984.

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