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.

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.

National Heart Foundation of Australia (NSW Division); 1993.
Rehabilitation care should be available to all patients with cardiovascular diseases in all countries.

Every professional health care worker, and the general public, should be aware of the need for cardiac rehabilitation.

Appropriate education should be provided to all cardiac patients and their families, and to all health care professionals involved in cardiovascular rehabilitation.

The type cardiovascular rehabilitation program should be matched to the needs and resources of each community, and there should be provision for periodic evaluation of the program.

Cardiac rehabilitation should be integrated into the existing health care delivery system of each country.
PHASE 1
• In Patient

PHASE 2
• Early Post D/C

PHASE 3
• structured exercise programme in a hospital

PHASE 4
• long term maintenance of physical activity and lifestyle change
PHASE 1
• In Patient

PHASE 2
• Ambulatory Out Patient

PHASE 3
• Maintenance
Phase 1

- early mobilisation and education
- individual/groups
- shorter hospital stay
- brief counselling
- increase the patient’s awareness
- reassure the patient about future progress and follow-up
Phase 2

- begins soon after discharge
- group exercise
- educational and supportive
- low or moderate intensity
- group education
- groups of patients and family members
Phase 3

- lifetime
- minimally supervised or unsupervised setting
- ongoing exercise class
Requirements

Basic Facility

Physical facility, equipment, educational materials and financing arrangement

Intermediate Facility

Programmed exercise and patient education

Advanced Facility

trained personnel
<table>
<thead>
<tr>
<th>Basic Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personnel</strong></td>
</tr>
<tr>
<td>• Trained community health worker</td>
</tr>
<tr>
<td><strong>Physical facility, equipment, educational materials</strong></td>
</tr>
<tr>
<td>• Any available community center</td>
</tr>
<tr>
<td>• Sphygmomanometer,</td>
</tr>
<tr>
<td>• Stethoscope</td>
</tr>
<tr>
<td>• Educational material</td>
</tr>
<tr>
<td>• Suitable area for walking exercise</td>
</tr>
<tr>
<td><strong>financing arrangement</strong></td>
</tr>
<tr>
<td>• Should be from existing health care system</td>
</tr>
<tr>
<td><strong>Programmed exercise and patient education</strong></td>
</tr>
<tr>
<td>• Supervised exercise program</td>
</tr>
<tr>
<td>• Group setting – consist callisthenic and light exercise</td>
</tr>
<tr>
<td>• Their families – certain basic information</td>
</tr>
</tbody>
</table>
Intermediate Facility

normally located in local hospital where general medical service available

Personnel
- Physician – trained in cardiology, exercise physiology, exercise testing, cardiac rehabilitation and CPR.
- Nurse/ Health Professional/Administrative assistant

Physical facility, equipment, educational materials
- Administrative office
- Multipurpose exercise room
- Treadmill, ergometer or step
- ECG recorder

financing arrangement
- Simple budget plan

Programmed exercise and patient education
- Supervised exercise program
- Group setting – consist callisthenic and light exercise
- Their families – certain basic information
- Returning to certain high intensity or demanding job
### Advanced Facility

**Personnel**
- Director – trained cardiologist
- Program Coordinator – trained health professional
- Exercise specialist
- Physiotherapist
- Dietitian
- Occupational or Vocational therapist
- Psychologists

**Physical facility, equipment, educational materials**
- Office
- Exercise testing room
- Gymnasium
- Resuscitation Equipment
- 2d echo and Nuclear medicine
- Classroom, audiovisual room
- Special clinic and Blood collection

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**1st Cardiac Rehabilitation Conference**

a leading referral center for patients with cardiovascular diseases
Advanced Facility

a leading referral center for patients with cardiovascular diseases

financing arrangement

• A budget plan should be developed, appropriate for the program that will be undertaken at the tertiary level

Programmed exercise and patient education

• Fully equipped and staffed cardiac rehabilitation center
• Able to do high intensity exercise program (with monitoring)
• Accurate clinical risk stratification
• Cardiac rehabilitation and secondary prevention programs should be conducted by a multidisciplinary team.
• many tasks can be shared by more than one member of the team
• Tasks require specific skills and training and should be performed by the appropriate, designated health professional.
• Meetings of the rehabilitation team should be held at regular defined times
• Team members should have appropriate qualifications and core competencies.

Staff Personnel
• Nurses fulfill a range of functions in cardiac rehabilitation and secondary prevention programs and should be considered key members of the team.
  • to detect medical and other problems
  • to refer patients to other health care providers, when required
  • involved in patient education
  • conducting
  • exercise sessions
  • recruiting patients to programs
  • can be the program coordinator
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.

- assessing the physical needs and cardiovascular fitness.
- monitoring patients during exercise
- provide practical advice
- addressing the work requirements of patients
• The dietitian is an essential member of the team, undertaking group and individual counseling about nutrition and appropriate dietary habits.
• The occupational therapist has important roles in the team, especially in facilitating return to work and assisting the patient to function effectively and independently.
• The social worker plays an important role in the team by promoting the psychosocial recovery of the patient and supporting the patient’s family.
• 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 behavioral changes.
  • undertaking counseling and stress management
  • assessing the psychological status or cognitive functioning of cardiac patients and relaying the results to the doctor and other team members.
• 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.
  • can make a significant contribution by referring patients
  • appointed as Director of Cardiac Rehabilitation
• The cardiac surgeon should support cardiac rehabilitation and secondary prevention programs by referring patients and encouraging them to attend.

• should endorse the program, referring patients and encouraging them to attend
The exercise physiologist has advanced training in exercise prescription and should design and conduct exercise sessions which involve high intensity exercise training.
• A diabetes educator is a valuable member of the team and may provide individual or group counseling.
• The pharmacist can play an important role by providing information and advice to the patient regarding medications and encouraging compliance with regimens.
• One member of the team should be designated the coordinator to ensure proper organization of the program. Any member of the team with appropriate skills may be the program coordinator.
• Nurse
• Physiotherapist
• Dietitian
• Occupational therapist
• Social worker
• Psychologist
• Cardiologist
• Cardiac surgeon
• General practitioner
• Exercise physiologist
• Exercise therapist
• Diabetes educator
• Welfare worker
• Rehabilitation physician
• Pharmacist
• Psychiatrist
• Vocational counsellor
• Community health worker
• Other health practitioners
• Program co-ordinator
• Regional co-ordinator

CRP team member
• **Site of exercise program**
  
  • Cardiac rehabilitation exercise programs should be established in all sizeable hospitals treating cardiac patients.
  
  • ideal appears to be the establishment and maintenance of programs in both hospitals and community centers.
• Safety protocols
  • 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 resuscitation.
  • Nitroglycerin should be available
  • The equipment includes a resuscitation trolley and a defibrillator, which must be regularly maintained and checked
  • Telemetered electrocardiography may be required
• **Equipment**
  
  - Low to moderate intensity exercise training can be undertaken using little equipment and at low cost.
  
  - a stethoscope
  
  - Sphygmomanometer
  
  - sets of steps
  
  - Treadmills
  
  - Stationary cycles
  
  - Indoor walking area
• Content of exercise classes

• 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.
• **Staffing**
  - Exercise training sessions should be conducted by suitably trained health professionals.

• **Staff to patient ratio**
  - 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.
• **Exercise testing before exercise training**
  
  • 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.

• **Patient assessment before entry to the program**
  
  • 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.
• Time of starting the exercise program
  • The optimal time for the patient to begin the outpatient exercise program is within a week of discharge from hospital.
• Monitoring during exercise sessions
  • 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
    • observe measured heart rate
    • patient measured heart rate
• Exercise testing after exercise training
  • 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.
• 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

Measuring exercise intensity – heart rate

- training heart rate from exercise stress test,
- training heart rate from formula
  - based percentage of maximal heart rate
  - based percentage of heart rate reserve (Karvonen, 1957)
- Perceived exertion (Borg Scale, 1975)
### Table 6: Correlation with exercise training levels (approximate)

<table>
<thead>
<tr>
<th>Exercise training level</th>
<th>Rate of perceived exertion (Borg)</th>
<th>% of maximal heart rate on test</th>
<th>Increment over resting heart rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW</td>
<td>Very, very light 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Very light 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Very light 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MODERATE</td>
<td>Light 9</td>
<td>50–65</td>
<td>10–25</td>
</tr>
<tr>
<td></td>
<td>Somewhat hard 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIGH</td>
<td>Hard (heavy) 11</td>
<td>60–75</td>
<td>20–35</td>
</tr>
<tr>
<td></td>
<td>Very hard 12</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Very, very hard 13</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Very, very hard 14</td>
<td></td>
<td></td>
</tr>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Borg Scale**
Frequency of sessions

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

• 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.
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.
Continued exercise beyond convalescence

Following ambulatory rehabilitation, a multifactorial program of long term 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.
Eligibility for exercise programs

- should be offered to all patients with cardiovascular disease
- Patients with heart failure and transplantation patients with pacemakers and implantable cardioverter defibrillators
- Patients with other forms of heart disease
- Obese patients and diabetic patients
- Unfit patients
- Elderly patients
A sizeable list of exclusions from exercise training in cardiac patients has been prepared by the American College of Sports Medicine 5th Edition (1995).

Most of these exclusions are reasonable for high intensity exercise and many apply to low intensity exercise.

- 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
• Knowledge
  
  • Education and counseling increase knowledge and understanding of heart disease and should be an integral part of comprehensive cardiac rehabilitation programs
• Health behaviors and risk factors
  • Smoking
  • Lipids
  • Blood pressure
  • Body weight
  • Physical inactivity
  • Psychosocial well-being
  • Stress
  • Impact upon the spouse and family
  • Sexual activity and activities of daily living
  • Return to work
- **Group versus individual counseling**
  - Education and counseling should be conducted in groups. Individual counseling should be available, if required.

- **Principles of adult learning**
  - Education groups should be based on adult learning principles and should encourage interactive discussion.
• **Duration and frequency of sessions**
  - approximately 45 minutes should take place twice weekly for four to eight weeks.

• **Size of groups**
  - no more than 20 to 25 people.
THANK YOU


• American Association of Cardiovascular and Pulmonary Rehabilitation. Guidelines for cardiac rehabilitation programs. 2nd ed. Champaign (IL): Human Kinetics Books; 1995

## Strength of evidence ratings for benefit (AHCPR 1995)

<table>
<thead>
<tr>
<th>Outcomes—Physical Functional effect</th>
<th>Strength of evidence (A, B, C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exercise alone</td>
</tr>
<tr>
<td>Improved exercise tolerance</td>
<td>A</td>
</tr>
<tr>
<td>Increased muscular strength</td>
<td>B</td>
</tr>
</tbody>
</table>

| 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                   | -                              | -                     |
## Strength of evidence ratings for benefit (AHCPR 1995)

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Strength of evidence (A, B, C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exercise alone</td>
</tr>
<tr>
<td>Smoking reduced</td>
<td>-</td>
</tr>
<tr>
<td>Lipids improved</td>
<td>-</td>
</tr>
<tr>
<td>Weight controlled</td>
<td>-</td>
</tr>
<tr>
<td>Blood pressure improved</td>
<td>-</td>
</tr>
<tr>
<td>Exercise habits improved</td>
<td>B</td>
</tr>
<tr>
<td>Safety of exercise training</td>
<td>A</td>
</tr>
<tr>
<td>Outcomes—Psychosocial</td>
<td>Exercise alone</td>
</tr>
<tr>
<td>-----------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Psychological wellbeing improved</td>
<td>B</td>
</tr>
<tr>
<td>Social functioning improved</td>
<td>B</td>
</tr>
<tr>
<td>Return to work increased</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcomes—Special Cases</th>
<th>Exercise alone</th>
<th>Comprehensive rehabilitation</th>
<th>Maintenance programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart failure</td>
<td>B</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Improved symptoms &amp; exercise tolerance</td>
<td>A</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transplantation</th>
<th>Exercise alone</th>
<th>Comprehensive rehabilitation</th>
<th>Maintenance programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved symptoms &amp; exercise tolerance</td>
<td>B</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Elderly</th>
<th>Exercise alone</th>
<th>Comprehensive rehabilitation</th>
<th>Maintenance programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>As for younger patients</td>
<td>B</td>
<td>B</td>
<td>B</td>
</tr>
</tbody>
</table>