

AN OVERVIEW OF CARDIAC REHABILITATION

Dr Chia Tee Hien, Dr Raymond Wong

INTRODUCTION

There is an increasing need worldwide for cardiac rehabilitation (CR) in view of the ageing population and its attendant increased prevalence in chronic cardiovascular diseases (CVD). This paper presents an overview of the current evidence, cost effectiveness, aims, patient selection, core components and other relevant issues like multidisciplinary team approach, safety, role of CR in special patient groups as well as strategies to overcome the current challenge of suboptimal uptake of the program.

KEYWORDS: cardiac rehabilitation, multi-disciplinary, cardiovascular diseases, quality of life, risk stratification, exercise, education, cardiac failure.

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METHODOLOGY

About 16.7 million people worldwide die of CVD annually, accounting for 29% of all deaths globally. With the ageing population, it is projected that by 2020 CVD will become the leading cause of death and disability worldwide. Locally, ischaemic heart disease (IHD) is the 3rd leading condition for hospitalization and 2nd for death.

Recent advances in medical care have resulted in many more survivors of acute myocardial infarct and those with recent revascularization procedures who constitute an additional CVD burden to our present healthcare system. At the same time, they are prime candidates for CR which is critical in facilitating their recovery.

WHAT IS CARDIAC REHABILITATION? ^{7,39}

Cardiac Rehabilitation (CR) is defined as the “sum of activities and interventions needed to ensure the best possible physical, mental and social conditions so that patients with chronic or post-acute CVD may resume their proper place in society and lead an active life.”

CHIA TEE HIEN, MMed (Fam Med), FCFP(S), Consultant Family Physician, St. Luke's Hospital

RAYMOND WONG, MRCP (UK), FAMS, Consultant Cardiologist, National University Heart Center

WHO ARE SUITABLE FOR CARDIAC REHABILITATION? ^{7,8,35,37}

Patients suitable for CR program include those who had:

- recent acute cardiac events e.g. myocardial infarct (MI),
- recent revascularization procedures e.g. coronary artery bypass graft (CABG), percutaneous transluminal coronary intervention,
- chronic stable angina,
- stable heart failure,
- increased risk of cardiac events in view of multiple cardiovascular risk factors (CVRf) and
- history of stable heart disease but de-conditioned due to recent intercurrent acute illnesses.

EVIDENCE ^{7,9-14,32,33,36,37,39}

Current literature has already demonstrated ample benefits of CR. They include:

- Reduction of mortality, subsequent cardiac events and revascularization,
- Reduction in subsequent readmissions and length of stay,
- Improvement in blood pressure, glycaemic and lipid control,
- Improvement in exercise capacity,
- Reduction of symptoms of angina and dyspnoea,
- Improvement in psychological function,
- Improvement in quality of life (QOL),
- Facilitating return to work and other social or recreational activities

MAIN AIMS ^{7,8,39}

- To maximize physical, psychological and social functioning so as to enable patients to reintegrate successfully into their families and societies, thus leading fulfilling lives.
- To encourage life-long behaviors involving lifestyle changes that may minimize the risk of further cardiac symptoms or events.

COST EFFECTIVENESS ^{15,30}

Current evidence supports the cost effectiveness of CR compared with usual care in myocardial infarction and heart failure. The incremental quality adjusted life years gained from CR come at a low absolute one-time incremental total cost of \$663 per patient in the United States of America as compared to the annual cost for statins (\$1200-\$2000) and drug eluting

stents (\$2500-\$3000). CR is also more cost effective than thrombolytic therapy, coronary artery bypass surgery and antihypertensive medications.

PHYSIOLOGY OF EXERCISE & CARDIOVASCULAR BENEFIT ¹⁵

In patients with coronary artery disease, there is impairment of nitrous oxide production and excessive oxidative stress, resulting in endothelial dysfunction and myocardial ischaemia. Exercise training has been shown to improve myocardial perfusion by partially reversing endothelial dysfunction and enhancing coronary vasodilatation, thus leading to exercise induced reduction in cardiovascular morbidity and mortality.

CONTRAINDICATIONS ¹⁶

The following conditions constitute contraindications to CR:

- Unstable angina
- Overt congestive cardiac failure
- Recent pulmonary embolism
- Severe hypertension
- Severe orthopaedic limitations
- Cognitive impairment interfering with rehabilitation
- Severe left ventricular outflow tract obstruction
- Severe and symptomatic aortic stenosis or regurgitation

COMPONENTS OF CR ^{7,8,17,39}

I. Risk stratification before enrolment: individualized comprehensive physical and psychosocial assessment

- Medical
 - o Diagnosis, etiology, current management and cardiac status according to New York Heart Association classification (NYHA)
 - o Relevant medical/surgical history including CVRF assessment
 - o Evaluation for any underlying physical disabilities or barriers to exercise program
 - o Setting realistic and achievable goals
- Psychosocial evaluation:
 - o Screening for any cognitive impairment or depression
 - o Current living arrangement, social support and coping with basic activities of daily living (BADL)
 - o Need for financial assistance
- The following parameters are recorded: body mass index, blood pressure (BP), heart-rate (HR), electrocardiogram and post-op surgical wound (post-CABG).
- High risk patients (those with MI complicated

by cardiac failure, cardiogenic shock and complex ventricular arrhythmia) will need exercise stress test and 2-dimensional echocardiogram to assess residual ischaemia and ventricular function.

- The CR coordinator will assess their overall needs and refer them to other health care professionals accordingly. For younger patients who are still working, additional evaluation and vocational rehabilitation are required before they return to work.

2. Exercise component

This is usually held 2-3 times a week for 8-12 weeks and care-givers are encouraged to accompany patients to observe. There are various stations that include treadmill trainer, stationary bike/arm ergo meter, staircase/steps, and free weights/thera-bands for upper limb strengthening.

A short warm up precedes the circuit training which ends with cooling down and stretching exercises. Rate of perceived exertion from 6-20 (RPE), BP, HR and pulse oximetry (SpO₂) are used to monitor patients' exercise tolerance and progress. Based on the initial 6 min walk test and patient's overall cardiac profile, exercises are individually tailored and supervised by the CR coordinator. Patients are taught how to use RPE to monitor and adjust their exercise intensity accordingly esp. at home where they are also encouraged to exercise and to record their performance using self monitoring charts.

The primary outcome measure is the 6 minute walk test which is repeated upon completion of the program. Other secondary outcome measures include weight, BP, HR, SpO₂ and lipid profile. After completing the supervised program, patients will be referred to community exercise support groups or enrolled into maintenance CR groups to continue long term exercise programmes.

A) Exercise prescription¹⁸

- There are 4 key components:
 - o Modality: any aerobic activity involving large muscle groups and can be maintained for prolonged period e.g. walking/cycling
 - o Intensity: using target HR or RPE. The target is usually low to moderate intensity for most patients
- High intensity (HR max > 80% or RPE 14 or more)
- Moderate intensity (HR max 60-80% or RPE 12-13)
- Low intensity (HR max < 60% or RPE 10-11)
 - o Duration: depending on mode and intensity, the exercise program is 20-45 minutes initially, but subsequently may be increased to 60 minutes
 - o Frequency: the goal is at least 3 times a week
- Rate of progression of exercise component varies, depending on patient's individual tolerance, progress, endurance, needs and goal.

B) Rate of perceived exertion (RPE) ¹⁹

| | |
|----|--|
| 6 | No exertion at all |
| 7 | Extremely light |
| 8 | |
| 9 | Very light - (easy walking slowly at a comfortable pace) |
| 10 | |
| 11 | Light |
| 12 | |
| 13 | Somewhat hard |
| 14 | |
| 15 | Hard (heavy) |
| 16 | |
| 17 | Very hard |
| 18 | |
| 19 | Extremely hard |
| 20 | Maximal exertion |

C) Safety ^{7,8,20}

Studies have shown that low to moderate intensity physical training can be undertaken safely both in community and hospital setting for patients with low to moderate risk. There is no evidence that clinically stable patients are harmed by the exercise component. Even patients with left ventricular dysfunction can safely be offered CR as exercise training does not appear to endanger this group of patients. In fact patients with poor left ventricular function respond most favorably to CR.

3. Educational component ^{7,8,17,20}

This is carried out weekly by various members of the multidisciplinary team. Pamphlets, handouts, charts and other educational materials are used to enhance patients' knowledge and awareness of their underlying disease conditions. Some of the essential topics include:

- Safety issues during exercise
- Anatomy, physiology, CVRF and cardiac procedures
- Healthy eating ideas: food label reading for healthier diet
- Coping with cardiac event and stress management techniques
- Anxiety and depression
- Management of cardiac symptoms
- Heart medications and their interactions
- Returning to usual activities (work and recreation) after heart problems

4. Psychological interventions ^{7,8,20}

- Psychological distress and poor social support have been shown to be powerful predictors of poor outcomes following MI. Similarly, depression and anxiety may also play a role in the etiology of coronary heart disease.
- Thus the CR coordinator will screen all patients for

depression and anxiety, and offer patients counseling (e.g. stress management, relaxation therapy or coping strategies) or refer them to social workers or psychiatrists if needed

- The CR coordinator also addresses patients' health beliefs and concerns as well as clarifies whatever cardiac misconceptions they may have.

5. Long Term follow-up ²⁰

- Primary care medical follow-up by family physicians:
 - o Drug therapy in secondary prevention
 - o CVRF optimization
 - o Lifestyle modification, especially diet control
- Community exercise group (support and self help groups) to facilitate long term maintenance of physical activity and lifestyle changes.

MULTIDISCIPLINARY TEAM APPROACH ^{7,8}

This is crucial especially for patients with complex medical and psychosocial issues. After the initial assessment and risk stratification, patients maybe referred to other allied health staff depending on their specific needs. Thus, the various team members individually assess patients' specific needs before coming together to formulate specific and individualized plans.

In view of the wide range of educational topics related to cardiovascular health, the expertise of the various team members is needed to equip patients with the essential knowledge so as to clarify any existing misconceptions and to develop long term self management strategies.

In the long term care, family members and carers are also actively engaged as part of the expanded CR team. They are vital in providing the necessary psychosocial and logistics support for patients in their respective home settings. Besides re-enforcing knowledge and skills that are taught, they also ensure a positive and conducive environment for patients to adhere to long term lifestyle modifications.

PHASES ^{7,8}**Phase I**

- o Inpatient stay: medical evaluation, education, mobilization and discharge planning

Phase II

- o Outpatient phase: aerobic conditioning, risk factor management and lifestyle changes
- o Home programs for homebound patients (alternative)

Phase III

- o Maintenance phase: long term maintenance of physical activity and lifestyle change conducted out of hospital setting e.g. at gym or leisure centre in a community centre
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LOCATION 7,8

Currently, in Singapore, most of phase II CR programmes are conducted at outpatient rehabilitation centers of restructured hospitals, including St. Luke's community hospital, which has also started a similar programme (mainly for low to moderate risk patients) in 2009. A number of randomized trials have found that low to moderate intensity exercises for low to moderate risk patients can be conducted as safely and as effectively in the community setting as in a hospital setting.

SPECIAL GROUPS**Elderly** 21-23,31,34

Studies had shown that elderly patients (aged 65 years or older) demonstrate equal benefits in terms of similar patterns of physical and psychological improvement during CR c.f. younger patients. They experience significant improvement in health related QOL, NYHA classification and 6 min walking distance. Exercise-based CR, started early after hospital discharge, is also safe in the elderly patients. However, there have been relatively few studies of the effects of exercise-based CR on physical function recovery in the very old (> 75 yrs).

Cardiac failure 7,8,24,25,34

Systematic reviews of CR in patients with stable, chronic heart failure have shown benefits to exercise capacity, symptomatic relief, fewer hospital attendances, improved quality of life and patient satisfaction. The latest multi-center trial (HF-ACTION RCT) showed that exercise based CR (c.f. usual care alone) conferred statistically significant improvement in self reported health status (which occurred early and persisted over time) as well as reduction for all-cause and cardiovascular mortality. At the same time, a Cochrane review of 29 clinical trials in 2004 also showed improvement in QOL and exercise capacity in patients with mild to moderate heart failure.

Peripheral vascular disease (PVD) 7,8,26-28

ACC/AHA 2005 guidelines recommend supervised exercise training as initial treatment modality for patients with intermittent claudication. During the program, the patient is instructed to walk until claudication pain occurs, rest until the pain subsides, and repeat the cycle. Regular exercise is thought to condition muscles to work more efficiently and increase collateral vessel formation. Studies have shown that exercise training improves 6-minute walk performance (walking time and distance) as well as QOL. As most patients have other CVRF, CR also confers benefits in reducing other CVRF and the risk of subsequent cardiac events.

CURRENT ISSUE 20,38,39,41

Despite the fact that CR is both evidence-based and cost effective, it is still severely underutilized in many countries. The current challenge is to explore underlying causes of suboptimal take-up rate and the corrective strategies.

Some of the current barriers include:

- Patient factors:
- Lack of interest or reluctance to change one's lifestyle often contributed by misconceptions about CR
- Work or domestic commitment that makes it difficult to attend the programme
- Lack of family support
- Service factors:
- Financial constraint
- Lack of accessibility of outpatient rehabilitation centers
- Language issues
- Professional factors:
- Attitude and lack of knowledge amongst health-care providers (HCP).

Some of the ways to improve take-up rate include:

- Reminders for patients and families e.g. written letters, telephone calls, pamphlets etc.
- Regular support from trained lay volunteers who had participated in previous program (in allaying the anxiety and addressing the concerns of newly enrolled patients),
- Effective coordination between hospital and primary care to encourage patients to enroll into the programme,
- Facilitation of the referral process by harnessing the electronic referral pathway e.g. adding a prompter for CR in discharge care pathway to remind HCP,
- Increasing awareness amongst public and HCP through regular educational sessions and public forum / mass media, imparting information regarding benefits and availability of CR,
- Offering CR in range of settings e.g. homes, community gymnasiums, workplaces and even shopping centers to overcome barriers of lack of time and physical environment.

FUTURE

- Diversification of CR programmes to include patients with multiple CVRF esp. those with diabetes mellitus, chronic renal failure, PVD and stroke.
- Home based CR programmes as a viable alternative option for those who are not able to access outpatient CR programs for logistics issues.
- There is a need for greater collaboration between different institutions e.g. acute, community hospitals and outpatient rehabilitation centers in the community.

- An increased funding or reimbursement for CR programmes is also required so that there is greater incentive for both patients and service providers to be involved in the programmes. Thus there is a need for greater support from both the government and public through various modalities to improve knowledge and awareness of CR programmes.

CONCLUSION

Current literature has already shown that CR in patients with chronic heart diseases is both evidence-based and cost effective. In this paper, besides presenting a comprehensive overview of the aims of CR, its various components, patient selection, risk stratification, exercise prescription and educational component, other relevant issues e.g. multidisciplinary approach, long term follow-up as well as CR in special groups are also discussed. Perhaps of great importance is the current challenge of improving the uptake of CR via a multifaceted approach.

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