International Journal for Pharmaceutical Research Scholars (IJPRS)
ISSN No: 2277-7873
REVIEW ARTICLE
V-1, I-2, 2012

An Overview On: Significance of Cardiac Rehabilitation on Cardiovascular Diseases

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Manuscript No: IJPRS/V1/I2/00110, Received On: 01/06/2012, Accepted On: 17/06/2012

ABSTRACT

Considering the high mortality and morbidity rate associated with cardiovascular diseases, Cardiac rehabilitation (CR) is regarded for prevention and management of cardiovascular diseases. CR services are generally provided in an outpatient as comprehensive, long-term programs involving medical evaluation, prescribed exercise, cardiac risk factor modification, education and counseling. This includes nutritional therapies, weight loss program management of lipid abnormalities with diet and medication, blood pressure control, diabetes management and stress management. The exercise component of a total approach to rehabilitation helps to overcome the fears and anxieties that so many people experience after a heart attack. Aerobic exercise training program improves cardiovascular fitness in both healthy individual and cardiac patients. Cardiac rehabilitation prevents and treat cardiovascular disease, reduces cardiac risk factors, improving patient's exercise capacity and enhancing quality of life. Aerobic exercise with intensity of approximately 60 to 70% of the maximal heart rate for 30 to 60 minutes, 3 to 4 times a week, for 4 to 6 weeks enhances exercise capacity.

KEYWORDS

Cardiac rehabilitation, Cardiovascular disease

INTRODUCTION

Cardiac Rehabilitation (CR)

Heart disease is the leading cause of morbidity and mortality in all over world. Cardiac Rehabilitation (CR) is a branch of rehabilitation medicine dealing with optimizing physical function in patients with cardiac disease. The aims of cardiac rehabilitation are to promote secondary prevention and improve both the quantity and quality of life by attempting to alleviate the physiological and psychological toll by reducing risks of re-infarction, managing symptoms, and allowing clients to regain control of their lives.CR services are generally provided in an outpatient as comprehensive, long-term programs involving medical evaluation, prescribed exercise, cardiac risk factor modification, education and counseling. This includes nutritional therapies, weight loss programs management of lipid abnormalities with diet and medication, blood pressure control, diabetes management and stress management.

Cardiac rehabilitation (CR) is a secondary prevention program composed of structured exercise, Yoga comprehensive education and Diet counseling.[1] Cardiac rehabilitation is the process by which patients with cardiac disease, in association with a multidisciplinary team of health professionals, are encouraged and supported to achieve and maintain optimal

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physical and psychosocial health. The involvement of social support of partners, other family members is also important.[2] Participation in CR results in lower morbidity and mortality.

Unfortunately, Patients are significantly less likely involve in these programs.[1] The earlier work shows a reduction of 20-25% in all-cause and cardiac mortality.[3] The recent work allowed analysis of an increased number of patients (8440 in 32 trials) and reported a reduction in total cardiac mortality of up to 31%. Participation in CR after MI also improves well-being and reduces disability.[4] in 2001, Pasquali et al. suggested that the reasons for the poor uptake of cardiac rehabilitation programmes are multiple, and physician recommendation and referral are considered to be the most important factor for better use. Social support is another influencing factor. In 1994 Yates et al. suggested that clients who have family support are more likely to adhere to the programmed than those who do not. In 2001 King et al. reported that women and older people are regularly reported to have low social support. This is in accordance with findings that there is lower rate of cardiac rehabilitation uptake among women, older people, the unemployed, and those with less education. Numerous studies have suggested that convenience factors, such as distance and availability of transport, influence participation.

Any exercise component of CR must be devided in to the individual participant. Ideally, cardiovascular exercise conditioning should be derived from a physician's prescription based on the following considerations[5].

• The results of a thorough physical examination that includes an exercise stress, or tolerance, test and assessment of cardiovascular risk factors.

• Overall state of health, including physical fitness and previous exercise history.

• Individual preferences and physical limitations (For example, arthritis or previous stroke can limit capabilities in certain types of exercise).

Phases of Cardiac Rehabilitation[3]

There are four phases of cardiac rehabilitation:

1. Phase I - Inpatient care
2. Phase II - The early post discharge period
3. Phase III - Exercise training
4. Phase IV - Long term follow up

Phase I - Inpatient Care

Phase I occurs during the inpatient stage or after a "step change" in the patient's cardiac condition (defined as any myocardial infarction, onset of angina, any emergency hospital admission for coronary artery disease (CAD), cardiac surgery or angioplasty, or first diagnosis of heart failure). At first, this activity may entail sitting up with feet dangling over the side of the bed or moving to a bedside chair. The patient may also been couraged to do simple range-of-motion exercises, such as lifting and lowering the arms and legs.[6] These exercises, which can be done sitting in bed, in a chair or when standing, helps to prevent muscle and joint stiffness and the formation of blood clots, especially in the legs.[6]

In a short time the patient will be encouraged to take a few steps around the hospital room, and then to take short walks in the hallway.[6] A simple act like walking to the bathroom or strolling up and down the hall is reassuring. Early activity (ambulation) also prevents the muscle weakness and reconditioning that comes with prolonged bedrest.[6]During this phase medical evaluation, reassurance and education, correction of cardiac misconceptions, risk factor assessment, mobilization and discharge planning are the key elements.[7] It is customary to involve family and partners from this early stage.

Phase II - The Early Post Discharge Period

Phase II is the early post discharge period, a time when many patients feel isolated and insecure. Support can be provided by home visiting, telephone contact, [8-9] and by supervised use of the heart Manual.[10]This manual is a self-help programme for patients recovering from a

heart disease that has been shown to reduce anxiety, depression and hospital readmission rate.

Phase III - Exercise Training

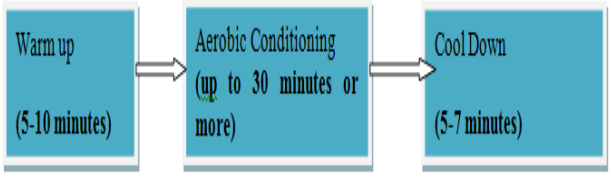
Phase III has historically taken the form of a structured exercise programme in a hospital setting with educational and psychological support and advised on risk factors. Increasingly it is recognized that both components can be undertaken safely and successfully in the community. [11-12] A menu based approach recognizes the need to tailor the delivery of services to the individual [13,14]and is likely to include specific education to reduce cardiac misconceptions and encourage smoking cessation and weight control for obese individual, vocational rehabilitation to assist return to work or retirement; and referral to a psychologist, cardiologist, or exercise physiotherapist.

Phase IV - Long Term Follow Up

Phase IV involves the long term maintenance of physical activity and lifestyle change. Available evidence suggests that both must be sustained for cardiac benefits to continue[15,16]. Membership of a local cardiac support group, which involves exercise in a community centre such as a gym or leisure centre, may help to maintain physical activity and behavioral change.

Exercise Training Program

There is no one exercise program or session that is ideal for all persons who have had prior MI and undergone angioplasty or CABG. It's mainly divided into three parts:



1. Warm up (5-10 minutes)

All exercise sessions should begin with a few minutes of warm-up or stretching exercise. These range of motion exercises, which are designed to tone and stretch muscles and manipulate joints, are important in preventing orthopedic injuries.

2. Aerobic Conditioning (up to 30 minutes or more)

Walking, jogging, cycling, swimming, or climbing stairs, and working on a rowing or climbing machine are all excellent aerobic activities.

3. Cool Down (5-7 minutes)

These are transitional exercise, which may be similar to the warm-up routine or simply a slow paced continuation of aerobic activity. They are designed to help muscles readjust to arresting state and to prevent cramping and other problems that may follow a vigorous workout.

ORGANIZED REHABILITATION VS HOME PROGRAM

The organized rehabilitation is more structured and more closely monitored, contains a number of advantages that are not obtained with home programs. Exercise is done under direct medical supervision which is more important for high-risk patients, such as those who experience angina during physical activity or who have disturbances in cardiac rhythm or a drop in systolic blood pressure when exercising or for a survivor of a cardiac arrest. Since recurrent heart attacks are more common in the weeks or first few months after the initial one, medical supervision during exercise may be more important during this period than later. In addition, the presence of a physician or other medical personnel helps to overcome the fear that many patients experience in starting an exercise program.

An organized program may provide extra motivation to continue. All too often, a person leaves the hospital after a heart attack filled with determination to change his life style, to lose weight, stop smoking, start exercising, and so forth. Typically, the determination lasts for a few weeks, and then, as the fear recedes and life settles back into normal routine, the person begins to backslide into former habits. This is not as likely to happen if the person participates

in an organized program. Also, if a person is paying to participate in rehabilitation, he or she may be more compliant.

Table 1: Exercise regimen

	Health individual	Cardiac patients (Phase II)	Cardiac patients (Phase III)
Intensity	70% of maximal heart rate	40-60%of maximal Heart rate	70%of maximal heart rate
Duration	40-60 minutes	30-60 minutes	30-60 minutes
Frequency	3-4 times/week for 4-6 weeks	3 times/week	3 times/week for 4-6 weeks
Mode	Swimming, treadmill, Walking, jogging, cycling, Aerobic dance	Monitor vital signs During the session -Circuit interval exercise program is the common method used in phase II - Start low level of Resistance training With 40% of Repetition maximum(RM) effort	Monitor vital signs During session - Swimming ,jogging and cycling

Other benefits of Organized Rehabilitation include:

Improved endurance and strength, increased sense of well-being, Improved weight control**,** and enhanced self-image.

Simply knowing that you can walk or jog around a track or work out on an exercise cycle provides the confidence that you can safely undertake other normal activities, including going back to work, resuming sexual relations, or enjoying a family outing.

Table 2: Possible biological mechanisms for exercise-induced reductions in cardiac risk factors [17]

Cardiovascular	Increase in myocardial contractility
	Reduction of blood pressure
	Expansion of plasma volume
	Increase peripheral venous tone
	Reduction in myocardial oxygen demand at submaximal level of physical activity
	Changes in fibrinolytic system
	Possible increase in coronary collateral vessels
Metabolic	Reduction of obesity
	Enhanced glucose tolerance, Improved lipid profile
Lifestyle	Possible reduction of stress, Short term reduction of appetite

BENEFITS OF CARDIAC REHABILITATION ON CARDIOVASCULAR DISEASES

Heart Failure

An estimated 1 to 2 million persons in the United States have heart failure. Mortality for those with this condition increases with advancing age. Considerable recent attention has focused on the use of exercise rehabilitation among patients with heart failure,with reported improvements of 18% to 25% in peak oxygen uptake[18-19]and 18% to 34% increases in exercise duration.[18-19] Exercise training in these patients

raises the anaerobic threshold, reduces resting and sub maximal exercise heart rates, reduces exercise minute ventilation, and improves peak blood flow to exercising limbs.[17,19] Subjective symptoms and quality of life scores were better after exercise training as well. No adverse effects were reported after 2 to 6 months oftraining.[19-20.]

Hyperlipidemia and Ischemic Heart Disease

Toufan and Afrasiabi performed a study to know the effect of cardiac rehabilitation on lipid profile. After cardiac rehabilitation there is important impacts on improving functional capacity, well being sensation, return to work and there is decrease in serum lipid profiles in coronary patients. Omiya K conducted a study of cardiac rehabilitation program on ischemic heart disease. It was observed that this program improves exercise tolerance, quality of life, coronary risk factors and many other aspects for ischemic heart disease patients.[21]

Myocardial Infarction

In Myocardial infarction there is insufficient myocardial perfusion which results in damage and necrosis of heart. So there is narrowing and occlusion of coronary blood vessels. Treatment based on patient's overall signs and symptoms of coronary insufficiency and hemodynamic instability. Junger et al. demonstrated the effect of cardiac rehabilitation in patients with myocardial infarction. Strong association of cardiac rehabilitation with reduced mortality was noticed, during one year follow up after ST elevation myocardial infarction (STEMI) or Non ST elevation myocardial infarction(NSTEMI).[22]Yu et al. conducted a prospective randomized controlled trial on long term effect of cardiac rehabilitation in patients with myocardial infarction or percutaneous coronary intervention(PCI).After cardiac rehabilitation there was increase in quality of life.

Heart Rate

Heart rate variability (HRV) is a noninvasive, practical and reproducible measure of autonomic nervous system function. A heart rate that is variable and responsive to demands is believed to bestow a survival advantage, whereas reduced HRV may be associated with poorer cardiovascular health and outcomes. Evidence suggests that reduced HRV has prognostic significance for individuals with myocardial infarction, chronic heart failure, unstable angina and diabetes mellitus. Interventions to increase HRV, such as exercise therapy, have also been examined. Exercise therapy may improve HRV in myocardial infarction, chronic heart failure and revascularization patients by increasing vagal tone and decreasing sympathetic activity. [23]

Blood Pressure

Exercise leads to a progressive increase in systolic blood pressure and a slight reduction in diastolic pressure due to reduction in total peripheral resistance. Reduced after load of the left ventricle allows an increase of ejection fraction and also stroke volume. After exercise, there is lowering of systolic blood pressure and so due to reduction in double product, it reduces risk of myocardial ischemia.[24]

Diabetes Management

Both diabetes mellitus and impaired fasting glucose are associated with adverse long-term cardiovascular outcomes; improved glycemic control favorably affects cardiovascular morbidity and mortality. Physical activity reduces insulin resistance and glucose intolerance. [25]

OTHER BENEFITS

Cardiac Transplantation

Exercise rehabilitation inpatients after cardiac transplantation increases peak functional capacity and exercise duration, raises the anaerobic threshold, and improves the ventilator responses to exercise.[26,27]

Cardiac Resynchronization Therapy

Exercise training leads to further improvements in exercise capacity, hemodynamic measures, and QOL in addition to the improvements seen after CRT(cardiac resynchronization therapy).

Therefore, exercise training allows maximal benefit to be attained after CRT. [28]

Risk Factor Modification

Improving the plasma lipid and lipoprotein profile with diet, exercises, and drug therapy is beneficial to patients with CAD. This has been assessed by the reduced recurrence of clinical events and the reduced rate of progression of coronary artery narrowing as determined by angiography.[19] The benefits of such therapies generally depend on their ability to achieve a substantial lipid-lowering effect. A diet restricted in saturated fat and cholesterol and designed to achieve and maintain normal body weight is an important component of a lipid-management program. Regular endurance exercise can help to control body weight as well as achieve reductions in plasma triglyceride levels and increases in HDL cholesterol levels.

Psychological Benefits

There are psychological benefits in group activity. Many participants in cardiac rehabilitation programs describe the importance of realizing that they are not alone, and that their fears are shared by others who have had similar experiences. Cardiac rehabilitation also helps in Psychosocial Interventions. Health education and counseling, psychotherapy, and stress management show promising results in improving the quality of life and reducing psychosocial distress among patients with CAD, especially in the early phases of recovery. Cardiac rehabilitation provides a unique opportunity to deliver an ongoing continuity of care for post cardiac event patients and lifestyle interventions particularly useful in ameliorating depression. The sense of community that patients often derive from participation in rehabilitation contributes to increased social support that may improve depression. Exercise therapy also has been shown to be effective in the treatment of depression.

Plasma Volume Expansion

Aerobic exercise induces an expansion of plasma volume. Possible mechanism of this is due to adjustment in the renin system. Exercise augmented ventricular preload contribute to the increase of cardiac stroke volume. Ventricular preloading is increased, contributing to the increase of cardiac stroke volume in the trained individual. There may be an associated decrease in the hemoglobin content of unit volume of blood, so that oxygen transport per liter of cardiac output is unchanged.[29]

Table 3: Effect of aerobic exercise on various variables[17]

Variable	Aerobic Exercise
Plasma lipids and lipoproteins	
HDL cholesterol	Small Increase
LDL cholesterol	Mild Decrease
Triglyceride	Moderate decrease
Cardiovascular dynamics	
Resting heart rate	Moderate decrease
Stroke volume, resting and maximal	Moderate increase
Cardiac output, rest	Unchanged
Cardiac output, maximal	Moderate increase
Blood pressure	Small decrease
VO2max	Large increase
Basal metabolic rate	Small increase
Health related quality of life	Small increase

Effect of Cardiac Rehabilitation on Mortality and Cardiovascular Outcomes

Randomized trials distinguish between two types of exercise-based cardiac rehabilitation:

i. Exercise only

ii. Exercise in addition to psychological and educational interventions, usually comprehensive cardiac rehabilitation.

A Cochrane review of men and women of all ages with previous MI, revascularization or angina found that exercise-only cardiac rehabilitation reduced all cause mortality by 27%, cardiac death by 31% and a combined end point of mortality, non fatal myocardial infarction and revascularization by 19%. [30] The benefits accrued over an average of 2.4 years. There were no effect on non fatal myocardial infarction alone and there was no apparent additional benefit from comprehensive cardiac rehabilitation. Most subjects were low risk middle aged men post MI. Patients with heart transplants; artificial valves and heart failure were excluded. There are two possible explanations for the failure of comprehensive cardiac rehabilitation to show additional benefit. One is that exercise-only cardiac rehabilitation is likely to include psychological and educational support, even if this is not offered in a structured fashion. The other is that most of the exercise-only trials were conducted in the pre-thrombolyticera; whereas most of the comprehensive trials were published more recently.This means that the benefits in the comprehensive rehabilitation trial are likely to be additional tothose of thrombolysis, prophylactic medication, and/or revascularization.

Benefits of Yoga

Meditation and Yoga induce relaxation of the body and limbic system resulting in a feeling of motivation, satisfaction, energy and potential. The practice of yoga induces significant alterations in neurohormonal system resulting in improved electrophysiological activity of the brain. Studies using high resolution brain imaging have shown that the activity in the frontal and other cortical brain regions is reduced, while activity in the limbic brain areas increases, especially in the hippocampus, the area associated with the stress hormone cortisol, during meditation.[31] Bremmer et al showed that patients with post-traumatic stress disorder or depression have smaller hippocampus that may be related to increased stress-induced cortisol levels. They also subsequently showed that meditation actually increases the hippocampus size.

The physiological benefits of yoga in the cardiovascular system can be primarily to a decrease in catecholamine release and activity resulting in lowering blood pressure, heart rate and respiratory rate, as well as activating the parasympathetic nervous system, resulting in a balanced sympathetic-parasympathetic axis. Other biochemical alterations associated with the practice of yoga include a decrease in urinary homovanillic mandelic acid, blood lactic acid and body temperature, and an increase in beta-endorphins and galvanic skin response (measure of decreasing sympathetic nervous activity). There is also a cessation of CO_2 generation by skeletal muscles, a 5-fold increase in plasma arginine vasopressin levels and EEG synchrony.[32]In one study conducted in residents of a yoga retreat, a significant reduction in urinary excretion of adrenaline, noradrenaline, dopamine and aldosterone as well as serum testosterone and luteinizing hormones, and an increase in cortisol excretion were observed. Innes et al, who examined 70 studies, observed a benefit of yoga practice on cardiac risk factors, especially glucosetolerance and insulin sensitivity, lipid profiles, blood pressure, oxidative stress, coagulation, and cardiovagal function. A regular practice of yoga reduces body mass index, total- and LDL-cholesterol, fibrinogen and blood pressure.

Current Awareness – Prevalence in India[33]

In recent years, there has been a marked increase in the number of medically supervised exercise programs for heart patients. Many of these programs are offered by hospital or medical center outpatient departments or research laboratories; others are offered by fitness centers or organizations. Some experts contend that there is no need for a formal cardiac rehabilitation program for the majority of low-risk persons, and that such patients can accomplish what needs to be done on their own

after two or three instructional sessions with a physician or rehabilitation specialist.

REFFERENCES

1. http://clinicaltrial.gov/ct2/show/study/NCT01019135?term=cardiac+rehabilitation&rank=4# Main Content. (Assessed on 28/Apr/2010).
2. Scottish Intercollegiate Guidelines Network. Cardiac Rehabilitation - A national clinical guideline, Jan 2002 (Reprints on Oct 2004) available on www.sign.ac.uk. (Assessed on 29/Apr/2010).
3. http://clinicaltrial.gov/ct2/show/NCT00219830?term=cardiac+rehabilitation&rank=5#Main Content. (Assessed on 28/Apr/2010).
4. http://clinicaltrial.gov/ct2/show/NCT00219830?term=cardiac+rehabilitation&rank=5#Main Content. (Assessed on 28/Apr/2010).
5. Zaret BL, Heart Book, Yale Univrsity Scool of Medicine, Cardiac Rehabilitation, Chapter 28, 1992, pp 349-358.
6. Scottish Intercollegiate Guidelines Network. Cardiac Rehabilitation - A national clinical guideline, Jan 2002 (Reprints on Oct 2004) available on www.sign.ac.uk. (Assessed on 29/Apr/2010).
7. World Health Organisation Expert Committee. Rehabilitation after cardiovascular disease with special emphasis on developing countries. Technical report series 831. Geneva: WHO; 1993.
8. Gilliss CL, Gortner SR, Hauck WW, Shinn JA, Sparacino PA, Tompkins CA, “Randomized clinical trial of nursing care for recovery from cardiac surgery”, Heart Lung, 1993, 22, 125-33.
9. Naylor MD, McCauley KM, “The effects of a discharge planning and home follow up intervention on elders hospitalized with common medical and surgical cardiac conditions”, J Cardiovasc Nurs, 1999, 14, 44-54.
10. Lewin B, Robertson IH, Cay EL, Irving JB, Campbell M, “Effects of self-help post myocardial-infarction rehabilitation on psychological adjustment and use of health services”, Lancet, 1992, 339, 1036-1040.
11. Bethell HJ, Mullee MA, “A controlled trial of community based coronary rehabilitation”, Br Heart J, 1990, 64, 370-375.
12. Hamalainen H, Kallio V, Knuts LR, et al., “Community approach in rehabilitation and secondary prevention after acute myocardial infarction: results of a randomized clinical trial”, J Cardiopulmonary Rehabilitation, 1991, 11, 221-226.
13. World Health Organisation Expert Committee. Rehabilitation after cardiovascular disease with special emphasis on developing countries. Technical report series 831. Geneva: WHO; 1993.
14. Johnston M, Foulkes J, Johnston DW, Pollard B, Gudmundsdottir H, “Impact on patients and partners of inpatient and extended cardiac counselling and rehabilitation: a controlled trial”, Psychosom Med, 1999, 61, 225-233.
15. Cupples ME, McKnight A, “Five year follow up of patients at high cardiovascular risk who took part in a randomised controlled trial of health promotion”, BMJ, 1999, 319, 687-688.
16. Schnohr P, Parner J, Lange P, “Mortality in joggers: population based study of 4658 men”, BMJ, 2000, 321, 602-603.
17. Williams MA, Haskell WL, Ades PA, Amsterdem EA, Bittner V, Franklin BA, etal., “Resistance exercise in individuals with and without cardiovascular disease: 2007 Update: A Scientific statement From the American Heart Association Council on Clinical Cardiology and Council on

Nutrition, Physical Activity, and metabolism. Circular", 2007, 116, 572-584.

18. Sullivan MJ, Higginbotham MB, Cobb FR, "Exercise training inpatients with chronic heart failure delays ventilator anaerobic threshold and improves submaximal exercise performance", Circulation, 1989, 79, 324-329.
19. Coats AJ, Adamopoulos S, Radaelli A, McCance A, Meyer TE, Bernardi L, Solda PL, Davey P, Ormerod O, Forfar C, Conway J,Sleight P, "Controlled trial of physical training in chronic heart failure: exercise performance, hemodynamics, ventilation, and autonomic function" Circulation, 1992, 85, 2119-2131.
20. Sullivan MJ, Higginbotham MB, Cobb FR, "Exercise training in patients with severe left ventricular dysfunction: hemodynamic and metabolic effects" Circulation, 1988, 78, 506-515.
21. Omiya K, "Cardiac rehabilitation in patients with ischemic heart disease" Nippon Rinsho, 2010, 68(4), 685-91.
22. Junger C, Rauch B, Schneider S, Liebhart N, Rauch G, Jochen S, et al., "Effect of early short term cardiac rehabilitation after acute ST-elevation myocardial infarction on 1 year mortality" Curr Med Res Opin, 2010, 26(4), 803-811.
23. Routledge FS, Campbell TS, McFetridge-Durdle JA, Bacon SL, "Improvements in heart rate variability with exercise therapy", Can J Cardiol, 2010, 26(6), 303-312.
24. Williams MA, Haskell WL, Ades PA, Amsterdem EA, Bittner V, Franklin BA, et al, "Resistance exercise in individuals with and without cardiovascular disease: 2007 Update: A Scientific statement From the American Heart Association Council on Clinical Cardiology and Council on Nutrition, Physical Activity, and metabolism", Circular, 2007, 116, 572-584.
25. Thompson PD, Buchner D, Piña IL, Balady GJ, et al., "Exercise and physical activity in the prevention and treatment of atherosclerotic cardiovascular disease. A statement from the Council on Clinical Cardiology (Subcommittee on Exercise, Rehabilitation, and Prevention) and the Council on Nutrition, Physical Activity, and Metabolism (Subcommittee on Physical Acitvity)", Circulation, 2003, 107, 3109 – 3116.
26. Kavanaugh T, Yacoub MH, Mertens DJ, Campbell RB, Sawyer P, "Exercise rehabilitation after heterotopic cardiac transplantation", Journal of Cardiopulmonary Rehabilitation, 1989, 9, 303-310.
27. Haskell WL, "Cardiac transplantation in cardiac transplantation patients. In: Wenger NK, Hellerstein HK Rehabilitation of the Coronary Patient. New York, NY: Churchill Livingstone Inc, 1992, 421-430.
28. Patwala AY, Woods PR, Sharp L, Goldspink DF, Tan LB, Wright DJ, "Maximizing patient benefit from cardiac resynchronization therapy with the addition of structured exercise training: a randomized controlled study", J Am CollCardiol, 2009, 53(25), 2332-2339.
29. Williams MA, Haskell WL, Ades PA, Amsterdam EA, Bittner V, Franklin BA, *et al.*, "Resistance exercise in individuals with and without cardiovascular disease:2007 Update: A scientific Statement From the American Heart Association Council on Clinical Cardiology and Council on Nutrition, Physical Activity, and Metabolism", Circulation, 2007, 116, 572-84.

30. Goble AJ, Worcester MU, "Best practice guidelines for cardiacrehabilitation and secondary prevention. Melbourne: The Heart Research Centre, on behalf of Department of Human Services Victoria; 1999.
31. Lazar SW, Bush G, Gollub RL, Fricchione GL, Khalsa G, Benson H, "Functional brain mapping of the relaxation response and meditation", Neuroreport, 2000, 11, 1581-1585.
32. Selvamurthy W, Sridharan K, Ray US, et al., "A new physiological approach to control essential hypertension", Indian J Physiol Pharmacol, 1998, 42, 205-213.
33. Zaret BL, Heart Book, Yale Univrsity Scool of Medicine, Cardiac Rehabilitation, Chapter 28, 1992, pp 349-358.

