

## Recent Development of Cardiac Rehabilitation in the Clinical Practice

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### Abstract

This Commentary Article describe about the Recent Development of Cardiac Rehabilitation in the Clinical Practice.

**Keywords:** Cardiac rehabilitation; Cardiopulmonary Exercise Test (CPET); Dietary Approaches to Stop Hypertension (DASH); Intensive Cardiac Rehabilitation (ICR)

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### Introduction

#### Cardiac Rehabilitation

In recent years, "Cardiac rehabilitation" has attracted attention. It is a comprehensive method for secondary prevention for reducing mortality and morbidity [1]. The World Health Organization (WHO) has also developed a package of rehabilitation interventions as a universal healthcare. Cardiac rehabilitation has a broad meaning [2]. Physician and medical team can provide appropriate treatment and rehabilitation to patients with myocardial infarction and heart failure. Secondly, we can influence various subjects who may be in a subclinical stage of diseases. Thirdly, medical staff can give advice to many people about continuing appropriate exercise and dietary habits in order to prevent any impaired function [3].

As to cardiac rehabilitation, the important point in actual life would be "aerobic exercise for 20 to 60 minutes a day", and walking is often recommended to mostly usual people [3]. However, the intensity of the aerobic exercise cannot be defined for a variety of people. Usual walking is too weak for young people. In contrast, jogging with about 5-6 km/h cannot be continued as aerobic exercise for middle-aged and elderly people. The appropriate strength varies depending on any subject and/or situation.

#### Cardiopulmonary Exercise Test (CPET)

As an evaluation method, there is a cardiopulmonary exercise test (CPET) [4]. When exercise intensity is gradually increased, the oxygen ventilation equivalent (ventilation volume/ oxygen uptake volume) and respiratory quotient (carbon dioxide output / oxygen uptake) begin to increase rapidly up to a certain level. This has been known as the Anaerobic Threshold (AT). According to the values of CPET and AT, cardiac rehabilitation can be performed successfully in an adequate degree for patients

with heart disease [5].

The purpose of cardiac rehabilitation is to improve QOL and prevent the recurrence of cardiovascular disease. It is necessary to evaluate multiple factors, such as disease severity, treatment status, ADL, exercise tolerance, nutrition, luxury items, psychological status of depression/dementia, and environment of work/home environment [6]. Furthermore, medical staffs can provide specific exercise and lifestyle guidance.

#### Chronic Heart Failure (CHF)

There are several medical indications for cardiac rehabilitation. They include acute myocardial infarction, angina pectoris, chronic heart failure (CHF), after open heart surgery, macro vascular disease, peripheral artery disease (PAD) and after Tran's catheter aortic valve implantation (TAVI) [3].

There are various physiological and clinical effects of cardiac rehabilitation on patients with cardiovascular disease. They include suppression of sympathetic nerve activity, enhancement of vagal nerve activity, reduction of arrhythmias, improvement of muscle strength /mass, general endurance, improvement of anxiety/ depression/ sleep disorders, improvement of vascular endothelial function, anti-inflammatory, anti-atherosclerotic effects, salt reduction, water management, nutrition management and others[2,3].

#### CHF, Chronic Kidney Disease (CKD)

On the other hand, there are several problems of subjects undergoing cardiac rehabilitation. They include CHF, chronic kidney disease (CKD), flail and locomotive syndrome. Exercise is possible even if the patient cannot stand. In such case, one can receive cardiac rehabilitation while sitting in a chair with some adequate devices. Checking medication status during cardiac rehabilitation can prevent hospitalization due to worsening conditions [7].

For middle-aged and older CKD patients, aerobic exercise and mild strength training improve systemic endurance, strength and muscle mass without impairing renal function [8]. Exercise therapy has also been suggested in heart failure patients with CKD and obesity/metabolic syndrome, as it is effective for weight loss and improving maximal oxygen uptake [9]. Furthermore, it has been recommended to perform mild to moderate exercise for younger subjects with CKD in terms of QOL, motor function and respiratory function [10]. Thus, proper exercise has been effective for maintaining renal function, and it is important to instruct keeping on exercise in usual life continually.

Historically, there is an important paper by Ornish [11]. The report showed that intensive diet and exercise had brought the regression of coronary plaques. For the protocol, patients with moderate to advanced coronary artery disease were treated with thorough diet and exercise therapy. There were two groups randomly assigned, which were intervention groups with strict diet (n=28) and control groups with usual dietary as the guidelines (n=20). After 5 years, the changes in the coronary artery stenosis rate by coronary angiography showed a difference of 37.3% vs. 51.9% in the intervention and control group, respectively [11].

This paper is with high quality and has been cited in about 1900 papers until the end of 2019. No other study has shown such a clear efficacy of strict diet therapy. The thorough diet applied was whole food vegetarian diet, including mainly raw vegetables associated with cooking as little seasoning without oils and fats. The characteristic feature is lack of dairy products or fish, and the energy content of lipids is less than 10%.

## Dietary Approaches to Stop Hypertension (DASH)

On the other hand, there has been Dietary Approaches to Stop Hypertension (DASH) diet that is famous for hypertension [12]. The difference between the Ornish diet and DASH is that the latter includes dairy food and fish. In our usual clinical practice, it is rather difficult to treat meals as strictly as Ornish. If the advised diet can be continued at the level of DASH, actual nutrition treatment seems to be good to fair [13]. Details will depend on a variety of individual and living conditions.

Recently, there was a useful guideline for cardiovascular nutrition [14]. It shows an evidence-based review of the health benefits of controversial foods. They indicate i) evidence of harm, ii) lacking evidence for harm or benefit, iii) evidence of benefit. Among these, sugar is the first food that should be avoided. The maximum daily intake of sugar is up to 25g, and synthetic sugars are basically not consumed. A recent meta-analysis of 39 RCTs was observed, in which higher intake of free sugar showed significant increases in TG, LDL and blood pressure [15].

Regarding cardiac rehabilitation, some problems are observed. There has been less utilization of cardiac rehabilitation so far. The reason would be due to both of patients and health system.

In particular, lower socioeconomic status (SES) would be involved in the current status [16]. Health costs have been risen promptly and expected expenses will be 1.1 trillion US dollars by 2035 [17]. It is necessary to reduce the massive economic burden, and disease prevention and cardiovascular health promotion will be crucial for healthcare system and community [18].

## Intensive Cardiac Rehabilitation (ICR)

Cardiac rehabilitation has been in evolution until now. Conventional rehabilitation mainly consists of monitoring exercise therapy and lifestyle guidance with nutritional and psychological supports. On the other hand, there is a new comprehensive rehabilitation named Intensive Cardiac Rehabilitation (ICR). ICR involves previous two factors, as well as stress management and dialogue between patients.

## Stress Management Program (SMP)

ICR has been originally presented by Ornish and colleagues. They had evaluated the integrated diet and exercise program as not just reducing, but improving the progression of coronary artery disease [19]. Then, ICR includes comprehensive and integrated meaning associated with several aspects. It also includes psychological care such as stress management program (SMP).

In summary, development of cardiac rehabilitation was described. There has been an evolution in this region, and intensive cardiac rehabilitation has been introduced. It includes SMP, manpower, economy, resources, and facilities and so on. This article will be expected to become a reference for future development of cardiac rehabilitation.

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