

# Cardiac rehabilitation in the United States: from evidence to application

Rehabilitacja kardiologiczna w Stanach Zjednoczonych: od faktów do praktyki

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Cardiac rehabilitation (CR) programs first appeared in the United States in the late 1960s. Over the past 40 years, CR has evolved into a comprehensive rehabilitation and secondary prevention service, delivered by a multidisciplinary staff, and based on scientific and clinical evidence. CR is now recognized as an important element in the continuum of care for patients with cardiovascular disease.

The contemporary definition of cardiac rehabilitation is: '...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 of sudden death or reinfarction, control cardiac symptoms, stabilize or reverse the atherosclerotic process, and enhance the psychosocial and vocational status of selected patients' [1].

## The evidence for cardiac rehabilitation

The clinical evidence for the efficacy of cardiac rehabilitation has been summarized in multiple systematic reviews and through the development of guidelines. The earliest reviews were published by Oldridge et al. [2] and O'Connor and colleagues [3] in 1988 and 1989, respectively. Results from these two studies demonstrated 22-25% lower mortality in the CR group compared to the usual care group.

More contemporary systematic reviews reported similar reductions in cardiac mortality for patients who received CR. The Cochrane Collaboration review reported a decrease in cardiovascular mortality of 26-31% in patients receiving CR, with the higher percentage reduction occurring in the exercise-only programs [4]. Taylor and colleagues [5] reported on the results for 8,940 patients

and the reduction in cardiac mortality for the patients who participated in CR was 26%. In addition, patients in CR had lower values for total cholesterol ( $-0.37$  mmol/l), triglycerides ( $-0.23$  mmol/l), and systolic blood pressure ( $-3.2$  mmHg), and there was 36% less self-reported smoking.

Clark et al. have published the most recent systematic review of secondary prevention programs, which included 21,295 patients [6]. Cardiac mortality results were not reported but all-cause mortality and recurrent myocardial infarction at 12 months of follow-up were 15% and 17% less, respectively, in the secondary prevention group. This reduction in mortality increased with longer follow-up: 47% at 24 months and 23% at 5 years.

Cardiac rehabilitation guidelines published by professional societies have also summarized the evidence and identified recommended program components. In North America, these include guidelines from the American Association of Cardiovascular and Pulmonary Rehabilitation and the Canadian Association of Cardiac Rehabilitation [7, 8]. In addition, many scientific or position statements have been published that address CR or the use of exercise and rehabilitation in heart disease [9-11]. The evidence for CR has been classified as Class I (useful and effective) by the American Heart Association and the American College of Cardiology in the management of patients with coronary artery disease [12-14].

## Application of the evidence

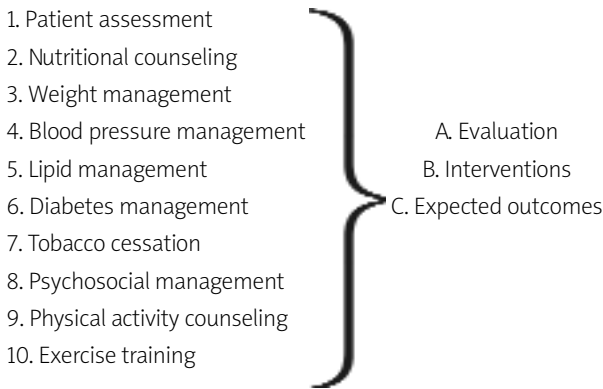
The Centers for Medicare and Medicaid Services administer the national Medicare insurance program in the United States. In March 2006, CMS stated that CR is reasonable and necessary and expanded payment coverage for CR services to include the following diagnoses: stable

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**Figure 1.** Core components of cardiac rehabilitation/secondary prevention programs [18]

angina pectoris; acute myocardial infarction; coronary artery bypass grafting surgery; percutaneous coronary interventions with or without stenting; heart valve repair or replacement; heart or heart-lung transplantation [15].

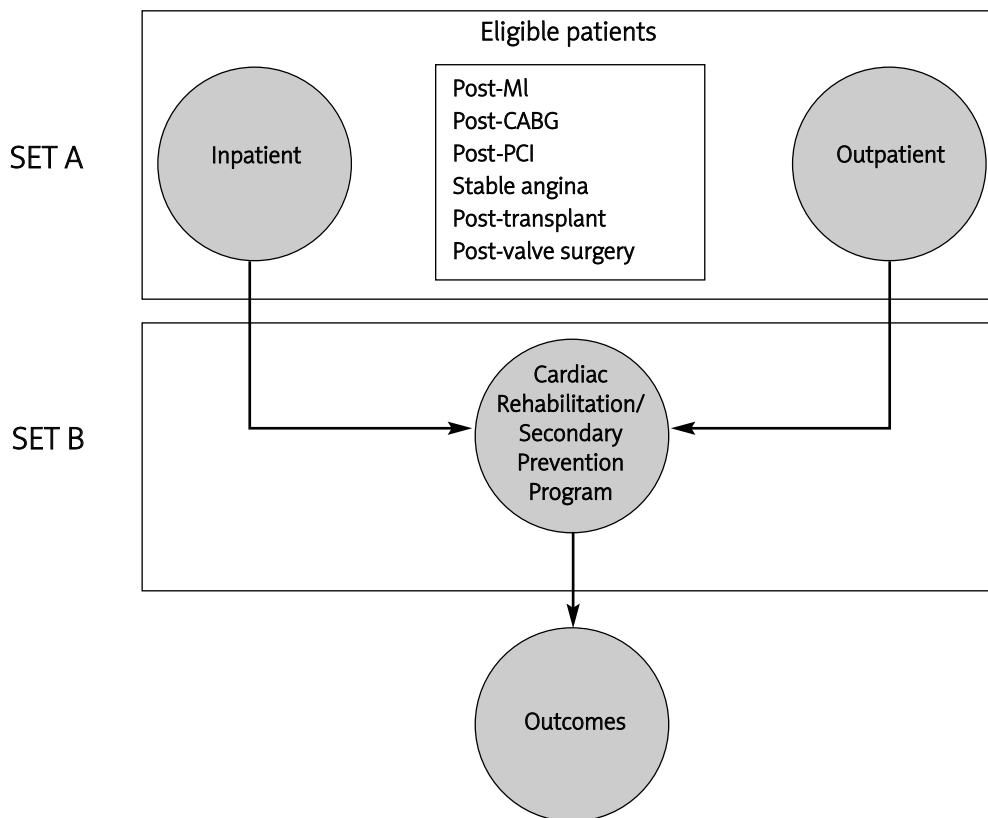
The typical model for delivering outpatient CR in the United States is for patients to attend sessions two to three times per week for up to 12-18 weeks (36 total sessions) [16]. A session typically lasts for approximately one hour and includes aerobic and/or resistance exercises with continuous electrocardiographic monitoring.

There are alternative approaches to this typical model. Patients can be classified as lowest, moderate or highest risk for participating in exercise based on a combination of clinical and functional data. The number of recommended supervised exercise sessions varies by risk level: low-risk patients receive 6-18 exercise sessions over 30 days or less from the date of the cardiac event/procedure; moderate-risk 12-24 sessions over 60 days; and high-risk 18-36 sessions over 90 days [7].

Yet another service delivery model is one developed at the Toronto Rehabilitation Centre [17]. In this model, patients attend supervised exercise sessions at the program only once per week and exercise four days per week away from the program. This format continues for approximately six months when patients then attend only one exercise session per month at the program while continuing to exercise five times per week. Supervised exercise sessions total approximately 32.

In addition to the exercise training and consistent with the current definition of CR, education and counseling are also included in CR sessions. These services focus on secondary prevention of cardiovascular disease and a heart-healthy lifestyle. Education topics include the atherosclerotic process, smoking cessation, hypertension, lipids, diet, exercise and physical activity, diabetes control, depression, and stress management.

The multidisciplinary healthcare team providing CR services includes physicians, nurses, clinical exercise



**Figure 2.** Cardiac rehabilitation performance measures sets A and B [20]

physiologists, and therapists. Other professionals who may also be involved are clinical psychologists, clinical dietitians, diabetic educators, and vocational counselors.

The recommended program components for comprehensive CR and secondary prevention have been defined [7, 18]. The 10 core components (see Figure 1) have most recently been updated by Balady et al. [18]. There are three aspects to each of the program core components: evaluation; interventions; expected outcomes.

The evaluation phase involves assessing the current status of the patient, determining the effectiveness of the management plan, and evaluating the patient's compliance with that plan within each core component. Interventions summarize the strategies and tools to be used to achieve target values and other goals that are appropriate for each core component. Lastly, the expected outcomes provide recommended clinical targets (e.g., blood pressure values) and patient behaviors (e.g., patient's ability to self-monitor blood sugar status) for each component.

A major issue facing outpatient cardiac rehabilitation is underutilization. In a recent report, Suaya and colleagues [19] reported that the utilization of outpatient cardiac rehabilitation in the United States by patients following acute myocardial infarction and coronary artery bypass surgery was 13.9% and 31%, respectively. Utilization rates varied by as much as nine-fold between states.

Increasing physician referrals to and patient enrollment in CR is a challenge for the future. New performance measures for CR that should help increase utilization have been recently published [20]. Set A of these measures focuses on physician referral of appropriate patients to CR (Figure 2). Measures in Set B are structure- and process-based measures used to assess and improve the quality of selected program policies and procedures. Efforts are currently underway to implement these performance measures in hospitals with CR programs and to elevate these measures to the status of quality indicators. If quality indicator status can be achieved, one measure of physician quality will be referral of appropriate patients to CR.

## Summary

Since CR programs first appeared in the United States about 40 years ago, they have evolved into comprehensive services that focus on both rehabilitation and secondary prevention of heart disease. The program components for CR are well defined and evidence-based. An important challenge for the future is to develop strategies for increasing utilization of CR services.

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