

Core Components of Cardiac Rehabilitation/ Secondary Prevention Programs: 2007 Update

A Scientific Statement From the American Heart Association
Exercise, Cardiac Rehabilitation, and Prevention Committee,
the Council on Clinical Cardiology; the Councils on Cardiovascular Nursing,
Epidemiology and Prevention, and Nutrition, Physical Activity, and Metabolism;
and the American Association of Cardiovascular and Pulmonary Rehabilitation

Gary J. Balady, MD, FAHA, Chair; Mark A. Williams, PhD, Co-Chair; Philip A. Ades, MD;
Vera Bittner, MD, FAHA; Patricia Comoss, RN; JoAnne M. Foody, MD, FAHA;
Barry Franklin, PhD, FAHA; Bonnie Sanderson, RN, PhD; Douglas Southard, PhD, MPH, PA-C

Abstract—The American Heart Association and the American Association of Cardiovascular and Pulmonary Rehabilitation recognize that all cardiac rehabilitation/secondary prevention programs should contain specific core components that aim to optimize cardiovascular risk reduction, foster healthy behaviors and compliance to these behaviors, reduce disability, and promote an active lifestyle for patients with cardiovascular disease. This update to the previous statement presents current information on the evaluation, interventions, and expected outcomes in each of the core components of cardiac rehabilitation/secondary prevention programs, in agreement with the 2006 update of the American Heart Association/American College of Cardiology Secondary Prevention Guidelines, including baseline patient assessment, nutritional counseling, risk factor management (lipids, blood pressure, weight, diabetes mellitus, and smoking), psychosocial interventions, and physical activity counseling and exercise training. (*Circulation*. 2007;115:2675-2682.)

Key Words: AHA Scientific Statements ■ prevention ■ rehabilitation

Cardiac rehabilitation/secondary prevention programs are recognized as integral to the comprehensive care of patients with cardiovascular disease^{1,2} and as such are recommended as useful and effective (Class I) by the American Heart Association (AHA) and the American College of Cardiology in the treatment of patients with coronary artery disease³⁻⁵ and chronic heart failure.⁶ Consensus statements from the American Heart Association,¹ the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR),⁷ and the Agency for Health Care Policy and Research² conclude that cardiac rehabilitation programs should offer a multifaceted and multidisciplinary

approach to overall cardiovascular risk reduction and that programs that consist of exercise training alone are not considered cardiac rehabilitation. The AHA and the AACVPR recognize that all cardiac rehabilitation/secondary prevention programs should contain specific core components that aim to optimize cardiovascular risk reduction, foster healthy behaviors and compliance with these behaviors, reduce disability, and promote an active lifestyle for patients with cardiovascular disease.⁸

This update to the previous statement⁸ aims to present current information on the evaluation, interventions, and expected outcomes in each of the core components of cardiac

The American Heart Association and the American Association of Cardiovascular and Pulmonary Rehabilitation make every effort to avoid any actual or potential conflicts of interest that may arise as a result of an outside relationship or a personal, professional, or business interest of a member of the writing panel. Specifically, all members of the writing group are required to complete and submit a Disclosure Questionnaire showing all such relationships that might be perceived as real or potential conflicts of interest.

This statement was approved by the American Heart Association Science Advisory and Coordinating Committee on December 11, 2006, and by the American Association of Cardiovascular and Pulmonary Rehabilitation on June 22, 2006.

This article has been copublished in the May/June issue of the *Journal of Cardiopulmonary Rehabilitation*.

Copies: This document is available on the World Wide Web sites of the American Heart Association (www.americanheart.org) and of the American Association of Cardiovascular and Pulmonary Rehabilitation (www.aacvpr.org). A single reprint is available by calling 800-242-8721 (US only) or writing the American Heart Association, Public Information, 7272 Greenville Ave, Dallas, TX 75231-4596. Ask for reprint No. 71-0394. To purchase additional reprints, call 843-216-2533 or e-mail kelle.ramsay@wolterskluwer.com.

Expert peer review of AHA Scientific Statements is conducted at the AHA National Center. For more on AHA statements and guidelines development, visit <http://www.americanheart.org/presenter.jhtml?identifier=3023366>.

Permissions: Multiple copies, modification, alteration, enhancement, and/or distribution of this document are not permitted without the express permission of the American Heart Association. Instructions for obtaining permission are located at <http://www.americanheart.org/presenter.jhtml?identifier=4431>. A link to the "Permission Request Form" appears on the right side of the page.

© 2007 American Heart Association, Inc., and the American Association of Cardiovascular and Pulmonary Rehabilitation.

Circulation is available at <http://www.circulationaha.org>

DOI: 10.1161/CIRCULATIONAHA.106.180945

rehabilitation/secondary prevention programs in agreement with the 2006 update of the AHA/American College of Cardiology (ACC) secondary prevention guidelines,⁹ including baseline patient assessment, nutritional counseling, risk factor management (lipids, blood pressure, weight, diabetes mellitus, and smoking), psychosocial interventions, and physical activity counseling and exercise training (Tables 1 and 2).^{2,7,9–25} The most notable updates in the present statement are the changes in lipid goals and strategies to attain them and a new emphasis on ensuring that patients are taking the appropriate medications that have been shown to be of substantial benefit in reducing subsequent adverse cardiovascular events. Inherent to these recommendations is the understanding that successful risk factor modification and the maintenance of a physically active lifestyle is a lifelong process. Hence, incorporation of strategies to optimize patient adherence to lifestyle and pharmacological therapies is integral to the attainment of sustained benefits. It is essential to the success of any program that each of these interventions is performed in concert with the patient's primary care provider and/or cardiologist, who will subsequently supervise and refine these interventions over the long term.¹⁰ These recommendations are intended to assist cardiac rehabilitation staff in the design and development of programs and to assist healthcare providers, insurers and policy makers, and consumers in the recognition of the comprehensive nature of such programs. In turn, insurance providers and third-party

payers should provide adequate reimbursement for cardiac rehabilitation/secondary prevention programs such that comprehensive interventions delivered by a multidisciplinary team of professionals can be sustained. It is not the intent of this statement to promote a rote approach or homogeneity among programs but rather to foster a foundation of services on which each program can establish its own specific strengths and identity and effectively attain outcome goals for its target population. Presently, these core components are an integral part of the national program certification process established by the AACVPR (<http://www.aacvpr.org/certification/>). As such, programs certified by the AACVPR are recognized as meeting essential standards of care in keeping with the contemporary definition of cardiac rehabilitation as a secondary prevention program. The AHA and AACVPR encourage all cardiac rehabilitation/secondary prevention programs to meet the standards for AACVPR program certification.

Comprehensive and detailed guidelines on cardiac rehabilitation/secondary prevention programs have been published by the AACVPR⁷ and endorsed by the AHA. Detailed guidelines on specific risk factor modification are also available.^{9,11–20} Specific details on management of patients with heart failure, valvular disease, arrhythmias, and other cardiovascular diagnoses in such programs are beyond the scope of this document and can be found in the AACVPR guidelines.⁷

TABLE 1. Core Components of Cardiac Rehabilitation/Secondary Prevention Programs: Patient Assessment, Nutritional Counseling, and Weight Management

Patient Assessment ^{7,9–11}	
Evaluation	<ul style="list-style-type: none"> ● Medical History: Review current and prior cardiovascular medical and surgical diagnoses and procedures (including assessment of left ventricular function); comorbidities (including peripheral arterial disease, cerebral vascular disease, pulmonary disease, kidney disease, diabetes mellitus, musculoskeletal and neuromuscular disorders, depression, and other pertinent diseases); symptoms of cardiovascular disease; medications (including dose, frequency, and compliance); date of most recent influenza vaccination; cardiovascular risk profile; and educational barriers and preferences. Refer to each core component of care for relevant assessment measures. ● Physical Examination: Assess cardiopulmonary systems (including pulse rate and regularity, blood pressure, auscultation of heart and lungs, palpation and inspection of lower extremities for edema and presence of arterial pulses); post-cardiovascular procedure wound sites; orthopedic and neuromuscular status; and cognitive function. Refer to each core component for respective additional physical measures. ● Testing: Obtain resting 12-lead ECG; assess patient's perceived health-related quality of life or health status. Refer to each core component for additional specified tests.
Interventions	<ul style="list-style-type: none"> ● Document the patient assessment information that reflects the patient's current status and guides the development and implementation of (1) a patient treatment plan that prioritizes goals and outlines intervention strategies for risk reduction, and (2) a discharge/follow-up plan that reflects progress toward goals and guides long-term secondary prevention plans. ● Interactively, communicate the treatment and follow-up plans with the patient and appropriate family members/domestic partners in collaboration with the primary healthcare provider. ● In concert with the primary care provider and/or cardiologist, ensure that the patient is taking appropriate doses of aspirin, clopidogrel, β-blockers, lipid-lowering agents, and ACE inhibitors or angiotensin receptor blockers as per the ACC/AHA,⁹ and that the patient has had an annual influenza vaccination.⁹
Expected Outcomes	<ul style="list-style-type: none"> ● Patient Treatment Plan: Documented evidence of patient assessment and priority short-term (ie, weeks-months) goals within the core components of care that guide intervention strategies. Discussion and provision of the initial and follow-up plans to the patient in collaboration with the primary healthcare provider. ● Outcome Report: Documented evidence of patient outcomes within the core components of care that reflects progress toward goals, including whether the patient is taking appropriate doses of aspirin, clopidogrel, β-blockers, and ACE inhibitors or angiotensin receptor blockers as per the ACC/AHA,⁹ and whether the patient has had an annual influenza vaccination⁹ (and if not, documented evidence for why not), and identifies specific areas that require further intervention and monitoring. ● Discharge Plan: Documented discharge plan summarizing long-term goals and strategies for success.

TABLE 1. Continued

Nutritional Counseling ¹²	
Evaluation	<ul style="list-style-type: none"> ● Obtain estimates of total daily caloric intake and dietary content of saturated fat, <i>trans</i> fat, cholesterol, sodium, and nutrients. ● Assess eating habits, including fruit and vegetable, whole grain, and fish consumption; number of meals and snacks; frequency of dining out; and alcohol consumption. ● Determine target areas for nutrition intervention as outlined in the core components of weight, hypertension, diabetes, as well as heart failure, kidney disease, and other comorbidities.
Interventions	<ul style="list-style-type: none"> ● Prescribe specific dietary modifications aiming to at least attain the saturated fat and cholesterol content limits of the Therapeutic Lifestyle Change diet.¹² Individualize diet plan according to specific target areas as outlined in the core components of weight, hypertension, and diabetes (as outlined in this table), as well as heart failure and other comorbidities. Recommendations should be sensitive and relevant to cultural preferences. ● Educate and counsel patient (and appropriate family members/domestic partners) on dietary goals and how to attain them. ● Incorporate behavior change models and compliance strategies into counseling sessions.
Expected Outcomes	<ul style="list-style-type: none"> ● Patient adheres to prescribed diet. ● Patient understands basic principles of dietary content, such as calories, fat, cholesterol, and nutrients. ● A plan has been provided to address eating behavior problems.
Weight Management ^{9,16,24}	
Evaluation	<ul style="list-style-type: none"> ● Measure weight, height, and waist circumference. Calculate body mass index (BMI).
Interventions	<ul style="list-style-type: none"> ● In patients with BMI >25 kg/m² and/or waist >40 inches in men (102 cm) and >35 inches (88 cm) in women*: <ul style="list-style-type: none"> ● Establish reasonable short-term and long-term weight goals individualized to the patient and his or her associated risk factors (eg, reduce body weight by at least 5% and preferably by >10% at a rate of 1-2 lb/wk over a period of time up to 6 months). ● Develop a combined diet, physical activity/exercise, and behavioral program designed to reduce total caloric intake, maintain appropriate intake of nutrients and fiber, and increase energy expenditure. The exercise component should strive to include daily, longer distance/duration walking (eg, 60-90 minutes). ● Aim for an energy deficit tailored to achieve weight goals (eg, 500-1000 kcal/day).
Expected Outcomes	<ul style="list-style-type: none"> ● Short-term: Continue to assess and modify interventions until progressive weight loss is achieved. Provide referral to specialized, validated nutrition weight loss programs if weight goals are not achieved. ● Long-term: Patient adheres to diet and physical activity/exercise program aimed toward attainment of established weight goal.

*BMI definitions for overweight and obesity may differ by race/ethnicity and region of the world. Relevant definitions, when available, should be respectively applied.

TABLE 2. Core Components of Cardiac Rehabilitation/Secondary Prevention Programs: Blood Pressure Management, Lipid Management, Diabetes Management, Tobacco Cessation, Psychosocial Management, Physical Activity Counseling, and Exercise Training

Blood Pressure Management ^{9,14}	
Evaluation	<ul style="list-style-type: none"> ● Measure seated resting blood pressure on ≥ 2 visits. ● Measure blood pressure in both arms at program entry. ● To rule out orthostatic hypotension, measure lying, seated, and standing blood pressure at program entry and after adjustments in antihypertensive drug therapy. ● Assess current treatment and compliance. ● Assess use of nonprescription drugs that may adversely affect blood pressure.
Interventions	<ul style="list-style-type: none"> ● Provide and/or monitor drug therapy in concert with primary healthcare provider as follows: ● If blood pressure is 120-139 mm Hg systolic or 80-89 mm Hg diastolic: <ul style="list-style-type: none"> ● Provide lifestyle modifications, including regular physical activity/exercise; weight management; moderate sodium restriction and increased consumption of fresh fruits, vegetables, and low-fat dairy products; alcohol moderation; and smoking cessation. ● Provide drug therapy for patients with chronic kidney disease, heart failure, or diabetes if blood pressure is $\geq 130/\geq 80$ mm Hg after lifestyle modification. ● If blood pressure is ≥ 140 mm Hg systolic or ≥ 90 mm Hg diastolic: <ul style="list-style-type: none"> ● Provide lifestyle modification and drug therapy.
Expected Outcomes	<ul style="list-style-type: none"> ● Short-term: Continue to assess and modify intervention until normalization of blood pressure in prehypertensive patients; <140 mm Hg systolic and <90 mm Hg diastolic in hypertensive patients; <130 mm Hg systolic and <80 mm Hg diastolic in hypertensive patients with diabetes, heart failure, or chronic kidney disease. ● Long-term: Maintain blood pressure at goal levels.
Lipid Management ^{9,12,13}	
Evaluation	<ul style="list-style-type: none"> ● Obtain fasting measures of total cholesterol, high-density lipoprotein, low-density lipoprotein, and triglycerides. In those patients with abnormal levels, obtain a detailed history to determine whether diet, drug, and/or other conditions that may affect lipid levels can be altered. ● Assess current treatment and compliance. ● Repeat lipid profiles at 4-6 weeks after hospitalization and at 2 months after initiation or change in lipid-lowering medications. ● Assess creatine kinase levels and liver function in patients taking lipid-lowering medications as recommended by NCEP.¹²

TABLE 2. Continued

Lipid Management, Continued	
Interventions	<ul style="list-style-type: none"> ● Provide nutritional counseling consistent with the Therapeutic Lifestyle Change diet,¹² such as the recommendation to add plant stanol/sterols and viscous fiber and the encouragement to consume more omega-3 fatty acids,⁹ as well as weight management counseling, as needed, in all patients. Add or intensify drug treatment in those with low-density lipoprotein >100 mg/dL; consider adding drug treatment in those with low-density lipoprotein >70 mg/dL. ● Provide interventions directed toward management of triglycerides to attain non-high-density lipoprotein cholesterol <130 mg/dL. These include nutritional counseling and weight management, exercise, smoking cessation, alcohol moderation, and drug therapy as per NCEP¹² and AHA/ACC.⁹ ● Provide and/or monitor drug treatment in concert with primary healthcare provider.
Expected Outcomes	<ul style="list-style-type: none"> ● Short-term: Continue to assess and modify intervention until low-density lipoprotein is <100 mg/dL (further reduction to a goal <70 mg/dL is considered reasonable⁹) and non-high-density lipoprotein cholesterol <130 mg/dL (further reduction to a goal of <100 mg/dL is considered reasonable⁹). ● Long-term: Low-density lipoprotein cholesterol <100 mg/dL (further reduction to a goal <70 mg/dL is considered reasonable⁹). Non-high-density lipoprotein cholesterol <130 mg/dL (further reduction to a goal of <100 mg/dL is considered reasonable⁹).
Diabetes Management ^{9,17,18}	
Evaluation	<ul style="list-style-type: none"> ● From medical record review: <ul style="list-style-type: none"> ● Confirm presence or absence of diabetes in all patients. ● If a patient is known to be diabetic, identify history of complications such as findings related to heart disease; vascular disease; problems with eyes, kidneys, or feet; or autonomic or peripheral neuropathy. ● From initial patient interview: <ul style="list-style-type: none"> ● Obtain history of signs/symptoms related to above complications and/or reports of episodes of hypoglycemia or hyperglycemia. ● Identify physician managing diabetic condition and prescribed treatment regimen, including: <ul style="list-style-type: none"> ● Medications and extent of compliance. ● Diet and extent of compliance. ● Blood sugar monitoring method and extent of compliance. ● Before starting exercise: <ul style="list-style-type: none"> ● Obtain latest fasting plasma glucose (FPG) and glycosylated hemoglobin (HbA1c). ● Consider stratifying patient to high-risk category because of the greater likelihood of exercise-induced complications.
Interventions	<ul style="list-style-type: none"> ● Educate patient and staff to be alert for signs/symptoms of hypoglycemia or hyperglycemia and provide appropriate assessment and interventions as per the American Diabetes Association^{17,18} ● In those taking insulin or insulin secretagogues: <ul style="list-style-type: none"> ● Avoid exercise at peak insulin times. ● Advise that insulin be injected in abdomen, not muscle to be exercised. ● Test blood sugar levels pre- and postexercise at each session: if blood sugar value is <100 mg/dL, delay exercise and provide patient 15 g of carbohydrate; retest in 15 minutes; proceed if blood sugar value is >100 mg/dL; if blood sugar value is >300 mg/dL, patient may exercise if he or she feels well, is adequately hydrated, and blood and/or urine ketones are negative; otherwise, contact patient's physician for further treatment. ● Encourage adequate hydration to avoid effects of fluid shifts on blood sugar levels. ● Caution patient that blood sugar may continue to drop for 24-48 hours after exercise. ● In those treated with diet, metformin, alpha glucosidase inhibitors, and/or thiazolidinediones, without insulin or insulin secretagogues, test blood sugar levels prior to exercise for first 6-10 sessions to assess glycemic control; exercise is generally unlikely to cause hypoglycemia. ● Education Recommendations: <ul style="list-style-type: none"> ● Teach and practice self-monitoring skills for use during unsupervised exercise. ● Refer to registered dietitian for medical nutrition therapy. ● Consider referral to certified diabetic educator for skill training, medication instruction, and support groups.
Expected Outcomes	<ul style="list-style-type: none"> ● Short-term: <ul style="list-style-type: none"> ● Communicate with primary physician or endocrinologist about signs/symptoms and medication adjustments. ● Confirm patient's ability to recognize signs/symptoms, self-monitor blood sugar status, and self-manage activities. ● Long-term: <ul style="list-style-type: none"> ● Attain FPG levels of 90-130 mg/dL and HbA1c <7%. ● Minimize complications and reduce episodes of hypoglycemia or hyperglycemia at rest and/or with exercise. ● Maintain blood pressure at <130/<80 mm Hg.

TABLE 2. Continued

Tobacco Cessation ^{9,15}	
Evaluation	<ul style="list-style-type: none"> ● Initial Encounter: <ul style="list-style-type: none"> ● Ask the patient about his or her smoking status and use of other tobacco products. Document status as never smoked, former smoker, current smoker (includes those who have quit in the last 12 months because of the high probability of relapse). Specify both amount of smoking (cigarettes per day) and duration of smoking (number of years). Quantify use and type of other tobacco products. Question exposure to second-hand smoke at home and at work. ● Determine readiness to change by asking every smoker/tobacco user if he or she is now ready to quit. ● Assess for psychosocial factors that may impede success. ● Ongoing Contact: Update status at each visit during first 2 weeks of cessation, periodically thereafter.
Interventions	<ul style="list-style-type: none"> ● When readiness to change is not expressed, provide a brief motivational message containing the “5 Rs”: Relevance, Risks, Rewards, Roadblocks, and Repetition. ● When readiness to change is confirmed, continue with the “5 As”: Ask, Advise, Assess, Assist, and Arrange. Assist the smoker/tobacco user to set a quit date, and select appropriate treatment strategies (preparation): <p><i>Minimal (brief):</i></p> <ul style="list-style-type: none"> ● Individual education and counseling by program staff supplemented by self-teaching materials. ● Social support provided by physician, program staff, family and/or domestic partner; identify other smokers in the house; discuss how to engage them in the patient’s cessation efforts. ● Relapse prevention: problem solving, anticipated threats, practice scenarios. <p><i>Optimal (intense):</i></p> <ul style="list-style-type: none"> ● Longer individual counseling or group involvement. ● Pharmacological support (in concert with primary physician): nicotine replacement therapy, bupropion hydrochloride. ● Supplemental strategies if desired (eg, acupuncture, hypnosis). ● If patient has recently quit, emphasize relapse prevention skills. ● Urge avoidance of exposure to second-hand smoke at work and home.
Expected Outcomes	<ul style="list-style-type: none"> ● Note: Patients who continue to smoke upon enrollment are subsequently more likely to drop out of cardiac rehabilitation/secondary prevention programs. ● Short-term: Patient will demonstrate readiness to change by initially expressing decision to quit and selecting a quit date. Subsequently, patient will quit smoking and all tobacco use and adhere to pharmacological therapy (if prescribed) while practicing relapse prevention strategies; patient will resume cessation plan as quickly as possible when temporary relapse occurs. ● Long-term: Complete abstinence from smoking and use of all tobacco products for at least 12 months (maintenance) from quit date. No exposure to environmental tobacco smoke at work and home.
Psychosocial Management ^{2,7}	
Evaluation	<ul style="list-style-type: none"> ● Identify psychological distress as indicated by clinically significant levels of depression, anxiety, anger or hostility, social isolation, marital/family distress, sexual dysfunction/adjustment, and substance abuse (alcohol or other psychotropic agents), using interview and/or standardized measurement tools. ● Identify use of psychotropic medications.
Interventions	<ul style="list-style-type: none"> ● Offer individual and/or small group education and counseling on adjustment to heart disease, stress management, and health-related lifestyle change. When possible, include family members, domestic partners, and/or significant others in such sessions. ● Develop supportive rehabilitation environment and community resources to enhance the patient’s and the family’s level of social support. ● Teach and support self-help strategies. ● In concert with primary healthcare provider, refer patients experiencing clinically significant psychosocial distress to appropriate mental health specialists for further evaluation and treatment.
Expected Outcomes	<ul style="list-style-type: none"> ● Emotional well-being is indicated by the absence of clinically significant psychological distress, social isolation, or drug dependency. ● Patient demonstrates responsibility for health-related behavior change, relaxation, and other stress management skills; ability to obtain effective social support; compliance with psychotropic medications if prescribed; and reduction or elimination of alcohol, tobacco, caffeine, or other nonprescription psychoactive drugs. ● Arrange for ongoing management if important psychosocial issues are present.
Physical Activity Counseling ^{7,9,19,21,22}	
Evaluation	<ul style="list-style-type: none"> ● Assess current physical activity level (eg, questionnaire, pedometer) and determine domestic, occupational, and recreational needs. ● Evaluate activities relevant to age, gender, and daily life, such as driving, sexual activity, sports, gardening, and household tasks. ● Assess readiness to change behavior, self-confidence, barriers to increased physical activity, and social support in making positive changes.

TABLE 2. Continued

Physical Activity Counseling,
Continued

Interventions	<ul style="list-style-type: none"> ● Provide advice, support, and counseling about physical activity needs on initial evaluation and in follow-up. Target exercise program to meet individual needs (see Exercise Training section of table). Provide educational materials as part of counseling efforts. Consider exercise tolerance or simulated work testing for patients with heavy labor jobs. ● Consistently encourage patients to accumulate 30-60 minutes per day of moderate-intensity physical activity on ≥ 5 (preferably most) days of the week. Explore daily schedules to suggest how to incorporate increased activity into usual routine (eg, parking farther away from entrances, walking ≥ 2 flights of stairs, and walking during lunch break). ● Advise low-impact aerobic activity to minimize risk of musculoskeletal injury. Recommend gradual increases in the volume of physical activity over time. ● Caution patients to avoid performing unaccustomed vigorous physical activity (eg, racquet sports and manual snow removal). Reassess the patient's ability to perform such activities as exercise training program progresses.
Expected Outcomes	<ul style="list-style-type: none"> ● Patient shows increased participation in domestic, occupational, and recreational activities. ● Patient shows improved psychosocial well-being, reduction in stress, facilitation of functional independence, prevention of disability, and enhancement of opportunities for independent self-care to achieve recommended goals. ● Patient shows improved aerobic fitness and body composition and lessens coronary risk factors (particularly for the sedentary patient who has adopted a lifestyle approach to regular physical activity).
Exercise Training ^{7,19-22}	
Evaluation	<ul style="list-style-type: none"> ● Symptom-limited exercise testing prior to participation in an exercise-based cardiac rehabilitation program is strongly recommended. The evaluation may be repeated as changes in clinical condition warrant. Test parameters should include assessment of heart rate and rhythm, signs, symptoms, ST-segment changes, hemodynamics, perceived exertion, and exercise capacity. ● On the basis of patient assessment and the exercise test if performed, risk stratify the patient to determine the level of supervision and monitoring required during exercise training. Use risk stratification schema as recommended by the AHA¹⁹ and the AACVPR.⁷
Interventions	<ul style="list-style-type: none"> ● Develop an individualized exercise prescription for aerobic and resistance training that is based on evaluation findings, risk stratification, comorbidities (eg, peripheral arterial disease and musculoskeletal conditions), and patient and program goals. The exercise regimen should be reviewed by the program medical director or referring physician, modified if necessary, and approved. Exercise prescription should specify frequency (F), intensity (I), duration (D), modalities (M), and progression (P). <ul style="list-style-type: none"> ● For aerobic exercise: F=3-5 days/wk; I=50-80% of exercise capacity; D=20-60 minutes; and M=walking, treadmill, cycling, rowing, stair climbing, arm/leg ergometry, and others using continuous or interval training as appropriate. ● For resistance exercise: F=2-3 days/wk; I=10-15 repetitions per set to moderate fatigue; D=1-3 sets of 8-10 different upper and lower body exercises; and M=calisthenics, elastic bands, cuff/hand weights, dumbbells, free weights, wall pulleys, or weight machines. ● Include warm-up, cool-down, and flexibility exercises in each exercise session. ● Provide progressive updates to the exercise prescription and modify further if clinical status changes. ● Supplement the formal exercise regimen with activity guidelines as outlined in the Physical Activity Counseling section of this table.
Expected Outcomes	<ul style="list-style-type: none"> ● Patient understands safety issues during exercise, including warning signs/symptoms. ● Patient achieves increased cardiorespiratory fitness and enhanced flexibility, muscular endurance, and strength. ● Patient achieves reduced symptoms, attenuated physiologic responses to physical challenges, and improved psychosocial well-being. ● Patient achieves reduced global cardiovascular risk and mortality resulting from an overall program of cardiac rehabilitation/secondary prevention that includes exercise training.²³

Disclosures

Writing Group Disclosures

Writing Group Member	Employment	Research Grant	Other Research Support	Speakers' Bureau/Honoraria	Ownership Interest	Consultant/Advisory Board	Other
Gary J. Balady	Boston University Medical Center	None	None	None	None	None	None
Mark A. Williams	Creighton University School of Medicine	None	None	None	None	None	None
Philip A. Ades	University of Vermont, Fletcher-Allen Health Care	None	None	None	None	None	None
Vera Bittner	University of Alabama at Birmingham	Pfizer, Atherogenics, NHLBI	None	Pfizer, Reliant	None	Pfizer, Reliant, CV Therapeutics	None
Patricia Comoss	Nursing Enrichment Consultants, Inc	None	None	None	Nursing Enrichment Consultants, Inc (president and owner)	None	None
Jo Anne M. Foody	Yale University	None	None	Merck, Pfizer	None	Merck, Pfizer	None
Barry Franklin	William Beaumont Hospital and Health Center	None	None	None	None	None	None
Bonnie Sanderson	University of Alabama at Birmingham	None	None	None	None	None	None
Douglas Southard	Health Management Consultants	None	None	None	None	None	None

This table represents the relationships of writing group members that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire, which all members of the writing group are required to complete and submit.

Reviewer Disclosures

Reviewer	Employment	Research Grant	Other Research Support	Speakers' Bureau/Honoraria	Expert Witness	Ownership Interest	Consultant/Advisory Board	Other
Jerome Fleg	National Heart, Lung, and Blood Institute	None	None	None	None	None	None	None
Gerald Fletcher	Mayo Clinic Jacksonville	None	None	None	None	None	None	None
Erika Sivarajan Froelicher	University of California, San Francisco	None	None	None	None	None	None	None
Nanette K. Wenger	Emory University School of Medicine	None	None	None	None	None	None	None

This table represents the relationships of reviewers that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire, which all reviewers are required to complete and submit.

References

- Leon S, Franklin BA, Costa F, Balady GJ, Berra KA, Stewart KJ, Thompson PD, Williams MA, Lauer MS. Cardiac rehabilitation and secondary prevention of coronary heart disease: an American Heart Association scientific statement from the Council on Clinical Cardiology (Subcommittee on Exercise, Cardiac Rehabilitation, and Prevention) and the Council on Nutrition, Physical Activity, and Metabolism (Subcommittee on Physical Activity), in collaboration with the American Association of Cardiovascular and Pulmonary Rehabilitation [published correction appears in *Circulation*. 2005;111:1717]. *Circulation*. 2005;111:369–376.
- Wenger NK, Froelicher ES, Smith LK, Ades PA, Berra K, Blumenthal JA, Certo CME, Dattilo AM, Davis D, DeBosk RF, Drozda JP, Fletcher BJ, Franklin BA, Gaston H, Greenland P, McBride PE, McGregor CGA, Oldridge NB, Piscatella JC, Rogers FJ. *Cardiac Rehabilitation*. Clinical Practice Guideline No. 17. Rockville, Md: US Department of Health and Human Services, Public Health Service, Agencies for Health Care Policy and Research, and the National Heart, Lung, and Blood Institute. AHCPR publication No. 96-0672. October 1995.
- Antman EM, Anbe ST, Armstrong PW, Bates ER, Green LA, Hand M, Hochman JS, Krumholz HM, Kushner FG, Lamas GA, Mullany CJ, Ornato JP, Pearle DL, Sloan MA, Smith SC Jr; American College of Cardiology; American Heart Association; Canadian Cardiovascular Society. ACC/AHA guidelines for the management of patients with ST-elevation myocardial infarction: executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the 1999 Guidelines for the Management of Patients With Acute Myocardial Infarction) [published correction appears in *J Am Coll Cardiol*. 2005;45:1376]. *J Am Coll Cardiol*. 2004;44:671–719.
- Braunwald E, Antman EM, Beasley JW, Califf RM, Cheitlin MD, Hochman JS, Jones RH, Kereiakes D, Kupersmith J, Levin TN, Pepine CJ, Schaeffer JW, Smith EE III, Steward DE, Theroux P, Gibbons RJ, Alpert JS, Faxon DP, Fuster V, Gregoratos G, Hiratzka LF, Jacobs AK, Smith SC Jr. ACC/AHA 2002 guideline update for the management of patients with unstable angina and non–ST-segment elevation myocardial infarction: summary article: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on the Management of Patients With Unstable Angina). *J Am Coll Cardiol*. 2002;40:1366–1374.
- Gibbons RJ, Abrams J, Chatterjee K, Daley J, Deedwania PC, Douglas JS, Ferguson TB Jr, Fihn SD, Fraker TD Jr, Gardin JM, O'Rourke RA, Pasternak RC, Williams SV, Gibbons RJ, Alpert JS, Antman EM, Hiratzka LF, Fuster V, Faxon DP, Gregoratos G, Jacobs AK, Smith SC Jr. ACC/AHA 2002 guideline update for the management of patients with chronic stable angina: summary article: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on the Management of Patients With Chronic Stable Angina). *Circulation*. 2003;107:149–158.
- Hunt SA, Abraham WT, Chin MH, Feldman AM, Francis GS, Ganiats TG, Jessup M, Konstam MA, Mancini DM, Oates JA, Rahko PS, Silver MA, Stevenson LW, Yancy CW. ACC/AHA guideline update for the diagnosis and management of chronic heart failure in the adult: summary article: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Update the 2001 Guidelines for the Evaluation and Management of Heart Failure): developed in collaboration with the American College of Chest

- Physicians and the International Society for Heart and Lung Transplantation: endorsed by the Heart Rhythm Society. *Circulation*. 2005;112:1825–1852.
7. American Association for Cardiovascular and Pulmonary Rehabilitation. *Guidelines for Cardiac Rehabilitation and Secondary Prevention Programs*. 4th ed. Champaign, Ill: Human Kinetics Publishers; 2004.
 8. Balady GJ, Ades PA, Comoss P, Limacher M, Piña IL, Southard D, Williams MA, Bazzarre T. Core components of cardiac rehabilitation/secondary prevention programs: a statement for healthcare professionals from the American Heart Association and the American Association of Cardiovascular and Pulmonary Rehabilitation Writing Group. *Circulation*. 2000;102:1069–1073.
 9. Smith SC, Allen J, Blair SN, Bonow RO, Brass LM, Fonarow GC, Grundy SM, Hiratzka L, Jones D, Krumholz HM, Mosca L, Pasternak RC, Pearson T, Pfeffer MA, Taubert KA. AHA/ACC guidelines for secondary prevention for patients with coronary and other atherosclerotic vascular disease: 2006 update: endorsed by the National Heart, Lung, and Blood Institute [published correction appears in *Circulation*. 2006;113:e-847]. *Circulation*. 2006;113:2363–2372.
 10. King ML, Williams MA, Fletcher GF, Gordon NF, Gulanic M, King CN, Leon AS, Levine BD, Costa F, Wenger NK. Medical director responsibilities for outpatient cardiac rehabilitation/secondary prevention programs: a scientific statement from the American Heart Association/American Association for Cardiovascular and Pulmonary Rehabilitation. *Circulation*. 2005;112:3354–3360.
 11. Sanderson BK, Southard D, Oldridge N. AACVPR consensus statement: outcomes evaluation in cardiac rehabilitation/secondary prevention programs: improving patient care and program effectiveness. *J Cardiopulm Rehabil*. 2004;24:68–79.
 12. National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) final report. *Circulation*. 2002;106:3143–3421.
 13. Grundy SM, Cleeman JI, Merz CN, Brewer HB Jr, Clark LT, Hunninghake DB, Pasternak RC, Smith SC Jr, Stone NJ; for the Coordinating Committee of the National Cholesterol Education Program, endorsed by the National Heart, Lung, and Blood Institute, American College of Cardiology Foundation, and American Heart Association. Implications of recent clinical trials for the National Cholesterol Education Program Adult Treatment Panel III guidelines [published correction appears in *Circulation*. 2004;110:763]. *Circulation*. 2004;110:227–239.
 14. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, Jones DW, Materson BJ, Oparil S, Wright JT Jr, Roccella EJ. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: the JNC 7 report [published correction appears in *JAMA*. 2003;290:197]. *JAMA*. 2003;289:2560–2572.
 15. Fiore MC, Bailey WC, Cohen SJ; for expert panel. *Treating Tobacco Use and Dependence*. Quick Reference Guide for Clinicians. Rockville, Md: US Department of Health and Human Services, Public Health Service. October 2000.
 16. Expert Panel on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults. Executive summary of the clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults. *Arch Intern Med*. 1998;158:1855–1867.
 17. American Diabetes Association. Standards of medical care for patients with diabetes mellitus [published correction appears in *Diabetes Care*. 2003;26:972]. *Diabetes Care*. 2003;26(suppl 1):S33–S50.
 18. Sigal RJ, Kenny GP, Wasserman DH, Castaneda-Sceppa C, White RD. American Diabetes Association. Physical activity/exercise and type 2 diabetes: a consensus statement from the American Diabetes Association. *Diabetes Care*. 2006;29:1433–1438.
 19. Thompson PD, Buchner D, Piña IL, Balady GJ, Williams MA, Marcus BH, Berra K, Blair SN, Costa F, Franklin B, Fletcher GF, Gordon NF, Pate RR, Rodriguez BL, Yancey AK, Wenger NK. 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 Activity). *Circulation*. 2003;107:3109–3116.
 20. Grundy SM, Pasternak R, Greenland P, Smith S Jr, Fuster V. Assessment of cardiovascular risk by use of multiple-risk-factor assessment equations: a statement for healthcare professionals from the American Heart Association and the American College of Cardiology. *Circulation*. 1999;100:1481–1492.
 21. American College of Sports Medicine. *Guidelines for Graded Exercise Testing and Exercise Prescription*. 7th ed. Baltimore, Md: Williams & Wilkins; 2006.
 22. Piña IL, Apstein CS, Balady GJ, Belardinelli R, Chaitman BR, Duscha BD, Fletcher BJ, Fleg JL, Myers JN, Sullivan MJ. Exercise and heart failure: a statement from the American Heart Association Committee on exercise, rehabilitation, and prevention. *Circulation*. 2003;107:1210–1225.
 23. Taylor RS, Brown A, Ebrahim S, Jolliffe J, Noorani H, Rees K, Skidmore B, Stone JA, Thompson DR, Oldridge N. Exercise-based rehabilitation for patients with coronary heart disease: systematic review and meta-analysis of randomized controlled trials. *Am J Med*. 2004;116:682–692.
 24. Poirier P, Giles TD, Bray GA, Hong Y, Stern JS, Pi-Sunyer FX, Eckel RH. Obesity and cardiovascular disease: pathophysiology, evaluation, and effect of weight loss: an update of the 1997 American Heart Association Scientific Statement on Obesity and Heart Disease from the Obesity Committee of the Council on Nutrition, Physical Activity, and Metabolism. *Circulation*. 2006;113:898–918.
 25. US Preventive Services Task Force. Screening for depression: recommendations and rationale. *Ann Intern Med*. 2002;136:760–764.

Core Components of Cardiac Rehabilitation/Secondary Prevention Programs: 2007 Update: A Scientific Statement From the American Heart Association Exercise, Cardiac Rehabilitation, and Prevention Committee, the Council on Clinical Cardiology; the Councils on Cardiovascular Nursing, Epidemiology and Prevention, and Nutrition, Physical Activity, and Metabolism; and the American Association of Cardiovascular and Pulmonary Rehabilitation

Gary J. Balady, Mark A. Williams, Philip A. Ades, Vera Bittner, Patricia Comoss, JoAnne M. Foody, Barry Franklin, Bonnie Sanderson and Douglas Southard

Circulation. 2007;115:2675-2682; originally published online May 18, 2007;
doi: 10.1161/CIRCULATIONAHA.106.180945

Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2007 American Heart Association, Inc. All rights reserved.
Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the
World Wide Web at:

<http://circ.ahajournals.org/content/115/20/2675>

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in *Circulation* can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the [Permissions and Rights Question and Answer](#) document.

Reprints: Information about reprints can be found online at:
<http://www.lww.com/reprints>

Subscriptions: Information about subscribing to *Circulation* is online at:
<http://circ.ahajournals.org/subscriptions/>