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STATE-OF-THE-ART PAPER

Cardiac Rehabilitation Exercise and Self-Care for Chronic Heart Failure

Philip A. Ades, MD,* Steven J. Keteyian, PhD,† Gary J. Balady, MD,‡ Nancy Houston-Miller, BSN,§ Dalane W. Kitzman, MD,|| Donna M. Mancini, MD,¶ Michael W. Rich, MD#

Burlington, Vermont; Detroit, Michigan; Boston, Massachusetts; Stanford, California; Winston-Salem, North Carolina; New York, New York; and St. Louis, Missouri

Chronic heart failure (CHF) is highly prevalent in older individuals and is a major cause of morbidity, mortality, hospitalizations, and disability. Cardiac rehabilitation (CR) exercise training and CHF self-care counseling have each been shown to improve clinical status and clinical outcomes in CHF. Systematic reviews and meta-analyses of CR exercise training alone (without counseling) have demonstrated consistent improvements in CHF symptoms in addition to reductions in cardiac mortality and number of hospitalizations, although individual trials have been less conclusive of the latter 2 findings. The largest single trial, HF-ACTION (Heart Failure: A Controlled Trial Investigating Outcomes of Exercise Training), showed a reduction in the adjusted risk for the combined endpoint of all-cause mortality or hospitalization (hazard ratio: 0.89, 95% confidence interval: 0.81 to 0.99; p = 0.03). Quality of life and mental depression also improved. CHF-related counseling, whether provided in isolation or in combination with CR exercise training, improves clinical outcomes and reduces CHF-related hospitalizations. We review current evidence on the benefits and risks of CR and self-care counseling in patients with CHF, provide recommendations for patient selection for third-party payers, and discuss the role of CR in promoting self-care and behavioral changes. (J Am Coll Cardiol HF 2013;1:540–7) © 2013 by the American College of Cardiology Foundation

Cardiac rehabilitation (CR)/secondary prevention programs are recognized as integral to the comprehensive care of patients with chronic heart failure (CHF) (1,2). Effective CR for CHF incorporates *both* supervised exercise training and comprehensive disease-related self-care counseling. Programs that consist of exercise training alone are not considered CR (3). Exercise training and CHF disease-related self-care counseling are both recommended by the American Heart Association (AHA) and the American College of Cardiology (ACC) as useful and effective in CHF at the Class I level (2). CR, which combines exercise training and self-care, is recommended by the ACC at the Class IIa level (2).

CHF affects >6.5 million Americans, and >650,000 new cases are diagnosed each year (4). Moreover, the prevalence and incidence of CHF are increasing, largely due to the aging of the population. CHF is the leading cause of hospitalization in the Medicare age group, accounting for >1 million admissions annually, and it is also a major source of diminished functional capacity, impaired quality of life, disability, and mortality (4). Despite major advances in CHF therapies, most patients continue to experience exercise intolerance due to intrinsic abnormalities of cardiac function coupled with maladaptive changes in skeletal muscles, the vasculature, and pulmonary circulation. Additionally, the magnitude of the exercise intolerance, as measured by peak oxygen uptake (V_{O_2}), is strongly and independently associated with prognosis in patients with CHF (5). Although CHF was once considered a contraindication to exercise, numerous studies demonstrate that regular exercise is safe and associated with a multitude of benefits in appropriately selected patients. This review will delineate the role of structured CR, including exercise training and self-care counseling, in patients with CHF and makes recommendations for the selection of appropriate patients for coverage of a CR benefit by third-party payers.

From the *Division of Cardiology, University of Vermont College of Medicine, Burlington, Vermont; †Division of Cardiology, Henry Ford Hospital, Detroit, Michigan; ‡Division of Cardiology, Boston University Medical Center, Boston, Massachusetts; §Department of Medicine, Stanford University School of Medicine, Stanford, California; ||Division of Cardiology, Wake Forest School of Medicine, Winston-Salem, North Carolina; ¶Division of Cardiology, Columbia University College of Medicine, New York, New York; and the #Division of Cardiology, Washington University School of Medicine, St. Louis, Missouri. The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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Exercise Training Studies in CHF

Effects on exercise capacity. Exercise training is recommended in the therapeutic approach to the stable CHF patient, and is supported by the ACC, the AHA, and the Heart Failure Society of America at a Class 1or 2 level (2,6). Endurance-type exercise training favorably affects peak V_{O_2}, central hemodynamic function, autonomic function, peripheral vascular and muscle function, and exercise capacity in CHF (Table 1) (7). These adaptations result in an exercise training effect that allows individuals to exercise to higher peak workloads or to the same submaximal workload at a lower heart rate and perceived effort (8). Daily activities are performed with less dyspnea and fatigue. Although training protocols vary, most CHF trials employ moderate-vigorous intensity exercise (50% to 60% peak V_{O_2}), yielding improvements of 13% to 31% in peak exercise capacity (Fig. 1). One study of lower intensity training (40% to 50% peak V_{O_2}) demonstrated a training effect after 8 to 12 weeks (9). A newer training technique termed "high-intensity interval training" (HIT) may yield greater improvements in peak V_{O_2} (up to 46%) than moderate intensity continuous training in patients with systolic CHF (10). (See the Exercise Prescription for CHF section for more details.) A meta-analysis of 57 studies, which involved patients with reduced ejection fraction and that directly measured peak V_{O_2}, reported an average 17% improvement in peak V_{O_2} (11). This is identical to the improvement in fitness seen in CR for patients with coronary artery disease (12). Of more than 2 dozen single-site, randomized exercise training studies, 8 were conducted with >70% of subjects taking angiotensin-converting enzyme inhibitors and β-adrenergic blockers. The unweighted median increase in peak V_{O_2} was 2.1 ml/kg/min (15%), whereas the unweighted median change among nonexercising controls was 0.1 ml/kg/min (1%) (Fig. 1) (13).

Heart failure with preserved ejection fraction (HFPEF) occurs in approximately 50% or more of CHF patients, and the proportion is higher among women and the very elderly (14,15). Despite its prevalence, due to its more recent recognition as a clinical entity (16), there are considerably fewer data on the role of physical training in HFPEF than in systolic CHF. However, 7 controlled trials (5 randomized, 1 multicenter) of physical training in HFPEF patients (17–24) (Table 2) have demonstrated that physical training is a safe and effective intervention to improve symptoms, to increase aerobic capacity and endurance, and generally to improve self-reported quality of life as well. Resting diastolic left ventricular function was found to be improved following exercise training in some studies (19,20) but not in others (18,21). Improvements in peripheral, noncardiac factors, particularly skeletal muscle, are major contributors to the training-related improvement in exercise capacity in older HFPEF patients (21,23,25). This is not dissimilar to observations made in heart failure with reduced ejection fraction patients, and it highlights the potential for CR to improve not only cardiac function, but also arterial and skeletal muscle function (26).

Exercise training alone on morbidity and mortality. ExTraMATCH (Exercise Training Meta-Analysis of Trials in Patients With Chronic Heart Failure) (27) analyzed 9 datasets that included 801 systolic CHF patients and demonstrated a significant 35% reduction in mortality in trained patients versus controls during a mean follow-up of 705 days. A more recent Cochrane Review of 19 trials (3,647 participants) showed no difference in pooled mortality at <1 year follow-up, but showed a nonsignificant trend toward lower mortality among trials with a follow-up >1 year (28). A significant 28% reduction in hospitalization rate at 1 year was demonstrated with exercise.

An analysis of >600,000 patients from the Medicare database addressed the effects of CR exercise training on mortality. Subgroup analyses of patients with CHF showed a 15% lower mortality in CHF patients who participated in CR compared with carefully matched CHF patients who did not participate (29).

Abbreviations and Acronyms

ACC = American College of Cardiology
AHA = American Heart Association
CHF = chronic heart failure
CR = cardiac rehabilitation
HFPEF = heart failure with preserved ejection fraction
HIT = higher intensity interval training
LVEF = left ventricular ejection fraction
MET = metabolic equivalent
NYHA = New York Heart Association
V_{O_2} = peak oxygen uptake

Table 1 Beneficial Effects of Exercise in Chronic Heart Failure

Aerobic training	Increased exercise capacity
	Lower heart rate response to submaximal exercise
	Improved diastolic function
	Improved endothelial function
	Increased skeletal muscle oxidative capacity
	Enhanced vagal tone and lower sympathetic tone
	Reduced inflammatory cytokines
	Lower all-cause mortality or hospitalization
	Improved quality of life
Resistance training	Increased muscle strength and endurance

Adapted, with permission, from Downing and Balady (7).

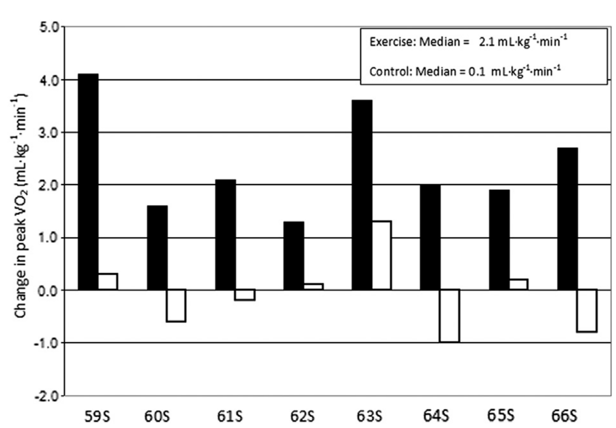

Figure 1 Reported Changes in Peak V_{O_2} in Aerobic Exercise-Trained Subjects

Subjects are from 8 single-site, randomized clinical trials in patients with congestive heart failure (13). **Solid bars** represent exercise-trained subjects; **open bars** represent control subjects. V_{O_2} = oxygen uptake. Adapted, with permission, from Keteyian (13).

Table 2 Controlled Exercise Intervention Trials in HFPEF Patients

First Author (Ref. #)	Group/Sample Size	Age, yrs	EF %	Mode	Frequency, days/week	Intensity	Duration, min	Length of Program, weeks	Main Findings
Gary et al. 2006 (17)	ET (n = 15) CNT (n = 13)	67 69	54 57	Walk	3	40%–60%	30	12	↑ 6MWD, QOL
Kitzman et al. 2010 (18)	ET (n = 24) CNT (n = 22)	70 69	61 60	Walk, cycle	3	40%–70% HRR	60	16	↑ peak V_{O_2}, ventilation threshold, 6MWD, and physical QOL
Edelmann et al. 2011 (19)	ET (n = 44) CNT (n = 20)	64 65	67 66	Cycle, RT (UE/LE)	2–3 2	HR: 50%–70% peak V_{O_2} 60%–65% 1RM	20–40 15 REPS	12 weeks 5–12	↑ peak V_{O_2}, 6MWD, physical function, ↓ rest LAV, E/e′, and procollagen type I
Alves et al. 2012 (20)	ET (n = 20) CNT (n = 11)	GP 63	GP 56	Cycle, treadmill	3	5–7 intervals (3–5 min duration) at 70%–75% HR_{max} with 1-min active recovery at 45%–55% HR_{max}	15–35	24	↑ peak MET, ↑ rest LVEF, E/A ratio, ↓ DT
Kitzman et al. 2013 (21)	ET (n = 32) CNT (n = 31)	70	58 56	Walking, cycle, arm ergometry	3	40%–79% HRR	60	16	↑ peak V_{O_2}, ↑ QOL, no change FMD, arterial stiffness
Smart et al. 2012 (22)	ET (n = 15) CNT (n = 15)	64	57	Cycle ergometry	3	60%–70% peak V_{O_2}	30	16	↑ peak V_{O_2}, ↓VE/V_{CO_2}, no change systolic or diastolic LV function
Fujimoto et al. 2012 (23)	ET (n = 7) CNT (n = 13)	73	76	Walking, cycling	3	70%–80% HR_{max}	25–40	52	No change in peak V_{O_2}, arterial stiffness, LV compliance, and volumes

CNT = control; DT = deceleration time; E/A = early to late mitral inflow velocity; E/e′ = early mitral inflow velocity/mitral annular excursion; EF = ejection fraction; ET = exercise training; FMD = flow-mediated vasodilatation; GP = data provided is for mean of whole group; HFPEF = heart failure with preserved ejection fraction; HR = heart rate; HR_{max}: maximal heart rate; HRR = heart rate reserve; LAV = left atrial volume; LE = lower extremity; LV = left ventricular; LVEF = left ventricular ejection fraction; MET = metabolic equivalent; QOL = quality of life; REPS = repetitions = RT = resistance training; UE = upper extremity; VE-V_{CO_2} slope = relationship between ventilation and carbon dioxide production; V_{O_2} = oxygen uptake; 1RM = 1-repetition maximum; 6MWD = 6-min walk distance.

HF-ACTION (Heart Failure: A Controlled Trial Investigating Outcomes of Exercise Training) (30,31) was a multicenter, randomized-controlled trial designed to measure the effects of exercise training alone (without CHF self-care counseling) on clinical outcomes in medically optimized, stable systolic CHF patients (left ventricular ejection fraction [LVEF] ≤35%) (30,31). The composite primary endpoint was all-cause mortality or all-cause hospitalization. Study subjects had New York Heart Association (NYHA) functional class II to IV symptoms (n = 2,331; 63% class II, 36% class III) and were randomized to 36 sessions of supervised, moderate-intensity training (60% to 70% heart rate reserve) followed by home-based training or usual care. At a median follow-up of 30 months, there was a 7% reduction in the primary combined endpoint ($p = 0.13$). After adjustment for pre-specified predictors of mortality (duration of exercise test, LVEF, Beck Depression Inventory II score, and history of atrial fibrillation), there was a statistically significant difference in the primary endpoint (hazard ratio: 0.89; $p = 0.03$). The median improvement in peak V_{O_2} in the exercise training group was only 4%. This less-than-expected training effect reflected a low adherence rate to exercise in the training group, as only 30% of subjects attained the targeted min/week. Furthermore, 8% of control patients exercised regularly. These factors might have attenuated differences in clinical outcomes between the study groups. In a subsequent analysis that investigated the relationship between volume of exercise and clinical events, patients who exercised as prescribed experienced a >30% reduction in mortality or hospitalization (32). In HF-ACTION, exercise training-induced increases in peak V_{O_2} were closely correlated with a better prognosis (33). For every 6% increase in peak V_{O_2} (+0.9 ml/kg/min) there was an associated 5% lower risk of the primary endpoint ($p < 0.001$) and an associated 8% lower risk of combined cardiovascular mortality and CHF hospitalizations ($p < 0.001$). Exercise training at 3 to 5 metabolic equivalent (MET) h/week was associated with 37% and 64% reductions in adjusted risks for death/hospitalization ($p = 0.03$) and cardiovascular death/heart failure hospitalization ($p = 0.001$) (25). Thus, for exercise to improve long-term outcomes, adherence to the exercise prescription is necessary (32,33). In the clinical setting, it is notable that third-party payers would reimburse only for CR sessions attended, which, as noted above, is linked with improved clinical outcomes.

Concerning any potential interaction among minority status, exercise training, and clinical outcomes, a secondary analysis of the HF-ACTION trial (34) found no interaction effect for all-cause mortality/hospitalization ($p = 0.66$), all-cause mortality alone ($p = 0.68$), or cardiovascular mortality/heart failure hospitalization ($p = 0.75$). This suggested that the favorable effects ascribed to exercise training and clinical outcomes occurred irrespective of race (31). Similarly, concerning sex, exercise training, and mortality, no interaction effect was observed when comparing women versus men ($p = 0.27$) (27). HF-ACTION showed a similar finding for sex, exercise training, and the combined endpoint of all-cause mortality/hospitalization (p value for interaction = 0.17) (31), also suggesting that the favorable exercise training-induced improvement in this clinical outcome occurred irrespective of sex. In the European Heart Failure Training Group study (35), the authors reported an observed increase in peak V_{O_2} among women (+2.7 ml/kg/min) that paralleled the increase observed among men.

Finally, a study of 123 patients with CHF randomized to supervised exercise training versus control status found that after 10 years of training, the training group had higher quality of life ($p < 0.05$), fewer hospital readmissions ($p < 0.001$), and a lower cardiac mortality ($p < 0.001$) than the control group (36). Thus, the clinical benefits of exercise training in systolic CHF can be expected to be long lasting. The effects of exercise training on prognosis may relate to its effects on autonomic function. Neurohumeral excitation and increased sympathetic nerve activity, both characteristic of CHF, are associated with long-term mortality, and these abnormalities are reduced by exercise training (37–39).

Resistance training in CHF. Studies of resistance training among systolic CHF patients have demonstrated clinical benefits, including improved muscle strength and endurance, with a lower V_{O_2} at submaximal workloads (40,41). Strength training also plays an important role in decreasing functional disability and improving physical function in CHF patients (42). Strength training has no deleterious effects on left ventricular function or structure in CHF patients (43). Resistance training was included as an adjunctive modality to standard aerobic exercise training in 1 trial of HFPEF (19), but it has not been studied as a primary training modality.

Exercise training effects on functional class, quality of life, and mental depression in CHF. The European Heart Failure Training Group reported on 134 patients with CHF and observed that NYHA functional class improved with aerobic training by 0.5 class compared with controls ($p < 0.01$), and the benefit was proportional to improvement in peak V_{O_2} (35). In HF-ACTION, 30% of subjects in the exercise group improved by 1 full NYHA functional class or more (30).

The effect of exercise training on health status and quality of life in CHF has been studied using the Kansas City Cardiomyopathy Questionnaire. In HF-ACTION, 3 months of exercise training led to a greater improvement in the Kansas City Cardiomyopathy Questionnaire total score than in controls (5.2 points vs. 3.3 points; $p < 0.001$), an increase that was maintained throughout the 30-month follow-up (30). Greater improvements in the exercise arm were seen for physical limitations, symptoms, and quality of life. A 2010 Cochrane Review of 6 exercise studies (700 patients) that utilized the Minnesota Living with Heart Failure Questionnaire showed a clinically-relevant improvement in quality of life of more than 10 U after exercise training (28). In the HF-ACTION study, exercise training resulted in lower depression scores at 3 and 12 months (both $p < 0.05$) (44). Improved quality of life has generally been observed with exercise training in HFPEF patients as well (24).

Cardiac rehabilitation for patients with CHF and cardiac devices. Many patients with CHF have implantable cardioverter-defibrillators, some with the capability of cardiac resynchronization therapy. Three randomized controlled trials have shown that structured exercise training leads to further improvements in exercise capacity and quality of life beyond cardiac resynchronization therapy alone (45–47). In HF-ACTION, 490 of 2,331 patients had implantable cardioverter-defibrillators, and only 1 patient experienced an exercise-induced discharge (31).

Safety of exercise training in heart failure. Large meta-analyses show no evidence of adverse events from exercise training for CHF (11,27,28). HF-ACTION (31) provides the largest single study in which the safety of exercise in patients with stable heart failure with reduced ejection fraction was carefully assessed. Exercise training was well tolerated and safe (48). No serious adverse training-related events have been reported in 6 trials that studied training in HFPEF patients (approximately 250 patients), which generally included older patients than in systolic CHF trials and a larger percentage of women (24).

Exercise Prescription for CHF

Pre-training exercise testing. Exercise testing is recommended prior to enrollment in an exercise program to screen for patients at high risk for adverse events and to assist in the determination of an exercise training intensity range. Such testing is safe, with a nonfatal major event rate of 1 per 2,000 tests (49). Exercise testing can be performed with simultaneous measurement of expired gases since both peak V_{O_2} and the relationship between ventilation and carbon dioxide production (VE-VCO_2 slope) provide useful prognostic and prescriptive information (50).

Exercise prescription. Exercise protocols used in clinical trials primarily included aerobic-type activities such as walking, stationary cycling, or rowing (11,27,31). The volume of exercise performed each week is progressively adjusted over time. For most patients, the prescribed volume of exercise approximates 3 to 7 MET-h/week (13). Common approaches to titration of exercise intensity involve progressively increasing effort until it falls within a training range between 55% and 80% of heart rate reserve (11,49) or between 70% and 85% of maximal heart rate at a Borg perceived exertion between 12 and 14. The duration and frequency of effort should be up-titrated before intensity is increased. The target duration should be $\geq$30 min/session 4 days/week (13). Once patients demonstrate a tolerance of aerobic training levels, resistance training activities are added. Such training should occur 2 to 3 times/week and should focus on the major muscle groups using 1 to 2 sets of 10 to 12 repetitions/set (40,41). The intensity of resistance training is increased progressively.

Over the past decade, several groups have studied HIT to improve exercise intolerance (10). Wisloff et al. (10) showed that HIT (4 intermittent 4-min intervals at up to 95% of peak heart rate) improved peak VO_2 by 46% in patients with CHF and was associated with favorable remodeling of the left ventricle compared with a 14% increase in peak VO_2 with moderate-intensity continuous training. Additionally, improvements in brachial artery flow-mediated dilation (endothelial function) were greater with HIT. A recent meta-analysis by Haykowsky et al. (51) included 7 randomized controlled trials of HIT and showed greater improvements in exercise tolerance with HIT versus traditional moderate-intensity continuous training, although no effect was observed on resting LVEF. One recent report (52) suggests that HIT is safe; however, further work is needed to elucidate its use in older patients and women, as well as to describe the equivalency of clinical benefits between HIT and moderate-intensity continuous training.

Optimizing adherence with exercise training. The greatest difficulties with improving adherence with exercise lie in 3 areas: 1) failure to address adherence barriers prior to exercise initiation; 2) application of strategies known to improve adherence; and 3) methods to ensure that adherence is addressed in clinical practice. Factors amenable to interventions include treating anxiety and depression, improving motivation, seeking social support, and managing the logistical problems of transportation and time. Strategies shown to improve exercise adherence in CHF include goal-setting, developing exercise prescriptions, problem-solving, feedback, positive reinforcement, motivational interviewing, and group interaction (53,54).

CR Self-Care Counseling in Heart Failure

Effective self-care is fundamental to maintaining physiological stability and improving health outcomes in patients with CHF (55,56). Most readmissions for CHF exacerbations are attributable, at least in part, to poor self-care, including nonadherence to medications and diet and failure to act upon escalating symptoms (55). As with other chronic conditions (e.g., diabetes), and in accordance with the Chronic Care Model (57), optimal CHF self-care requires a knowledgeable patient who is actively engaged in maintaining his or her health through self-monitoring of symptoms and adherence to prescribed treatment, including medications and behavioral recommendations. Table 3 summarizes key elements of self-care in patients with HF (56).

Multiple clinical trials, observational studies, and meta-analyses have documented that CHF disease management programs that emphasize self-care are associated with reductions in hospitalizations and mortality (58,59).

Table 3 Self-Care Behaviors for Patients With Heart Failure
Develop a system for taking medications as prescribed (e.g., a pill box)
Limit dietary sodium intake (≤2 to 2.3 g/day in most cases)
Avoid excess fluid intake (≤1.5 to 2 l/day in most cases)
Obtain a reliable scale and maintain a record of daily weights; monitor for an excessive change in body weight (e.g., ± 3 lbs from baseline "dry" weight)
Observe signs/symptoms of shortness of breath, swelling, fatigue, and other indicators of worsening heart failure
Contact provider promptly for unexpected weight change or increasing symptoms
Do not use dietary supplements or herbal medicines unless approved by provider or pharmacist
Avoid all tobacco products and exposure to second-hand smoke
Restrict alcohol intake (≤2 drinks/day in men; ≤1 drink/day in women)
Avoid recreational toxins, especially cocaine
Seek treatment for depression and anxiety
Discuss sleep disturbances with provider, especially heavy snoring
Achieve and maintain physical fitness by engaging in regular exercise
Visit a provider at regular intervals (appropriate frequency depends on disease activity and severity)
If appropriate, monitor coexisting conditions, such as high blood pressure, diabetes, and cholesterol abnormalities
Maintain current immunizations, especially influenza and pneumococcal pneumonia

Adapted from Riegel et al. (56).

Moreover, participation in self-care has been associated with better quality of life and functional status, as well as reduced symptom burden and, in some studies, decreased healthcare costs (60,61). In a review of 19 CHF self-care intervention studies from 2000 to 2010 involving 3,166 patients, Baranson et al. (62) found that the majority of studies reported significantly higher levels of knowledge and self-care behaviors, including higher use of regular weighing, adherence to diuretic prescriptions, restriction of dietary sodium, and smoking cessation. Based on the large body of evidence demonstrating the benefits of CHF disease management programs and self-care interventions, the 2013 ACCF/AHA heart failure guidelines provide a Class I recommendation for patients to receive specific education to facilitate heart failure self-care (Level of Evidence: B) (2). Nonetheless, there is a critical need to augment traditional patient education and counseling strategies for self-care management and maintenance, and the CR setting is an obvious place to institute such strategies (62).

The benefits of a nurse-directed comprehensive CHF management program administered in a CR setting were demonstrated in a prospective randomized clinical trial involving 105 CHF patients (mean age 72 years, 62% male) (63). Patients randomized to the intervention group received 12 weeks of exercise training and care coordination through self-care management with individualized goals and adherence strategies. Control group patients received education and routine care by their regular physicians. At the 12-month follow-up, patients in the intervention group experienced significant reductions in all-cause hospital readmissions (44% vs. 69%, $p = 0.01$), cardiac readmissions (24% vs. 55%, $p = 0.001$), and all-cause mortality (7% vs. 21%, $p = 0.03$).

Intervention patients also showed improvements in 6-min walk distance and were more likely to be on evidence-based therapies at 12 months.

As demonstrated by Davidson et al. (63), CR programs offer an ideal venue for supporting CHF self-care, as patients are seen on a regular basis by a multidisciplinary team of nurses, exercise physiologists, dieticians, physical therapists, and physicians. CR personnel are well positioned and fully qualified to provide ongoing education and support for incorporating self-care behaviors into the patients' daily routines. In addition, CR personnel can assist in managing complex medical problems, coordinating care with other providers, identifying medication side effects, and facilitating early recognition and management of worsening symptoms, thereby reducing readmissions. Self-care tools such as the Self-Care of Heart Failure Index (64,65), the European Heart Failure Self-Care Behavior Scale (66) and the Heart Failure Activity Checklist (67) can be utilized to evaluate the impact of self-care interventions. In summary, CR programs can facilitate management of CHF patients through a combination of exercise training, education, and promotion and monitoring of self-management skills.

Selection of Appropriate Patients for CR

Ambulatory patients with AHA/ACC stage C stable CHF with stable NYHA functional class II or III symptoms (dyspnea and fatigue) despite guideline-directed medical therapy should be considered for supervised CR.

Rationale for patient selection criteria. Most studies of exercise training for individuals with CHF were carried out in individuals with stable NYHA functional class II and III symptoms; thus, class IV patients are presently excluded. All patients should be clinically stable prior to embarking on CR, thus the above recommendations build in a required period of at least 1 month of clinical stability after an index hospitalization.

Contraindications to CR exercise training also include uncontrolled diabetes or hypertension, moderate to severe aortic stenosis, hypertrophic obstructive cardiomyopathy, significant ischemia at <2 METs of work, any comorbidity that prevents exercise participation, or acute myocarditis or other acute cardiomyopathy until stabilized.

Conclusions

CR exercise training and CHF self-care counseling confer significant clinical benefits to individuals with stable CHF: exercise capacity is increased, clinical symptoms are markedly improved, quality of life is enhanced, and the risk for future clinical events is decreased. Based upon this evidence, third-party payers should provide medical insurance coverage for supervised CR for appropriately-selected patients with stable CHF.

Reprint requests and correspondence: Dr. Philip A. Ades, Cardiac Rehabilitation and Prevention, Fletcher Allen Health Care, 62 Tilley Drive, South Burlington, Vermont 05403. E-mail: Philip.Ades@vtmednet.org.

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