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Growing Relevance of Cardiac Rehabilitation for an Older Population With Heart Failure

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Abstract

Cardiac rehabilitation (CR) is a comprehensive lifestyle program that can have particular benefit for older patients with heart failure (HF). Prevalence of HF is increasingly common among older adults. Mounting effects of cardiovascular risk factors in older age as well as the added effects of geriatric syndromes such as multimorbidity, frailty, and sedentariness contribute to the high incidence of HF as well as to management difficulty. CR can play a decisive role in improving function, quality of life, symptoms, morbidity, and mortality, and also address the idiosyncratic complexities of care that often arise in old age. Unfortunately, the current policies and practices regarding CR for patients with HF are limited to HF with reduced ejection fraction and do not extend to HF with preserved ejection fraction, which is likely undercutting its full potential to improve care for today's aging population. Despite the strong rationale for CR on important clinical outcomes, it remains underused, particularly among older patients with HF. In this review, we discuss both the potential and the limitations of contemporary CR for older adults with HF.

Keywords

Old age; heart failure; multimorbidity; frailty; disability; cardiac rehabilitation

Prevalence of heart failure (HF) increases among older adults in part because of the cumulative effects of cardiovascular risk factors over a lifetime¹ as well as the mounting effects of multimorbidity in old age.² Typically, HF is associated with marked intolerance to physical activity, poor quality of life (QOL), frequent hospitalizations (including high 30-day rehospitalizations), high morbidity, and high mortality. Goals to improve function, improve QOL, reduce hospitalizations, and reduce morbidity and mortality are all especially relevant³ for the expanding population of susceptible senior adults as HF-related

functional decrements are compounded by sarcopenia, multimorbidity, frailty, and other vulnerabilities inherent with age. Cardiac rehabilitation (CR) is a comprehensive secondary prevention program designed to optimize physical activity and health in the context of known disease, and provides important opportunities to address idiosyncratic needs of older patients with HF.⁴⁻⁶

CR originated as an exercise program primarily for middle-aged male patients recovering from myocardial infarctions.⁷ The range of eligible diagnoses for CR broadened over time, and soon included coronary heart disease, coronary revascularization, valvular heart disease, and heart transplant. In contrast, HF was only approved for CR by the Centers for Medicare and Medicaid Services (CMS) in February 2014.⁸ By that time, CMS was essentially catching up to the 2010 HF clinical guidelines that already included CR as a class I recommendation.⁹

Although the CMS decision regarding HF for CR constituted an important advance,⁸ many relevant opportunities regarding geriatric dimensions of HF management were not included. CMS based HF eligibility for CR on the strongest existing data that were available; in particular, it relied on the landmark trial, Heart Failure: A Controlled Trial Investigating Outcomes of Exercise Training (HF-ACTION). CMS aligned CR management criteria with the HF-ACTION protocol and stipulated that eligibility had to be limited to patients with systolic HF (ie, HF with reduced ejection fraction [HFrEF]), and only after they were stable as outpatients for 6 weeks. Thus, in contrast to other diagnoses deemed eligible for CR, patients with HF could not initiate CR during or immediately after a HF hospitalization. Ironically, although most patients with HF are usually encouraged to be active during and after their acute hospitalizations, CR is not immediately available to support and guide this process. Furthermore, HF with preserved ejection fraction (HFpEF), a type of HF that occurs disproportionately as adults grow older, remains ineligible for CR although ongoing investigations are analyzing benefits of exercise training in these patients.

HF in Older Adults: Competing Challenges of Management

Longevity is increasing. Average length of life has increased 30 years since 1900.¹⁰ Men and women are now more likely to live to old age, many after recovering from diseases/events that would have once ended their lives at a younger age. The result is a growing population of older adults with a constellation of medical complexities and vulnerabilities that represent a relatively new clinical challenge. This burgeoning population is uniquely predisposed to HF. HFrEF tends to increase because of the insidious effects of risk factors and chronic cardiac disease that progress over a lifetime.¹¹ HFpEF tends to rise disproportionately in old age as inflammation accrues in association with multimorbidity.² Incidence of HFpEF doubles each decade after 65 years, such that it eventually becomes the dominant type of HF in the senior population.¹²

Older adults are more likely to experience detrimental consequences from HF as well as from HF management. De-conditioning, management conundrums, and poor adherence are all more likely in older age. Such vulnerabilities can arise when treatment goes smoothly (eg, increased susceptibility to deconditioning and posthospitalization syndrome)^{13,14} and

they are especially likely if/when common difficulties arise (eg, increased sequelae from concurrent diseases, polypharmacy, delirium, prolonged lengths of stay), all of which are more common with advancing age. Even basic precepts of HF care often become confounded by age. Benefits of diuretics for HF are counterbalanced by incontinence. Benefits of beta-blockers and angiotensin-converting enzyme inhibitors are counterbalanced by increased risks of hypotension and falls.

CR provides opportunities to address a wide range of geriatric syndromes, both by virtue of the added contact time and longitudinal perspective it adds to care, including poly-pharmacy, competing multimorbidities, and frailty (Table 1). HF, comorbidity, geriatric issues, sleep, nutrition, and other aspects of holistic care can all potentially be addressed. The importance of physical activity is especially important to modify biological risks associated with sedentariness in aging¹⁵ and the compounding effects of disease and hospitalizations.¹⁶ Sedentariness exacerbates risks of progressive disability,^{17,18} recurrent disease, institutionalization, and increased mortality. CR has utility to moderate these risks.

CR is a comprehensive, long-term program involving exercise training as well as medical evaluation, cardiac risk factor modification, education, and counseling, which is designed to limit the physiologic and psychological effects of cardiac illness.⁹ Therefore, CR is perfectly positioned to reinforce quality care for an older HF population. CR programs can help transition patients with HF from hospitalization-to-home as well as from skilled nursing facility-to-home with valuable supervision and guidance of physical activity to reduce the effects of hospital-related deconditioning.¹⁹ CR programs also provide opportunities to review medications and goals of care to ensure management is well-directed, well-coordinated, and patient-centered. This reduces the chance of unchecked medication interactions and unnecessary polypharmacy.

Exercise training in CR programs limits the effects of muscle atrophy and weakness that occurs with HF and aging²⁰ and that increases predisposition to frailty,²¹ diminished physical self-confidence, and dependency.²² Increasing muscle strength and balance also helps reduce risks of falls and can be particularly useful for patients on new vasoactive medications.²³ Finally, CR education programs foster insight into patients' understanding of disease and healthful behaviors with the potential to instill prolonged living habits that sustain/prolong CR benefits. Notably, studies show that CR education can be successful tailored to achieve meaningful impact despite cognitive limitations associated with age and disease.^{24,25}

One of the special features of CR is that treatment is personalized to the individual needs of the patient (ie, it aims to facilitate each patient's own goals of care). Lifestyle and exercise plans are created and adjusted throughout the course of the CR program to ensure that each individual progresses in a pace and trajectory that are tailored to their own capabilities (physical, cognitive, emotional) and objectives. Patients are typically assessed at enrollment and then recurrently as treatment evolves using a standardized individualized treatment protocol format.²⁶

The Limits of the Evidence

HF-ACTION was a landmark trial that purportedly showed efficacy and safety of an aerobic exercise training program for a wide range of HFrEF patients. However, not only was there implicit selection bias in a study population that volunteered for a 2- to 3-year training trial, but HF-ACTION's conclusions regarding life-prolonging benefits of exercise training were only significant after adjustments for baseline characteristics strongly predictive of the trial's clinical endpoints²⁷ (ie, exercise duration, left ventricular ejection fraction, depression, and atrial fibrillation). Although many are critical of such statistical tweaking, most agree that HF-ACTION demonstrated the utility of aerobic exercise training to increase cardiorespiratory fitness and improved QOL beyond the benefits of state-of-the art therapy (beta-blockers, angiotensin-converting enzyme inhibitors, and even implantable cardioverter defibrillators [ICDs]).

Although HF-ACTION included almost 500 patients aged ≥ 70 years, these were relatively more intact seniors and not burdened with the extent of comorbidity, complexity, and declines that are typical of most very old adults with HF. HF-ACTION also omitted other important considerations pertaining to old age. Strength training was not evaluated, which is especially important for patients with sarcopenia and frailty. Balance training was not considered, which is especially important for patients at high risks of falls. High-intensity interval training, which is especially important to maximize cardiorespiratory fitness and that may have particular value for older, frail patients with HF was also not evaluated.²⁸ Even after HF-ACTION, the utility of many basic precepts of HF management are less certain in relation to older patients who are also vulnerable to complexities related to their age.²⁷ The ongoing Rehabilitation Therapy in Older Acute Heart Failure Patients trial is investigating the effect of exercise training in older adults with both HFrEF and HFpEF on symptoms, QOL, hospitalization, and other age-related complexities of care. Hopefully, it will contribute to broader application of CR.

CR has myriad benefits that are generalizable to a much broader HF population, including older, frailer candidates. CR provides an important opportunity to address these intricacies and to achieve a realistic, patient-centered, and safe routine. Despite the limitations present in health care policy, we address the specific and important benefits of CR for older adults to encourage its use in this population.

Benefits of CR for HF in an Aging Population

Benefits—Physical Function and Exercise Capacity

HF patients have lower baseline oxygen consumption than healthy controls.²⁹ A major benefit of exercise training in patients with stable HF is improved exercise capacity (maximum amount of sustainable physical exertion) that has been observed in both duration as well as peak oxygen uptake. Having greater exercise capacity allows one to be active at higher intensity or for a longer time and to also perform activities of daily living at a relatively lower percentage of overall fitness (which is conducive to increased physical activity throughout daily living and also to greater physical self-efficacy). Exercise capacity becomes increasingly important in older adults because of the typical decline in exercise

capacity as part of the aging process, vulnerabilities then exacerbated by acute deconditioning and weakening from disease, medications, and hospitalizations, and associated predisposition to increasing disability and dependency.¹⁸ CR can help offset these risks.³⁰

Exercise training has demonstrated an increase in exercise capacity in older adults with HFrEF. In HF-ACTION, aerobic training resulted in significant increases in 6-minute walk test distance, time tolerated on a standardized cardio-pulmonary exercise test, and peak oxygen consumption.³¹ When stratified by age, these benefits were seen across all age groups; older subjects derived as much benefit as those who were younger.

Benefits—QOL and Symptoms

Exercise has many beneficial mechanisms on cardiac function. Exercise has been shown to have favorable effects on cardiac filling pressures, oxygen consumption, and ventilation in patients with HF.^{32–34} Although most studies of exercise in HFrEF have shown minimal change in left ventricular ejection fraction, some studies demonstrate increased maximal stroke volume and cardiac output.³⁵ Studies of CR for HF have demonstrated improved QOL scores and reduced symptom burden. The HF-ACTION trial reported significant benefits in QOL using the Kansas City Cardiomyopathy Questionnaire. The Kansas City Cardiomyopathy Questionnaire score improved by 3.3 points in the control group and 5.2 points in the exercise group, which was a significant difference of 1.9 points ($P < .001$). Although this improvement stabilized after 3 months, it did not attenuate over time. This finding was consistent regardless of age and gender as well.³¹ Subsequent Cochrane reviews, which included older and sicker patients than HF-ACTION, also demonstrated improvements in patient-reported QOL.^{36,37} In patients with low-moderate risk New York Heart Association class II-III HFrEF, exercise training results in significant improvements in QOL. Similar benefit of exercise training to QOL in HFpEF patients has not yet been demonstrated.³⁸

Benefits—Mortality

Over the past decade, a series of studies has now explored the benefits of CR in patients with HFrEF. In HF-ACTION, approximately one-half of all subjects were older than age 60 and it showed significant reductions in the primary outcome of all-cause mortality or all-cause hospitalizations³⁹ after statistical adjustment.²⁷ In a prespecified subgroup of nearly 500 subjects age ≥ 70 , mortality, QOL, and rehospitalization were all consistent with findings of the younger subjects.³¹ Cochrane Reviews have also demonstrated that exercise training reduces mortality in patients with HF, including patients older and frailer than in HF-ACTION, and with mortality reductions even greater than HF-ACTION in smaller studies with follow-up >1 year.^{36,37}

Benefits—Frailty

Definition of frailty remains controversial, but physical frailty generally involves a state of overall weakening and fatigability, with clinical impact that includes increased vulnerability to disease and decreased tolerance of therapies.⁴⁰ Older adults with cardiovascular disease (CVD) are particularly prone to physical frailty^{41,42} because they are biologically related

through common inflammatory origins.^{43,44} Effects of hospitalizations tend to exacerbate these risks.⁴⁵ Patients with CVD who are frail have poorer prognosis, with more than twice the morbidity and mortality than similarly aged patients without frailty,^{42,46} implying the strong need to prioritize interventions to moderate incidence and risks of frailty.

A recent review of interventions for frail elderly patients evaluated 20 studies with exercise interventions including 13 studies of exercise alone.⁴⁷ All of the studies involved patients aged 65 years. Exercise interventions included aerobic and resistance training over various durations (3 months up to 2.6 years). Outcomes included a variety of functional measures including the short physical performance battery, activities of daily living, gait speed, strength, and exercise capacity. Amidst this variability, exercise training resulted in consistent improvements in physical performance in frail individuals. Similarly, in 2 studies that specifically assessed benefits of exercise for physical frailty patients with CVD, functional benefits were significant.^{48,49} There are numerous ongoing trials evaluating CR-related interventions in older frail adults including exercise training, nutritional supplementation, combined exercise and nutritional supplementation, pharmacologic products, multidimensional programs, and home-based services all specifically investigating physical frailty indices as their outcomes.⁵⁰ It is anticipated that the results of these studies will further inform specific therapies that can be incorporated into CR programs treatment of frail individuals with HF.

Additional focus on resistance training to increase muscle strength among these patients can be extremely useful. Goals to increase muscle mass, reduce atrophy, and increase intrinsic muscle performance are all important considerations for reducing frailty and improving clinical outcomes in chronic HF.^{51–53} Small studies of resistance training in patients with HF have shown the ability to increase muscle strength,⁵⁴ which has in turn reduced physical limitations and disability associated with significant weakness.⁵⁵

It is especially important in the older, frail patient to incorporate a holistic approach to management. Adequate attention to treating frail patients is best accomplished with an interdisciplinary team whose care provides related opportunities to link cardiovascular concerns with pertinent consideration of functional capacity, polypharmacy, nutrition, sleep, and other vital aspects of management.⁴⁹ CR resonates with these goals and essentially adds to the paradigm of a HF team approach with complementary focus on physical function.

Benefits—Polypharmacy and Medication Adherence

Ironically, evidence-based standards of care for HFrEF entails implicit polypharmacy, especially if HF is coupled with atrial fibrillation, coronary heart disease, or other comorbidities. Avoiding mistakes and honing an optimal regimen in patients with frailty and multimorbidity is inherently challenging. CR programs perform medication reconciliation to ensure patients are taking medications as prescribed, and also can monitor patients for interactions, side effects, and complication over time. Furthermore, CR provides opportunity to coordinate with patients' own providers to facilitate key refinements in care (eg, reducing beta-blockers in patients with chronotropic incompetence and/or adjusting diuretics in someone who has become mired by incontinence).

Benefits—Cognition, Psychologic, and Socialization

Reduced cognition and isolation are also widespread among older adults. CR can help with both. Observational studies have demonstrated that physical activity is associated with a slowing in age-related decline of cognition and reduction in cognitive impairment.^{56,57} Although the optimal intensity and duration of exercise necessary for the benefits are uncertain, it has generally been demonstrated that higher exercise levels are associated with better cognitive health.⁵⁸ A cross-sectional study of older adults reported better performance on executive function testing in those individuals who had higher levels of physical activity.⁵⁹ Although not all interventions of aerobic and resistance exercise have shown improvement in cognitive performance, multicomponent exercise interventions, which are more representative of CR programs combining aerobic and resistance training together, may be more beneficial to cognitive function than aerobic exercise alone.⁶⁰ Similarly, CR goals to improve medication regimens, sleep hygiene, diet, and mood likely contribute to improved cognition.

Socialization is also a critical component of CR that may especially benefit older patients. For many, CR serves as a means to counterbalance vulnerabilities to isolation that often arise amidst aging and disease. A study of adults age 65 years surveyed and reported that the socialization aspect of CR was 1 of the most important reasons patients valued the program.⁶¹ Psychological diseases, in particular depression, are increasingly recognized as having a major impact on CVD with greater morbidity and mortality.^{62,63} Older adults who are depressed have lower baseline levels of exercise capacity and QOL compared with nondepressed patients.⁶⁴ CR programs have the capability of improving not only exercise capacity in depressed patients, but also improving mood and reducing depressive symptoms.⁶⁵

Posthospitalization Syndrome

Krumholz described posthospitalization syndrome as “an acquired, transient period of vulnerability.” This vulnerability is as much due to the acute illness prompting the hospitalization as it is to the broader allostatic and physiologic stresses of being hospitalized, which leaves patients with an impaired ability to respond to health-related stressors.¹³ It constitutes a disproportionate risk for older patients with HF, especially among those with recurrent hospitalization and the progressively destabilizing effects of deconditioning, poor nutrition, poor sleep. Although the standard to wait 6 weeks before initiating CR for HF was implemented as a standard of safety based on HF-ACTION, it undermines a key opportunity to mitigate posthospitalization syndrome, and in many ways it seems reminiscent of outdated standards that had once kept patients bedbound for weeks of a myocardial infarction, with risks from sedentariness that far outweighed any benefits to the heart.⁶⁶ The contemporary model of CR also seems misaligned with the routine practice of mobilizing older, frailer patients with HF as quickly as possible during and after their hospitalizations.

HFpEF

As adults live longer, HFpEF is becoming the dominant form of HF in the expanding senior population. Thus, while CMS was well-intended in basing CR eligibility on HF-ACTION

trial data, this essentially overlooked the likely benefits of CR for HFpEF. While there is no equivalent large multicenter trial to HF-ACTION for HFpEF, multiple small studies have demonstrated the safety and utility of exercise training to improve functional capacity in older patients with HFpEF.⁶⁷ Although HFpEF was once thought to stem primarily from abnormal lusitropic physiology, it has come to be recognized as a complex systemic disease. Exercise training benefits HFpEF pathophysiology on many pertinent levels. Some studies highlight exercise benefits for diastolic performance⁶⁸; however, most emphasize exercise benefits pertaining to skeletal muscle^{69,70} and peripheral vasculature.⁷¹

Although there have been recurrent efforts to broaden CMS eligibility criteria for CR to include HFpEF,^{8,72} there has also been regulatory pushback until there are more corroborating data. Many remain hopeful that the ongoing Rehabilitation Therapy in Older Acute Heart Failure Patients study will help respond to this prerequisite, but it seems ironic that CMS expanded CR eligibility to include valvular heart disease and heart transplant with data that are relatively inferior to the data already available for HFpEF.

Risks Associated with CR

For many years, there were entrenched concerns that exercise training might provoke harmful ventricular remodeling, particularly among those patients with HFrEF. Multiple trials have addressed this issue. A meta-analysis of randomized trials of exercise training attests to this large body of literature and confirms that aerobic exercise does not worsen ventricular remodeling. In fact, exercise training is likely to reverse ventricular remodeling in HFrEF⁷³ with beneficial effects. Similarly, exercise training does not worsen remodeling in HFpEF, although the number of subjects who have been studied remains low.⁶⁷ Although overall adverse event rates during exercise in patients with HF is very low, the most common events are hypotension and arrhythmias.⁷⁴ Exercise testing before CR⁷⁵ and telemetry monitoring during CR can facilitate opportunities to identify high-risk patients and intervene effectively if necessary, particularly in the early sessions of exercise training.

One of the most common concerns among physicians and patients is that CR is not safe for older adults because of greater risks of sustaining a fall or exercise-related injury. Patient apprehension and anxiety to undergo exercise may limit participation and adherence to an exercise-based CR program.⁷⁶ Paradoxically, a supervised exercise program is specifically intended to reduce patients' anxiety of their symptoms and risks. These concerns are common, yet inconsistent with studies of actual risks, which consistently show that exercise training is actually useful at reducing the risk of falls and fall-related injuries. A systematic review of 17 trials of exercise interventions in older adults found that all falls, including falls that produced major injuries, were reduced.⁷⁷ Although the etiologies of falls in older adults vary, they are frequently from imbalance that results from weakness.⁷⁸ CR programs have been demonstrated to increase strength and to thereby improve balance and reduce falling risks.⁷⁹ The multifaceted nature of CR adds to this benefit as effects of arrhythmias, medication interactions, sleep impairments, and/or dietary limits (eg, dehydration) are also considered, with the impact that falling risks are reduced even further.

In consideration of falls and other safety parameters, it is important to clarify that older patients' response to exercise is different than those who are younger, and added precautions to minimize risks in older patients are warranted.⁸⁰ Monitoring for proper breathing, exercise techniques, hemo-dynamics, and capacity to control the equipment are all important, particularly amidst frailty, cognitive deficiencies, and comorbidity that can complicate care. Longer warm-up periods are necessary to ensure adequate flexibility and blood flow to large muscle groups. Cool-down time allows for the vasodilation present during exercise to recover and return to normal, which can put the patient at risk of hypotension if regular activity is restarted too quickly.

Underutilization of CR

Despite the compelling benefits of CR and the wide-spread endorsement of its use, CR is vastly underused among patients with CHD.⁸¹ A recent study found only a 10% referral rate for patients after hospitalization for HF to CR from hospitals in the Get With the Guidelines database.⁸² Although this report predated the recent CMS decision to extend CR coverage to HFrEF, the enrollment of older patients into CR remains low even for diagnoses that have been approved for years,⁸¹ reflecting multiple impediments from patients, providers, and the overall health care system. When he was the president of the American Heart Association, Yancy authored a presidential advisory with his colleagues, urging increased CR referral and participation⁸³ and acknowledging a need to overcome prolonged underuse of CR; it is not likely that that mere eligibility of patients with HF will change these patterns.²⁷

Challenges

Numerous challenges still remain to maximizing the use of CR for older adults with HF. For patients with HFrEF, the guidelines and reimbursement structure exists; however, there is still a common lack of understanding of all that CR can accomplish, particularly among candidates who are old and frail. For patients with HFpEF, there is a lack of large trials to substantiate CR benefits, despite a multitude of small studies that suggest compelling benefits and therapeutic rationale for a disease that lacks many alternative treatment options.

The reasons for poor participation in CR have been well-studied. Older patients tend to be referred less frequently than younger patients, and many patients and providers do not understand the potential value of a CR program in old age.^{84,85} Thus, older patients are less likely to be referred and even when they are, they are less likely to enroll.⁸⁶ Many may also be burdened by comorbidity, cognitive limitations, or with caregiving responsibilities for an enfeebled spouse. Many others are limited by high copayments. Transportation and travel issues can be of particular burden to older patients who are less able to drive long distances necessary to participate in traditional facility-based programs.⁸⁷⁻⁸⁹

A burgeoning concept of home-based and hybrid CR programs aims to bridge a gap between patients willing and able to participate in facility-based programs and who are limited by logistics or other impediments. However, they have yet to be well-studied in patients with HF and important questions and concerns remain regarding whether CR is safe and effective at home for older patients with HF, and whether it will be reimbursed. Recently, CMS has

announced an incentive payment model to increase utilization of CR, but only included patients hospitalized for myocardial infarction and coronary bypass surgery at this time.⁹⁰ The safety of older adults in home-based CR is an important consideration. Although new technologies in telehealth may help better enable this option, it will be critical to carefully consider safety concerns regarding (eg, falls, hemodynamics), adherence, and other concerns.

Conclusions

Benefits of CR for HF include reduced mortality and morbidity, but also improved exercise capacity, QOL, symptoms, and mood—parameters that may be particularly important to older patients. CR is also particularly useful in addressing additional complexities of care for patients with advanced age, including multimorbidity, polypharmacy, and falling risks. Although CR is underused, particularly among older adults, it has the potential to greatly improve important clinical out-comes for patients with HF.

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Table 1.**Opportunities for Cardiac Rehabilitation to Better Manage Geriatric Syndromes**

Challenges of Geriatric Care	Opportunities to Intervene and Improve Care	Role of Cardiac Rehabilitation
Harmful processes of care	Reduce deconditioning and disorienting transitions Reduce vulnerabilities to delirium, disability, and institutionalization	Restore mobility and self-efficacy as quickly and safely as possible Aid in transition of patients from hospital-to-home and skilled nursing facility-to-home
Multimorbidity	Clarify symptoms and priorities amidst multiple cardiac and noncardiac diseases that commonly occur in combination	Help coordinate care amidst inherent complexity
Polypharmacy	Reduce medications that tend to rise in number in association with cardiac disease as well as comorbidity	Coordinate with primary physician to discontinue unnecessary medications. Monitor for side effects (eg, hemodynamic, fatigue, appetite) and possible interactions
Sarcopenia and frailty	Atrophy and weakening of skeletal muscle is common because of age and disease Frailty phenotype characterized by weakening, slowing, exhaustion, and exercise decline	Supervised resistance training to increase strength Tailored balance and flexibility training to reduce falls
Reduced health literacy	Increased challenge of education, decision-making, and behavior changes amidst cognitive declines and/or social pressures	Provide disease and risk factor education to optimize self-management. Can help overcome limitations of socioeconomic and cognition with tailored care
Poor adherence	Exacerbated by multimorbidity, polypharmacy, reduced health literacy, and reduced cognition	Reinforce medication adherence through education, family organization, and strategies to overcome impediments