HEART FAILURE IN OLDER PERSONS: CONSIDERATIONS FOR THE PRIMARY CARE PHYSICIAN

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Heart failure (HF) affects over 500,000 Canadians, with 50,000 new patients diagnosed each year.[1,2] While mortality from cardiovascular diseases has progressively declined in Canada,[3] the burden of HF is expected to continue rising as a result of population aging and improved survival of patients with other cardiovascular diseases.[4] HF is the leading cause of hospitalization and death among those aged 65 years and over,[3] with a mortality rate of up to 50% within 5 years of diagnosis.[1] Elderly HF patients are complex: a recent Ontario study of home care recipients with HF found that these clients had more health instability, took more medications, and had more co-morbidities compared with other home care clients.[5]

Optimal management of HF in "complex seniors" requires that clinicians understand the interactions between HF and age-associated syndromes such as frailty, cognitive impairment, and functional decline.[1,6] As the majority of Canadian patients with HF are treated by primary care providers (PCPs),[7] this article is directed at PCPs caring for older adults with HF. It is meant as a brief overview and discusses how the Canadian Cardiovascular Society (CCS) Consensus Guidelines on HF can be applied in daily practice (Table 1).[1,8–13]

What Is Heart Failure?

HF is a syndrome that results when abnormal heart function leads to clinical manifestations of low cardiac output and/or pulmonary or systemic congestion.[14] The main conditions associated with the development of HF are coronary heart disease (CHD) and hypertension.[14,15] HF patients with a left ventricular ejection fraction (LVEF) <45% are defined as having HF with reduced ejection fraction (HFREF), whereas HF patients with a LVEF ≥45% are considered to have HF with preserved ejection fraction (HFPEF). Recent data suggest that HFPEF may be as common as HFREF among seniors and that both conditions may be associated with similar outcomes.[16–18]

Considerations in Older Patients

PCPs are uniquely positioned to diagnose HF in its earlier stages. The diagnosis of HF is primarily established on clinical grounds. It is important to perform a good history and physical examination. Chest radiography is recommended, though it has in the primary care setting modest specificity and sensitivity for pulmonary edema.[19,20] Furthermore, diagnosing and managing HF can be complicated in older outpatients with concomitant co-morbidities such as frailty or cognitive impairment.[6,15,21–23]

Table 1. Canadian Cardiovascular Society (CCS) Guidelines*

2011 Update[8]	"Heart Failure Management Guidelines Update: Focus on Sleep Apnea, Renal Dysfunction, Mechanical Circulatory Support, and Palliative Care"
2010 Update[9]	"Heart Failure in Ethnic Minority Populations, Heart Failure and Pregnancy, Disease Management, and Quality Improvement/Assurance Programs"
2009 Update[10]	"Diagnosis and Management of Right-Sided Heart Failure, Myocarditis, Device Therapy and Recent Important Clinical Trials"
2008 Update[11]	Best practices for Transition of Care of Heart Failure Patients, and the Recognition, Investigation and Treatment of Cardiomyopathies"
2007 Update[12]	"Prevention, Management during Intercurrent Illness pr Acute Decompensation, and Use of Biomarkers"
2006 Guideline[1]	"Diagnosis and Management"
2002/2003 Update[13]	"Consensus Conference Update for the Diagnosis and Management of Heart Failure"

*Since 2005, the CCS has implemented a "closed loop" model to support knowledge translation in cardiovascular care, accommodating end-user and stakeholder input and evaluation on an ongoing basis, and thus allowing the CCS to continually improve and expand the breadth and utility of guidelines. The first CCS guideline to which the model was applied was heart failure. Since 2005, there have been six CCS heart failure guideline updates that have been informed by feedback from end users. For more information on the HF guideline program please visit http://www.ccs.ca/guidelines/cc_library_e.aspx.

Table 2. Signs and Symptoms of Heart Failure

Classic Features of HF	Atypical Clinical Features of HF in Frail Seniors
Dyspnea	Delirium/new or worsening confusion
Orthopnea	Falls
Paroxysmal nocturnal dyspnea	Sudden functional decline
Fatigue	Sleep disturbances
Weakness	Nocturia or nocturnal incontinence
Exercise intolerance	Dyspnea less likely if patient is sedentary
Dependent edema	Ankle edema may reflect venous insufficiency, drug effects, immobility, or malnutrition
Cough	Sacral edema
Weight gain	Pulmonary rales/crackles are nonspecific
Abdominal distension	
Nocturia	
Cool extremities	

HF = heart failure.

Frailty arises from the accumulation over time of deficits across multiple physiological systems, and leads to decreased homeostatic reserve, loss of resistance to health stressors, and a greater vulnerability to poor health outcomes.[24] Frailty can affect between 25 and 50% of patients with cardiovascular disease,[25] particularly older patients with HF.[26] Frail HF patients are at greater risk of hospitalization and functional decline compared with their non-frail counterparts.[21,25] Frail and functionally impaired seniors are more likely to manifest atypical signs and symptoms (Table 2).[22,23]

Older patients with HF have an increased risk of cognitive impairment (CI), including dementia.[27–31] Older patients hospitalized with HF exacerbation can also present with acute and fluctuating CI due to delirium.[32] CI in HF patients has been associated with an increased risk of non-adherence to treatment, accelerated functional decline, increased hospitalization, and increased mortality.[33,34] Recent data suggest that even mild CI, defined either as a Mini-Mental State Examination (MMSE) score <28/30, or a Montreal Cognitive Assessment (MoCA) score of 23 or less, may be associated with worse self-care ability and adverse outcomes in older persons with HF.[35–38]

Psychiatric symptoms, such as anxiety or depression, may also be associated with symptomatic or undertreated HF among frail seniors.[39] Orthopnea and paroxysmal nocturnal dyspnea are more specific symptoms of HF that may not become apparent until relatively late in the course of an HF exacerbation; however, these symptoms may manifest as non-specific sleep disturbances. In addition, many of the physical signs of HF can also occur in other diseases that are common in older patients.[15] Exertional dyspnea may occur as a result of pulmonary disease, obesity, or deconditioning. Individuals with HF and who are sedentary may not experience exertional dyspnea, and dependent edema may accumulate over the sacrum rather than at the ankles.[6]

Assessing Older Patients with HF

A complete history and physical examination should be conducted to assess any senior presenting with classic clinical features of HF, or the recent development of atypical symptoms or geriatric syndromes.[6] For most seniors, collateral information from an informal caregiver should be sought.[21] Transthoracic echocardiography is the modality of choice to assess the heart and should be performed in all patients with suspected HF. Routine hematological, renal, electrolyte, and thyroid indices should be assessed to rule out factors contributing to the HF syndrome or that could complicate its management. If available, plasma natriuretic peptides such as brain natriuretic peptide (BNP) can be useful to rule out HF if they are normal, or to rule in HF when the clinical diagnosis is in doubt.[12] A chest radiograph should be obtained looking for evidence of pleural effusions, vascular redistribution, or interstitial or alveolar edema. A normal electrocardiogram makes a diagnosis of HF unlikely, and while it is not specific for HF, it can identify the presence of underlying conditions, such as CHD or arrhythmias, that can exacerbate or precipitate HF.[40]

Once HF is diagnosed, it is important to characterize a patient's functional capacity. Such information is useful to follow patient progress and guiding therapeutic choices. The New York Heart Association (NYHA) Functional Classification is commonly used for this purpose and consists of four categories based on the presentation of symptoms in relation to activity.[41] Concerns have been raised about the reliability of the NYHA classification in older HF patients, who might be more appropriately assessed using items and subscales from instruments such as the Resident Assessment Instrument (RAI) 2.0.[42] Clinicians should consider screening older HF patients for CI, using an instrument such as the MoCA, and for frailty, using, for example, the Canadian Study of Health and Aging (CSHA) frailty scale.[1,36,43] For cognitively impaired HF patients, identifying and educating a capable caregiver who can help with self-monitoring, medication adherence, and lifestyle modifications such as fluid management and meal preparation are strongly recommended.

Management

Pharmacological Therapy

The most recent CCS recommendations for the pharmacological treatment of HF are presented in Figure 1 and Table 3. While most of these recommendations are derived from large clinical trials that generally exclude frail seniors, evidence from several small randomized trials and multiple observational studies suggest that they also apply to older patients.[1,44–46] However, HF therapies remain underprescribed for older patients. Among home care clients with HF in Ontario, 28.6% received no first-line pharmacotherapy and only 28.0% received the recommended combination therapy of angiotensin-converting enzyme inhibitors (ACEIs) and β-blockers (Figure 2).[47] Reasons why

Table 3. Drug Therapy in Heart Failure

Drug	Start Dose (mg)	Target Dose (mg)	Practical Tips
ACEIs			• Prescribe early in course of HF, starting at a low dose and titrating to target or highest tolerable dose. • Closely monitor for renal dysfunction and hyperkalemia, especially during acute dehydrating illness.
Captopril	6.25–12.5 tid	25–50 tid	
Enalapril	1.25–2.5 bid	10 bid	
Ramipril	1.25–2.5 od–bid	5 bid or 10 od	
Lisinopril	2.5–5 od	20–35 od	
Perindopril	2–4 od	4–8 od	
Trandolapril	1–2 od	4 od	
β-blockers			• Prescribe early in course of HF, starting at a low dose and titrating to target or highest tolerable dose. • Avoid sudden major dose reduction or abrupt withdrawal. • Delay use until resolution of any pulmonary edema. • Avoid in patients with severe reactive airway disease, symptomatic bradycardia, or significant AV block.
Carvedilol	3.125 bid	25 bid	
Bisoprolol	1.25 od	10 od	
Metoprolol CR/XL	12.5–25 od	200 od	
ARBs			• Prescribe early in course of HF, starting at a low dose and titrating to target or highest tolerable dose. • Closely monitor for renal dysfunction and hyperkalemia, especially during acute dehydrating illness.
Candesartan	4 od	32 od	
Valsartan	40 bid	160 bid	
Aldosterone antagonists			• Aldosterone antagonists are not intended to be used as diuretics, and exceeding recommended doses may lead to complications of hyperkalemia. • Closely monitor for renal dysfunction and hyperkalemia, especially during acute dehydrating illness.
Spironolactone	12.5 od	50 od	
Eplerenone	25 od	50 od	
Loop diuretics			• Consider reducing dose if patient is patient is otherwise stable, the lowest minimal dose should be used. • Before and after introduction, or significant increase in dose, blood work should be checked for electrolytes and renal function. • Serum potassium should be maintained at 4 mmol/L or greater. • Serum magnesium and calcium should be checked if ventricular arrhythmias or muscle cramps occur. • Some patients can be taught how to adjust their diuretic dose based on symptoms. • Metolazone should be used sparingly in combination with furosemide; continuous use may result in rapid and profound volume depletion.
Furosemide			
Metolazone			
Bumetanide			
Vasodilators			• Avoid continuous use of nitrates as most patients develop tolerance. • Calcium channel blockers and α-blockers are NOT used as a primary therapy for HF but may have other specific indications in selected patients (e.g., angina).
Isosorbide dinitrate	10 tid	40 tid	
Hydralazine	37.5 tid	40 tid	

ACEI = angiotensin-converting enzyme inhibitor; ARB = angiotensin receptor blocker; AV = atrioventricular; bid = twice daily; HF = heart failure; od = once daily; tid = thrice daily.

physicians are reticent to prescribe recommended HF therapies include diagnostic uncertainty, concerns over adverse drug events (ADEs), patient non-adherence, and a lack of awareness of research evidence relevant to seniors.[48,49]

HF with Reduced Ejection Fraction

For patients with HFREF, first-line combination therapy consists of an ACEI and a β-blocker, unless specific contraindications to either drug exist. There is overwhelming evidence demonstrating that these medications reduce the risks of death, hospitalization, dyspnea, and improve function as well as quality of life.[50–53] ACEIs may be especially beneficial in frail seniors for preserving physical and cognitive functions.[39,45,54,55] Angiotensin receptor blockers (ARBs) have not been shown to be more effective than ACEIs and are thus recommended for patients who are truly intolerant of ACEIs.[56] Patients intolerant of ACEIs and ARBs may be considered for combination nitrate and hydralazine therapy.[1]

Patients with persistent symptoms despite optimal doses of first-line drugs may benefit from additional therapies. Aldosterone antagonists such as spironolactone and eplerenone are indicated in patients with LVEF <35% and NYHA III–IV HF, and in high-risk patients with persistent NYHA II symptoms.[1] ARBs may be considered as add-on therapy to ACEIs in patients with persistent NYHA II–IV symptoms. When patients experience repeat HF hospitalizations, digoxin therapy may be considered. Digoxin dosing should be adjusted for creatinine clearance in order to achieve 8- to 12-hour post-dosage serum levels of

Table 4. Medications to Avoid in Patients with Heart Failure

Drug Class	Effect
Older-generation calcium channel blockers (nifedipine, verapamil, diltiazem)	Negative inotropes
Thiazolidinediones (glitazones)	Cause fluid retention
Antiarrhythmic agents (especially flecainide, negative inotropic effect propafenone, disopyramide, and calcium channel blockers, and less so for amiodarone, dofetilide, and ibutilide)	Negative inotropic effect
Doxorubicin	Direct cardiotoxic effect
Nonsteroidal anti-inflammatory drugs, including cyclooxygenase-2 inhibitors	Fluid retention

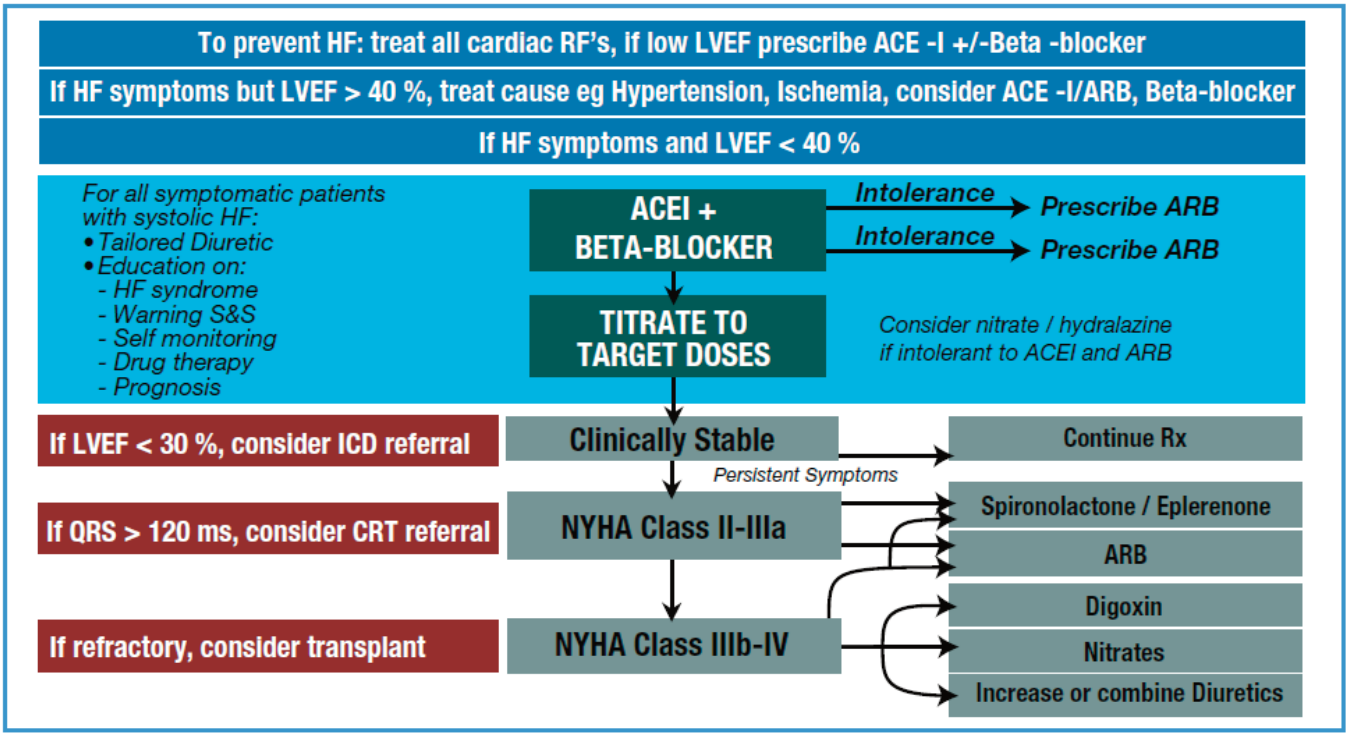

Figure 1. Algorithm for prevention and treatment of clinically stable heart failure.
ACE-I/ACEI = angiotensin-converting enzyme inhibitor; ARB = angiotensin receptor blocker; CRT = cardiac resynchronization therapy; ICD = implantable cardiac defibrillator; HF = heart failure; LVEF = left ventricular ejection fraction; NYHA = New York Heart Association; RF = reduced ejection fraction; Rx = prescription; S&S = signs and symptoms. Reproduced with permission.

1 ng/mL.[1] Medically optimized older patients with HFREF and LVEF <30%, and who are otherwise healthy and functionally independent, should be considered for insertion of an implantable cardiac defibrillator if such an intervention is compatible with their advance care plans. Older HF patients with LVEF <30% and a QRS interval >120 ms should be considered for referral for cardiac resynchronization therapy. Loop diuretics, nitrates, and vasodilators may be considered if additional symptom control is required.

HF with Preserved Ejection Fraction

There is a paucity of clinical trial evidence to guide the management of patients with HFPEF, and the few trials that have been conducted in this area suggest that, at best, treatment with ACEIs, ARBs, or β-blockers may be associated with fewer hospitalizations.[57] Hypertension is the most common underlying etiology of HFPEF and, therefore, if present, should be treated optimally. Rate control of any arrhythmia is paramount to permit diastolic filling, and loop diuretics can be used to control pulmonary congestion and peripheral edema.

Optimal Prescribing for Patients with HF

In seniors with multiple co-morbidities, adherence to the HF guidelines inevitably leads to polypharmacy, an increased risk of ADEs, and poor medication adherence. Certain medications can exacerbate HF and should be avoided (Table 4). Cognitive enhancers should be prescribed with caution. Acetylcholinesterase inhibitors can exacerbate cardiac conduction problems and lead to syncope.[58]

Despite oft-cited concerns about hypotension and renal and electrolyte abnormalities, HF medications can be used safely in older patients. Medications may need to be introduced in lower doses and titrated more slowly. In order to maximize clinical benefit, medications doses should be titrated to those shown to be effective in clinical trials, or to the highest dose tolerated by an individual patient.[1,59] In general, cough, symptomatic hypotension, bradycardia, or renal and electrolyte disorders can be effectively managed without having to discontinue medications. Table 5 offers troubleshooting tips to optimize prescribing for HF patients. Adherence can be enhanced by prescribing once-daily drug formulations; using dosettes, blister packs, or similar

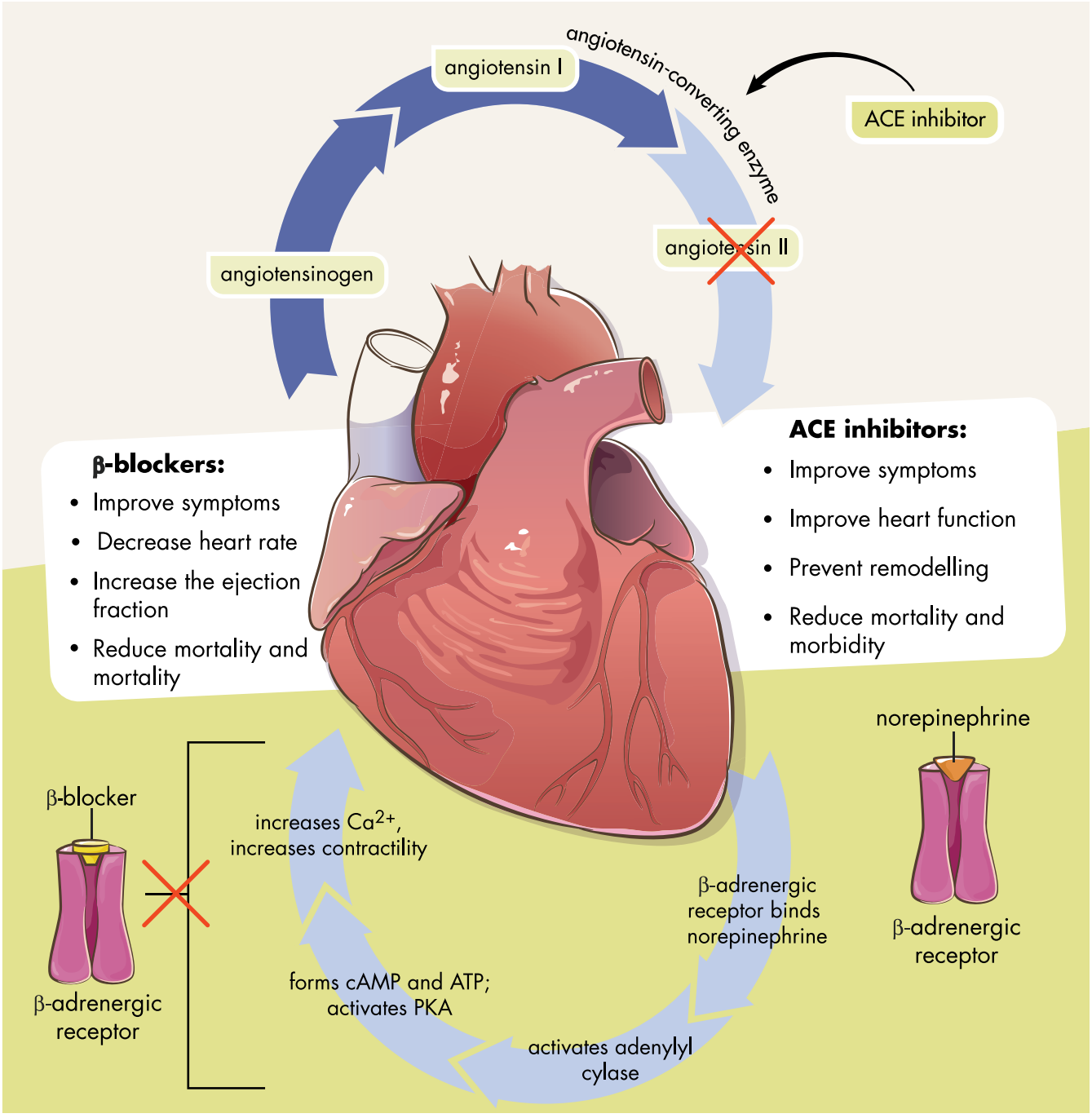

Figure 2. Mechanism of action and benefits of angiotensin-converting enzyme inhibitors and β-blockers.
ATP = adenosine triphosphate; cAMP = cyclic adenosine monophosphate; PKA = protein kinase A.

devices; as well as involving and educating caregivers in daily monitoring strategies.

Non-pharmacological Interventions

Regular physical activity is recommended for all stable HF patients, other than those with NYHA IV symptoms.[1] Referral of older HF patients to a cardiac rehabilitation program should be strongly considered. Participants should undergo a graded exercise stress test to assess functional capacity and determine target heart rates for training. Exercise programs should aim to achieve moderate aerobic and strength training exercises three to five times per week for 30–45 minutes. If such programs are not suitable, more frail HF patients should be referred to regular exercise programs that target aerobic capacity, strength, and balance and that are tailored to their needs and limitations, in order to prevent deconditioning and promote independence.

Restriction of salt intake is recommended to prevent worsening of HF symptoms.[1] Recent evidence suggests that 3 g/d or less of sodium can

Table 5. Troubleshooting Tips for Prescribers

Problem	Possible Causes	Possible Solutions
The patient is dizzy when the ACEI/ARB or β-blocker dose is increased.	• Hypovolemia from inadequate fluid intake and/or excessive diuresis • Concurrent use of non-first-line cardiovascular medication (nitrates, vasodilator, calcium channel blocker) • Orthostatic hypotension related to a psychotropic or anticholinergic drug (e.g., tricyclic, dopaminergic) • If bradycardia <50, consider other rate/rhythm altering drugs such as amiodarone or digoxin, or heart block	• Reduce diuretic and monitor resident. • Reduce dose or eliminate potentially offending drug. • If heart block is present, avoid β-blocker and/or consider cardiology referral.
The creatinine rises after starting or increasing ACEI or ARB dose.	• Normal response to ACEI/ARB if increase no greater than 30% from baseline • Normal response to ACEI/ARB if increase no greater than 30% from baseline • Hypovolemia from inadequate fluid intake and/or excessive diuresis • Concurrent use of an NSAID	• Reduce diuretic and monitor patient. • Reduce dose or eliminate potentially offending drug.
Hyperkalemia occurs when the ACEI/ARB/spironolactone dose is increased.	• Worsening renal failure, especially among diabetic patients • Patient prescribed potassium supplements offending drug. • Concurrent use of medications that promote hyperkalemia, such as NSAID or other potassium-sparing diuretics	• Reduce dose or eliminate potentially • If no reversible cause found, and patient is prescribed both an ACEI and/or ARB and an aldosterone antagonist, the preponderance of evidence suggests that the aldosterone antagonist be discontinued first.
The patient develops a cough while on an ACEI.	• Patient has developed worsening pulmonary edema • Patient has developed an infectious process or has a post-viral cough • Patient has developed an ACE inhibitor cough	• Assess the patient for possible pulmonary edema and treat with temporary increase in diuretics; then reassess. • If cough is TRULY intolerable and no obvious cause is found, stop the ACEI and consider an ARB. If cough persists with the ARB, consider combination therapy with nitrates and hydralazine.

ACEI = angiotensin-converting enzyme inhibitor; ARB = angiotensin receptor blocker; NSAID = non-steroidal anti-inflammatory drug.

prevent adverse events in patients with NYHA class III/IV HF, and another study found lower event rates in patients taking <2.8 g/d.[60,61] These studies were conducted in prospective cohorts of community-dwelling patients aged on average in their mid-60s and primarily with HFREF, though their results are likely equally applicable to patients with HFPEF. Regular weights, ideally obtained daily, allow for the early recognition of decompensated HF, often days or weeks prior to the onset of shortness of breath.[62,63]

HF and Disease Management

Referral of older HF patients to disease management programs should be considered.[64] Discharge of hospitalized seniors with HF should be facilitated by transitional care programs.[65–67] Referral of cognitively impaired or frail older HF patients to specialized geriatric services should be considered. However, continued involvement of and collaboration with PCPs is essential. The reorganization of primary care into multidisciplinary teams, as exemplified by the Family Health Team model in Ontario, has shown promising results in the management of chronic diseases such as dementia[68] and, thus, has the potential to also improve the care of HF.

End-of-Life Planning and Care

HF has a highly variable illness trajectory and high prognostic uncertainty. Patients with HF may die suddenly, often early in the course of their illness, or follow a course of progressive decline punctuated by acute exacerbations.[9] Consequently, it is important to start discussing end-of-life planning and care with patients early in the course of their illness. The timing of discussions should strongly consider the high mortality rate in the year following an HF hospitalization.[69] Advanced medical directives and a living will should be discussed with patients as well as their identified surrogate decision makers.

Conclusion

HF is a common condition among older patients. The syndrome can be complicated by geriatric syndromes such as frailty, functional decline, and CI. Understanding the impact of these geriatric syndromes on the assessment and management of HF is critical to optimal delivery of care to these patients. The potential for clinical improvements in the severity and expression of HF underscores the importance of optimizing therapies in older patients. PCPs have an important role to play in the management of aging HF patients, a role that should continue to expand successfully.

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References

1. Arnold JMO, Liu P, Demers C, et al. Canadian cardiovascular society consensus conference recommendations on heart failure

2006: Diagnosis and management. Can J Cardiol 2006;22:23–45.
2. Ross H, Howlett JG, Arnold JMO, et al. Treating the right patient at the right time: Access to heart failure care. Can J Cardiol 2006;22:749–54.
3. Public Health Agency of Canada. Tracking heart disease and stroke in Canada 2009. Ottawa: Author. Available at: http://www.phac-aspc.gc.ca/publicat/2009/cvd-avc/index-eng.php. Accessed November 2, 2011.
4. Johansen H, Strauss B, Arnold JMO, et al. On the rise: the current and projected future burden of congestive heart failure hospitalization in Canada, Can J Cardiol 2003;19:430–35.
5. Foebel AD, Hirdes JP, Heckman GA, et al. A profile of older community-dwelling home care clients with heart failure in Ontario. Chronic Dis Can 2011;31:49–57.
6. Heckman GA, Demers C, Hogan DB. Heart failure: Old disease, older adults, fresh perspective. Geriatr Aging 2008;11:21.
7. Lee DS, Tran C, Flintoft V, Grant FC, Liu PP, Tu JV. CCORT/CCS quality indicators for congestive heart failure care. Can J Cardiol 2003;19:357–64.
8. McKelvie RS, Moe GW, Cheung A, et al. The 2011 Canadian cardiovascular society heart failure management guidelines update: Focus on sleep apnea, renal dysfunction, mechanical circulatory support, and palliative care. Can J Cardiol 2011;27:319–38.
9. Howlette JG , McKelvie RS, Jeannine C, et al. The 2010 Canadian cardiovascular society guidelines for the diagnosis and management of heart failure update: Heart failure in ethnic minority populations, heart failure and pregnancy, disease management, and quality improvement/assurance programs. Can J Cardiol 2010;26:185–202.
10. Howlette JG , McKelvie RS, Arnold JMO, et al. Canadian cardiovascular society consensus conference guidelines on heart failure – 2009 update: Diagnosis and management of right sided heart failure, myocarditis, device therapy and recent important clinical trials. Can J Cardiol 2009;25:85–106.
11. Arnold JMO, Howlette JG, Ducharme A, et al. Canadian cardiovascular society consensus conference guidelines on heart failure – 2008 update: Best practices for the transitional care of heart failure patients, and the recognition, investigation and treatment of cardiomyopathies. Can J Cardiol 2008;24:21–40.
12. Arnold JMO, Howlette, Dorian P, et al. Canadian cardiovascular society consensus conference guidelines on heart failure – 2007 update: Prevention, management during intercurrent illnesses or acute decompensation, and use of biomarkers. Can J Cardiol 2007;23:21–45.
13. Lui P, Arnold JMO, Belenkie I, et al. The 2002/3 Canadian Cardiovascular Society Consensus Guideline Update for the Diagnosis and Management of Heart Failure. Can J Cardiol 2003;19:347–56.
14. Jiang H, Ogden LG, Bazzano LA, et al. Risk factors for congestive heart failure in US men and women. Arch Intern Med 2001;161:996–1002.
15. Gillespie ND, Witham MD, Stuthers AD. Chronic cardiac failure. In: Fillit HM, Rockwood K, Woodhouse. Brocklehurst's Textbook of Geriatric Medicine and Gerontology, 7th edition. New York: Elsevier. 2009.
16. Hogg K, Swedberg K, McMurray J. Heart failure with preserved left ventricular systolic function; epidemiology, clinical characteristics, and prognosis. J Am Coll Cardiol 2004;43:317–27.
17. Bhatia RS, Tu JV, Lee DS, et al. Outcome of heart failure with preserved ejection fraction in a population-based study. N Engl J Med 2006;355:260–9.
18. Lenzen MJ, Scholte op Reimer WJ, Boersma E, et al. Differences between patients with a preserved and a depressed left ventricular function: a report from the EuroHeart Failure Survey. Eur Heart J 2004;25:1214–21.
19. Mant J, Doust J, Roalfe A, et al. Systematic review and individual patient data meta-analysis of diagnosis of heart failure, with modelling of implications of different diagnostic strategies in primary care. Health Technol Assess 2009;13:1–207.
20. Fonseca C, Mota T, Morais H, et al. The value of the electrocardiogram and chest x-ray for confirming or refuting a suspected diagnosis of heart failure in the community. Eur J Heart Fail 2004;6:807–12, 821–2.
21. Heckman GA, Demers C, McKelvie RS, et al. Heart failure in older adults. J Gen Intern Med 2007;2:24–26.
22. Jarrette PG, Rockwood K, Carver D, et al. Illness presentation in elderly patients. Arch Intern Med 1995;155:1060–1064.
23. Tresch DD.The clinical diagnosis of heart failure in older patients. J Am Geriatr Soc 1997;45:1128–33.
24. Ferrucci L, Guralnik JM, Studenski S, et al. Interventions on frailty working group. Designing randomized controlled trials aimed at preventing or delaying functional decline and disability in frail, older persons: a consensus report. J Am Geriatr Soc 2004;52:625–34.

Key Points

- *Older patients with heart failure (HF) are often frail, functionally impaired, and suffering from concomitant cognitive impairment.*
- *The diagnosis of HF rests primarily on clinical grounds. Clinicians must realize that frail seniors are more likely to manifest atypical findings of HF such as delirium, falls, sleep disturbances, nocturia, and sacral edema.*
- *Transthoracic echocardiography is the modality of choice to assess cardiac function and structure; echocardiography should be performed in all patients with suspected HF.*
- *Evidence suggests that recommended HF therapies are safe and effective in frail seniors. Angiotensin-converting enzyme inhibitors (ACEIs) in particular may have benefits that include not only better symptom control but also improved function, mood, and cognition.*
- *When caring for a frail senior with HF, it is essential to seek out a reliable caregiver from whom collateral information can be obtained, and who can be trained to help in the management of the patient.*

25. Afilalo J. Frailty in patients with cardiovascular disease: Why, when, and how to measure. Curr Cardiovasc risk rep 2011;5:467–72.
26. Newman AB, Gottidiener JS, McBurnine MA, et al. Association of subclinical cardiovascular disease with frailty. J Gerontol A Biol Sci Med Sci 2001:56A:M158–166.
27. Cacciatore F, Abete P, Ferrara N, et al. Congestive heart failure and cognitive impairment in an older population, J Am Geriatr Soc 1998;46:1343–48.
28. DiCarlo A, Baldereschi M, Amaducci L, et al. Cognitive impairment without dementia in older people: prevalence, vascular risk factors, impact on disability. The Italian Longitudinal Study on Aging. J Am Geriatr Soc 2000;48:755–82.
29. Tilvis RS, Kahonen-Vare MH, Jolkkonen J, et al. Predictors of cognitive decline and mortality of aged people over a 10 year period. J Gerontol Med Sci 2004;59A:268–74.
30. Qiu C, Winblad B, Marengoni A, et al. Heart failure and the risk of dementia and Alzheimer disease. Arch Intern Med 2006;166:1003–1008.
31. Vogels RL, Oosterman JM, van Harten B, et al. Profile of cognitive impairment in chronic heart failure. J Am Geriatr Soc 2007;55:1764–70.
32. Inouye SK. Delirium in older persons. N Engl J Med 2006;354:1157–65.
33. Zuccala G, Onder G, Pedone C, et al. Cognitive dysfunction as a major determinant of disability in patients with heart failure: results from a multicentre survey. J Neurol Neurosurg Psychiatry 2001;70:109–112.
34. Rozzin R, Sabitini T. Cognitive impairment and mortality in elderly patients with heart failure. Am J Med 2004;116:137–8.
35. Folstein MF, Folstein SE, McHugh PR. Mini-mental state: A practical method for grading the cognitive status of patients for the clinician. Journal of Psychiatr Res 1975;12, 189–98.
36. Nasreddine ZS, Phillips NA, Bedirian V, et al. The Montreal Cognitive Assessment, MoCA: a brief screening tool for mild cognitive impairment. J Am Geriatr Soc 2005;53:695–9.
37. McLennan SN, Mathias JL, Brennan LC, et al. Cognitive impairment predicts functional capacity in dementia-free patients with cardiovascular disease. J Cardiovasc Nurs. 2010 Sep-Oct;25(5):390–7.
38. Cameron J, Worrall-Carter L, Page K, et al. Does cognitive impairment predict poor self-care in patients with heart failure? Eur J Heart Fail 2010;12(5):508–15. Epub 2010 Mar 30.
39. Heckman G, Misiaszek B, Merali F, et al. Association between psychotropic drug use and heart failure therapy in elderly long term care residents. J Am Geriatr Soc 2006;54:1973–75.
40. Davie AP, Francis CM, Love MP, et al. Value of the electrocardiogram in identifying heart failure due to left ventricular systolic dysfunction. BMJ 1996;12:222.
41. The Criteria Committee of the New York Heart Association. Nomenclature and criteria for diagnosis of disease of the heart and great vessels, 9th edition. Boston: Little Brown. 1994.
42. Tjam EY, Heckman GA, Smith S, et al. Predicting heart failure mortality in frail seniors: Comparing the NYHA functional classification with the Resident Assessment Instrument (RAI) 2.0. Int J Cardiol 2012 Feb 23;155(1):75–80. Epub 2011 Feb 3.
43. Rockwood K, Song X, MacKnight C, et al. A global measure of fitness and frailty in elderly people. Can Med Assoc J 2005;173:489–95.
44. Heiat A, Gross CP, Krumholz HM. Representation of elderly, women, and minorities in heart failure clinical trials. Arch Intern Med 2002;162:1682–88.
45. Hutcheon SD, Gillespie ND, Crombie IK, et al. Perindopril improves six minute walking distance in older patients with left ventricular systolic dysfunction: a randomized double blind placebo controlled trial. Heart 2002;88:373–7.
46. Tanne D, Freimark D, Poreh A, et al. Cognitive functions in severe congestive heart failure before and after exercise program. Int J cardiol 2005;103:145–9.
47. Foebel AD, Heckman G, Hirdes JP, et al. Clinical, demographic and functional characteristics associated with pharmacotherapy for heart failure in older home care clients: A retrospective, population-level, cross-sectional study. Drugs Aging 2011;28:561–73.
48. Steinman MA, Patil S, Kamat P, et al. A taxonomy of reasons for not prescribing guideline-recommended medications for patient with heart failure. Am J Geritri Pharm 2010;8:583–94.
49. Fuat A, Hungin PA, Murphy JJ. Barriers to accurate diagnosis and effective management of heart failure in primary care: qualitative study. BMJ 2003;326:1–6.
50. Garg R, Yusuf S. Overview of randomized trials of angiotensin-converting enzyme inhibitors on mortality and morbidity in patients with heart failure. Collaborative Group on ACE Inhibitor Trials. JAMA 1995;273:1450–6.
51. Flather MD, Yusuf S, Kober L, et al. Long-term ACE-inhibitor in patient with heart failure or left-ventricular dysfunction: a systematic overview of data from individual patients. ACE-Inhibitor Myocardial Infarction Collaborative Group. Lancet 2000;355:1575–81.
52. Abdulla J, Pogue J, Abildstrom SZ, et al. Effect of angiotensin-converting enzyme inhibition on functional class in patient with left ventricular systolic dysfunction – a meta-analysis. Eur J Heart Fail 2006;8:90–6.
53. Shibata MC, Flather MD, Wang D. Systematic review of the impact of beta blockers on mortality and hospital admissions in heart failure. Eur J Heart Fail 2001;3:351–7.
54. Gambassi G, Lapane KL, Sgadari A. Effects of angiotensin-converting enzyme inhibitors and digoxin on health outcomes of very older patients with heart failure. SAGE Study group. Systematic Assessment of Geriatric drug use via epidemiology. Arch Intern Med 2000;160:53–60.
55. Zuccala G, Onder G, Marzetti, et al. Use of angiotensin-converting enzyme inhibitors and variation in cognitive performance among patients with heart failure. Eur Heart J 2005;26:226–33.
56. Shibata MC, Tsuyki RT, Wiebe N. The effects of angiotensin-receptor blockers on mortality and morbidity in heart failure: a systemic review. Int J Clin Pract 2008;62:1397–402.

57. Heckman G, McKelvie RS. Diagnosis and management of heart failure with preserved ejection fraction in older adults. Geriatr Aging 2009;12:93–96.
58. Gill SS, Anderson GM, Fischer HD, et al. Syncope and its consequences in patients with dementia receiving cholinesterase inhibitors: A population-based cohort study. Arch of Int Med 2009;169:867–73.
59. Schwartz JS, Wang YR, Cleland JG, et al. High versus low-dose angiotensin converting enzyme inhibitor therapy in the treatment of heart failure: an economic analysis the Assessment of Treatment with Lisinopril and Survival (ATLAS) trial. Am J Manag Care 2003;9:417–24.
60. Lennie TA, Song EK, Wu JR, et al. Three gram sodium intake is associated with longer event-free survival only in patients with advanced heart failure. J Card Fail 2011;17:325–30.
61. Arcand J, Ivanov J, Sasson A, et al. A high-sodium diet is associated with acute decompensated heart failure in ambulatory heart failure patients: a prospective follow-up study. Am J Clin Nutr 2011;93:332–7.
62. Jurgens CY. Somatic awareness, uncertainty, and delay in care-seeking in acute heart failure. Res Nurs Health 2006;29:74–86.
63. Chaudhry SI, Wang Y, Concato J, et al. Patterns of weight change preceding hospitalization for heart failure. Circulation 2007;116:1549–54.
64. Pulignano G, Del Sindaco D, Di Lenarda A, et al. Usefulness of frailty profile for targeting older heart failure patients in disease management programs: a cost-effectiveness, pilot study. J Cardiovasc Med 2010;11:739–47.
65. Naylor MD. A decade of transitional care research with vulnerable elders. J Cardio Nurs 2000;14:1–14.
66. Bowles KH, Naylor MD, Foust JB. Patient characteristics at hospital discharge and a comparison of home care referral decisions. J Am Geriatr Soc 2002;50:336–42.
67. Naylor MD, Brooten DA, Campbell RL, et al. Transitional care of older adults hospitalized with heart failure: a randomized, controlled trial. J Am Geriatr Soc 2004;52:675–84.
68. Rosser WW, Colwill JM, Kasperski J, et al. Patient-centered medical homes in Ontario. N Engl J Med 2010;362.
69. Jong P, Vowinckel E, Liu PP, et al. Prognosis and determinants of survival in patients newly hospitalized for heart failure: a population-based study. Arch Internal Med 2002;162:1689–94.