

Heart Failure: Old Disease, Older Adults, Fresh Perspective

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The burden of heart failure is rapidly rising. Heart failure is associated with substantial mortality, morbidity, and economic cost, which disproportionately affect older adults. Heart failure among older individuals is frequently complicated by geriatric syndromes, including frailty, functional decline, cognitive impairment, and atypical clinical presentations. Understanding the nature of these geriatric syndromes and their impact on the assessment and management of heart failure is a critical component to diagnosing and delivering appropriate care to these patients. In this article we review the geriatric aspects of heart failure.

Key words: geriatric syndrome, heart failure, older adults, diagnosis, frailty

Introduction

Despite remarkable technological advances during the last century, the clinical encounter between a patient and a physician continues to lie at the heart of medicine, as it has for millennia, even as far back as the time of ancient Egypt.¹ One of the key purposes of the encounter is to elicit a particular pattern of symptoms and signs, or syndrome, which suggests an underlying diagnosis. The term syndrome is derived from the Greek roots *syn*, meaning *together*, and *dromos*, meaning *a running*.² A medical syndrome is therefore a running together of symptoms and signs that points to an underlying physiological abnormality. Heart failure (HF) is a syndrome that occurs in the setting of abnormal cardiac function and results in clinical features of low cardiac output and/or pulmonary or peripheral congestion (see Figure 1).³ Papyri dating from as far back as 1500

BC, as well as documents from ancient Greece and Rome, allude to persons with cardiac disease who seem to have been suffering from HF. Often young, they experienced exertional dyspnea, exercise intolerance, orthopnea, paroxysmal nocturnal dyspnea, wheezing, edema, and ascites.^{1,4,5}

In contrast to those living in antiquity, modern-day individuals with HF are much older. Today, the prevalence of HF rises with age from 1% among persons <65 years old to >10% among those age 75 years or more.⁶ As the Canadian population ages, and with cardiovascular patients surviving longer, the burden of HF will continue to rise.⁷ Heart failure is the most common cause of hospitalization of persons age 65 years and over, and those age 75 years or over account for two thirds of inpatient hospital days for HF.^{8,9} The 1-year mortality rate in Ontario following a first hospitalization for HF



is 30% but exceeds 60% among older adults with multiple comorbidities.^{10,11} Furthermore, HF among older adults may be complicated by concurrent geriatric syndromes such as frailty, functional decline, and cognitive impairment. In contrast to medical syndromes that consist of signs and symptoms explained by a specific pathophysiology, geriatric syndromes result from the running together of impairments in multiple systems that renders an older person vulnerable in the setting of a situational challenge to one of these multifactorial health conditions.¹² For example, the presence of sensory deficits, underlying dementia, and dehydration render an older person susceptible to the development of delirium during an acute illness.¹³ The occurrence of geriatric syndromes among older adults with HF leads to particular challenges in their management, which are the focus of this article.

An Illustrative Case

An 83-year-old woman is referred for assessment of recent confusion. She is worse at night, when she suddenly wakes up confused and hallucinating a few hours after bedtime. She sees small children running in her bedroom and complains to her husband about them. When he points out that he cannot see them, she hits him and leaves the bed to sleep in a reclining armchair. She denies any cardiac or respiratory symptoms. Her past medical history includes ischemic cardiomyopathy, with a left ventricular ejection fraction of 20%, and her cognition until the past few months was felt by her family to be normal. Her medications include enteric-coated acetylsalicylic acid 81 mg daily, irbesartan 75 mg daily, and furosemide 20 mg occasionally, when her chronic leg edema becomes severe. In response to her confusion and hallucinations, she was prescribed rivastigmine and quetiapine, neither of which has improved her symptoms. Her physical examination is notable for tachypnea in the supine

Table 1: Signs and Symptoms of Heart Failure among Older Adults

Established	Atypical Presentation and/or Geriatric Syndrome
Dyspnea	Insomnia
Orthopnea	Delirium
Paroxysmal nocturnal dyspnea	Sudden functional decline
Fatigue	Falls
Weakness, exercise intolerance	Incontinence, nocturia
Cough	Anorexia
Weight gain, abdominal distension and discomfort	

position, jugular venous distension, severe pitting peripheral edema, a third heart sound, and bibasilar rales. Her blood pressure and heart rate are normal. Her neurological examination demonstrates no focal deficits, but she has significant lower extremity muscle weakness and her Mini-Mental State Examination score is 17 out of 30. She is diagnosed with heart failure, delirium, and deconditioning, and admitted to a Geriatric Assessment and Rehabilitation Unit for further therapy.

The case described above illustrates some of the complications that can occur among older adults with HF. We expand upon these concepts in the following sections.

Heart Failure, Frailty, and Functional Impairment

Frailty is a term used to denote a state of increased vulnerability due to the loss of physiological reserve; it is most often, but

not exclusively, found among older persons.^{14,15} Functional impairment and decline denote the loss of a person's ability to perform basic and/or instrumental activities of daily living.¹⁶⁻¹⁸ Heart failure is associated with frailty among older adults. Sarcopenia, the loss of lean muscle mass, is common to both frailty and HF, and in both circumstances is associated with diminished physical activity.^{19,20} Investigators in the Cardiovascular Health Study carried out an extensive cardiovascular and frailty assessment in a large group of community-dwelling older adults aged 65 years and over. Participants with a history of HF were more likely to be frail (odds ratio [OR] 7.51, 95% confidence interval [CI] 4.66-12.12).²¹ Functional decline is common among older patients hospitalized with HF, who, following discharge, often require home care services or admission to a nursing home.²²⁻²⁵

Heart Failure and Cognitive Impairment

There is substantial evidence that older adults with HF have an increased risk of cognitive impairment. Cross-sectional studies suggest that the prevalence of cognitive impairment among older hospitalized individuals with HF may exceed 50%, particularly among those with severe left ventricular (LV) systolic dysfunction or a worse New York Heart Association (NYHA) classification.²⁶⁻²⁸ Many of these patients may experience delirium. Stable community-dwelling older adults with a history of HF also have an increased risk of developing cognitive impairment.²⁹⁻³² In a randomly selected sample of >1,000 community-dwelling older adults (mean age 74 years), a history of HF was associated with an increased risk of cognitive impairment (adjusted OR 1.96, 95% CI 1.07-3.58).²⁹ In a Finnish study of 650 randomly selected community-dwelling older adults followed up for 5 years, a history of HF was associated with a greater risk of cognitive decline (relative risk 1.83, 95% CI 1.02-3.27).³¹ The Kungsholmen project followed up 1,301 community-dwelling older adults (mean age 82 years) with no prior dementia over 5 years.³² Those with prior HF were more likely to develop dementia during follow-up (hazard ratio 1.84, 95% CI 1.35-2.51).

Individuals with HF who have cognitive impairment have an increased risk of nonadherence to recommended therapy, rehospitalization, functional decline, and mortality.³³⁻³⁶ Emerging evidence

Table 2: Confusion Assessment Method*

Criterion	Description
1	Acute onset and fluctuating course: information obtained from a reliable source
2	Inattention: difficulty focusing attention
3	Disorganized thinking: disorganized, incoherent, rambling/incoherent conversation, illogical/unclear reasoning, and unpredictable switching
4	Altered level of consciousness: anything but alert

*A diagnosis of delirium requires criteria 1 and 2 plus either 3 or 4.

Source: Adapted from Inouye SK et al., 1990.⁵⁰

Figure 1:
Congestive Heart Failure

functional impairment

Heart failure is a syndrome that occurs in the setting of abnormal cardiac function and results in clinical features of low cardiac output and / or pulmonary or peripheral congestion.

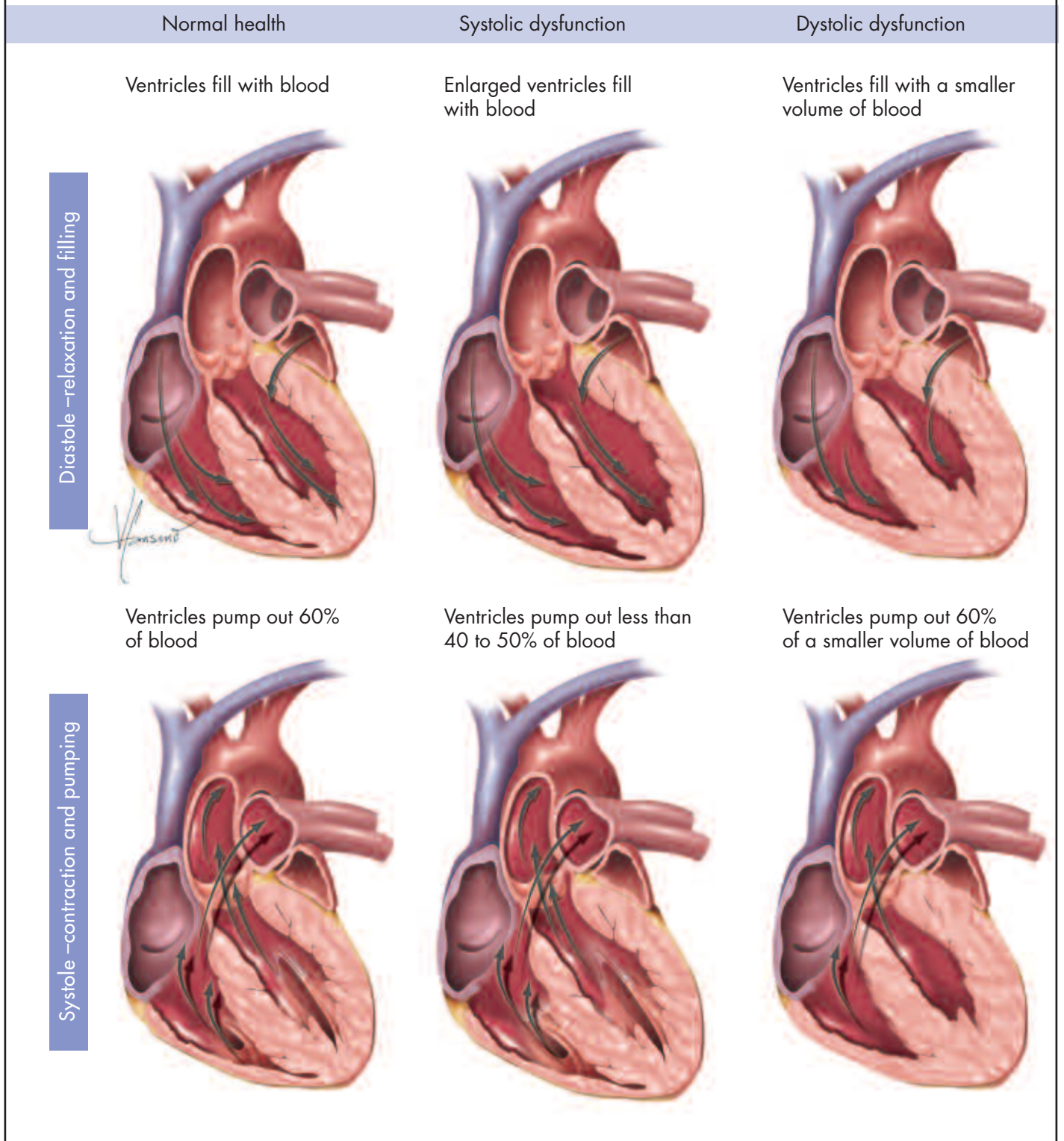


Table 3: The Canadian Study of Health and Aging Clinical Frailty Scale

Frailty Level	Description
1. Very fit	Robust, active, energetic, well motivated, and fit; these people commonly exercise regularly and are in the fittest group for their age
2. Well	Without active disease but less fit than people in category 1
3. Well, with treated comorbid disease	Disease symptoms are well controlled compared with those in category 4
4. Apparently vulnerable	Although not frankly dependent, these people commonly complain of being “slowed up” or having disease symptoms
5. Mildly frail	With limited dependence on others for instrumental activities of daily living
6. Moderately frail	Help is needed with both instrumental and noninstrumental activities of daily living
7. Severely frail	Completely dependent on others for activities of daily living, or terminally ill

Source: Adapted from Rockwood K et al., 2005.⁵²

suggests that cognitive impairment interferes with the ability of persons with HF to self-manage their condition.^{37,38} Persons with HF may have impaired memory and attention, processing speed, learning, and executive function deficits, all of which may interfere with adherence to lifestyle and dietary prescriptions, medications, regular weighing, and the recognition of early symptoms of decompensated HF.³⁹ Rehospitalization for HF has been associated with medication mismanagement and failure to recognize HF symptoms and seek medical attention in a timely manner.^{40–44}

Presentation of Heart Failure among Older Adults

Atypical disease presentations are associated with functional impairment and/or frailty among older adults.^{45,46} A study of older hospitalized medical patients showed that atypical presentations—such as delirium, acute functional decline, or falls—are more common among individuals with premorbid functional limitations.⁴⁵ Individuals with HF who are sedentary from other comorbidities may not experience exertional dyspnea. In bed-bound patients, edema may accumulate over the sacrum rather than at the ankles. Edema is not specific to HF and might reflect venous insufficiency, treatment with calcium-channel blockers, reduced oncotic pressure, or pulmonary

disease. Nonspecific sleep disturbances may be atypical manifestations of orthopnea, paroxysmal nocturnal dyspnea, or nocturia due to the mobilization of peripheral edema in the recumbent position.^{47,48} Psychiatric symptoms, such as anxiety or depressed mood, may be associated with symptomatic or undertreated HF among frail older persons.⁴⁹

Assessing Older Adults with Heart Failure

As in ancient Egypt, the cornerstone of the assessment of older adults with HF remains the history and physical examination. In addition to the common features of the HF syndrome, clinicians should consider HF in the differential diagnosis of persons presenting with a geriatric syndrome (Table 1). For an accurate history, and specifically to assess the premorbid cognition and performance of activities of daily living, collateral information obtained from a caregiver who knows the patient well is essential. Acute cognitive impairment in any person, and specifically in a person with prior HF, suggests delirium, which can be detected using the Confusion Assessment Method (CAM) (Table 2).⁵⁰ For stable patients, particularly those being considered for discharge from hospital, the use of brief and sensitive tools such as the Montreal Cognitive Assessment (www.mocatest.org) may help to detect

subtle yet potentially clinically significant cognitive impairment.⁵¹ The Mini-Mental State Examination is no longer considered the instrument of choice to screen persons with vascular disease for cognitive impairment.⁵¹ Frailty can be assessed with the brief seven-item Canadian Study of Health and Aging Clinical Frailty Scale (Table 3).⁵²

Most persons presenting with HF should undergo transthoracic echocardiography as well as basic laboratory investigations (Table 4).³ Further investigations should be done if clinically indicated and are reviewed in the Canadian Cardiovascular Society (CCS) Consensus Conference Recommendations on HF.³

Management of Older Adults with Heart Failure

The CCS Consensus Conference recommends that HF therapies for older patients should be similar to those for younger patients. Readers are referred to the HF consensus conference articles for more details.^{3,53,54} Though most large randomized trials of HF therapy excluded frail older adults, evidence from smaller trials and observational data consistently supports the benefits of standard HF therapies, particularly angiotensin-converting enzyme (ACE) inhibitors and beta-blockers, on mortality and morbidity of these individuals.^{3,55} Evidence is mounting that the benefits of

Table 4: Baseline Investigations for Individuals with Heart Failure

Clinical history and physical examination

Clinical laboratory investigations; consider the following:

- Complete blood count
- Renal function (creatinine and blood urea nitrogen)
- Electrolytes
- Glucose
- Urinalysis
- Liver enzymes and function
- Thyroid function

Imaging:

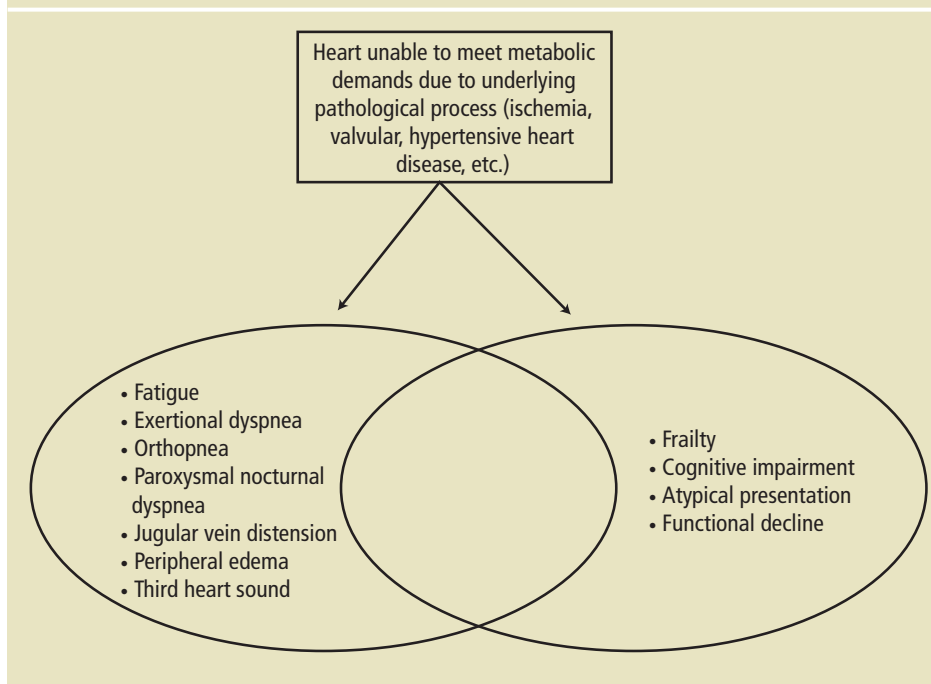
- Chest radiography
- Electrocardiography
- Transthoracic echocardiography

If clinically indicated, further investigations to assess for myocardial ischemia may include the following:

- Cardiopulmonary exercise testing
- Radionuclide imaging
- Cardiac catheterization

Adapted from Data from Arnold JMO et al., 2006.³

recommended therapies for older adults with HF, particularly ACE inhibitors and exercise, may include preservation of function and cognition. In a randomized placebo-controlled trial of 60 NYHA class II–III individuals with HF from LV systolic dysfunction age 81 ± 6 years, perindopril over 10 weeks was associated with a 37-metre increase in 6-minute walking distance compared with baseline, versus no significant change in the control group ($p < .001$).⁵⁶ A supervised exercise program over 18 weeks in 20 NYHA class III HF individuals who were age 63 ± 13 years and had an LV ejection fraction 35% or less resulted in improvements in psychomotor speed and general attention.⁵⁷ Numerous observational studies have suggested that ACE inhibitors prescribed to older adults with HF result in slower functional decline,

Figure 2: The Cardiogeriatric Syndrome of Heart Failure

improved cognition, and less depression.^{49,58–60}

The prescription of multiple therapies to older adults with HF, many of whom have diverse comorbidities, invariably leads to polypharmacy and an increased risk of adverse drug events. Medication review is essential in the management of HF for these individuals. Medications to be used cautiously include nonsteroidal anti-inflammatory drugs, thiazolidinediones (glitazones), antiarrhythmic drugs, and older-generation calcium channel blockers.³ Older adults prescribed HF combination therapy, particularly with medications that affect the renin-angiotensin-aldosterone system, should be followed up closely for changes in renal function and the development of fluid/electrolyte abnormalities.³ When dehydration is suspected, serum electrolytes, creatinine, and urea should be measured without delay and spironolactone temporarily withheld due to the risk of hyperkalemia.^{3,53} In 2001, an estimated 560 additional hospitalizations and 73 deaths from hyperkalemia occurred in Ontario following a more widespread use of spironolactone for HF after the publication of the Randomized

Aldactone Evaluation Study, underscoring the importance of appropriate prescribing and monitoring.⁶¹

Nonpharmacological modalities for HF management include regular daily physical activity. Referral for cardiac rehabilitation should be considered for stable individuals.³ Most people should be advised to restrict their salt intake to <3 g daily; this can usually be achieved by not cooking with salt or using salt at the table.³ Persons with significant chronic renal insufficiency or with congestion not easily controlled with diuretics should be weighed daily in the morning.³ For such individuals, restricting daily fluid intake to 2 L may also be considered.³ In the case of persons with cognitive impairment, educational interventions should be directed at their cognitively intact caregivers.³ Adherence to prescribed therapy may be improved through the use of aids such as weekly dosettes or blister packs, close supervision by a pharmacist or caregiver, and adequate social support through family members or visiting nurses.⁶² While referral of frail individuals to multidisciplinary HF management programs or specialized geriatric services

should be considered, the continued involvement of their primary care physicians is essential.³

Predicting when the death of an individual with HF will occur is challenging—many die suddenly, while others die slowly of progressive disease. Discussions concerning advanced directives and identification of substitute decision makers should occur early in the course of the HF process and be reviewed periodically, particularly after changes in the patient's condition.³

Case Resolution

The patient did well and was discharged home after a 4-week stay in the Geriatric Assessment and Rehabilitation Unit. Optimization of medications for her HF was limited because she was unable to tolerate an ACE inhibitor due to a cough, and she developed symptomatic hypotension when attempts were made to achieve the target dose for irbesartan of 300 mg daily and when a beta-blocker was introduced. Her cardiac and respiratory statuses stabilized, and she was able to ambulate with a walker and look after her basic activities of daily living. She was discharged and assigned to irbesartan 150 mg and furosemide 20 mg daily. Her Mini-Mental State Examination score improved to 29 out of 30, but more extensive testing led to a diagnosis of vascular dementia. Her family assumed responsibility for the management of her HF.

Conclusion

Frailty, functional decline, and cognitive impairment can complicate HF among older adults. Understanding these geriatric syndromes and their impact on the assessment and management of HF is critical to optimal care delivery. Recognizing the *cardiogeriatric syndrome of HF* (Figure 2), a term coined by Michael Rich⁶³ to represent the interface of a classic medical syndrome with a variety of geriatric syndromes, translating clinical findings into an accurate diagnosis remains as important today as it was in the time of ancient Egypt. To Egyptians, the heart was regarded as the centre of knowledge and consciousness. Perhaps their awareness of the geriatric aspects of HF may have been lost in 20th century transla-

Key Points

The burden of heart failure (HF) is increasing and disproportionately affects older persons.

In addition to classic symptoms and signs, the presentation of HF among older adults may include atypical symptoms and geriatric syndromes, such as cognitive impairment, functional decline, falls, psychiatric symptoms, or frailty. Understanding geriatric syndromes and their impact on the assessment and management of HF is critical to diagnosis and optimal care delivery.

Therapies for older adults with HF should be similar to those for younger individuals. Periodic medication review is essential, and renal function and electrolytes should be monitored regularly, particularly during periods of intercurrent illness.

Identifying a capable caregiver, who knows the patient well, is essential: (1) the caregiver can provide accurate collateral information regarding a patient's baseline function and cognition; and (2) education interventions regarding HF management can be directed at the caregiver of patients with cognitive impairment.

tions, as the following excerpts—first from the Ebers papyrus¹ and second a description of HF—suggest:

*His heart is overflowed. This means that his heart is forgetful like one who thinks something else.
Weakness of old age ...*



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