Concise Review for Primary-Care Physicians

Congestive Heart Failure in Elderly Patients

MICHELE SENNI, M.D., AND MARGARET M. REDFIELD, M.D.

The prevalence of congestive heart failure (CHF) is increasing. Most patients with CHF are elderly, and CHF is the most common dismissal diagnosis in elderly hospitalized patients. As many as 50% of elderly patients with heart failure may have normal systolic function and isolated diastolic heart failure. Assessment and management of elderly patients are complicated by comorbidities, increased susceptibility to side effects, and concerns about the appropriate use of costly and invasive procedures. The basics of the approach to the evaluation and management of heart failure in elderly patients are reviewed.

(Mayo Clin Proc 1997; 72:453-460)

ACE = angiotensin-converting enzyme; CHF = congestive heart failure

Congestive heart failure (CHF) is a clinical syndrome associated with systolic or diastolic ventricular dysfunction resulting from various cardiovascular diseases. Although morbidity and mortality from cardiovascular disease have decreased in recent decades, the prevalence of CHF is increasing. This review focuses on this extremely common clinical condition in elderly patients.

CONGESTIVE HEART FAILURE

Epidemiology.—Approximately 400,000 new cases of CHF occur in the United States each year, and an estimated 2 million people in the United States have CHF.[1] The prevalence of CHF increases dramatically with advancing age; investigators estimate that 9.1% of people older than age 80 years have CHF (Fig. 1).[1-3] Currently, in the United States, 33 million people are 65 years of age or older, and approximately 7.9 million are age 80 years or older. By the year 2030, an estimated 70 million Americans will be older than 65 years of age, approximately 18 million of whom will be older than age 80 years. Thus, even with conservative estimates of the prevalence of CHF in elderly patients, the number of elderly patients with CHF will more than double and will approach 3.6 million by that time. These figures probably significantly underestimate the prevalence of milder CHF because clinical criteria tend to be insensitive for early manifestations of CHF, particularly in elderly patients.[4]

Associated Costs.—CHF was the most common dismissal diagnosis in patients older than age 65 years in 1991 and was the primary dismissal diagnosis in 722,000 patients in 1990. When secondary diagnoses are also included, the hospital dismissals for CHF exceed 2 million patients.[1] In 1991, the Health Care Financing Administration (HCFA) hospitalization cost for CHF was more than $5 billion, which exceeds the combined HCFA hospitalization cost for cancer and myocardial infarction in elderly patients. The number of outpatient visits due to CHF is second only to those for hypertension and exceeds 11 million visits per year.[5] Overall, the health-care cost of CHF was estimated to be more than $10 billion in 1989 by the National Heart, Lung, and Blood Institute, with more than 50% of this cost used for hospitalizations.

FACTORS RESPONSIBLE FOR PREVALENCE OF CHF

The exponential increase in the prevalence of CHF with advancing age can be attributed to the increase in the prevalence and cumulative duration of systemic hypertension with advancing age, the increase in the prevalence and duration of coronary artery disease with advancing age, and perhaps age-related changes in cardiac structure and function, which occur even in the absence of cardiovascular disease.

Hypertension.—Hypertension is extremely common in elderly patients. In industrialized nations, systolic blood pressure increases with age. With use of 140/90 mm Hg as the upper limit of normal, hypertension occurs in more than 50% of people in the United States who are older than age 65 years and in almost 75% of elderly blacks.[6]

Several cardiovascular conditions that predispose to the development of CHF have been identified, the most common of which is hypertension in the general population. In the Framingham study, after adjustments were made for other heart failure risk factors, the possibility of heart failure de-

From the Division of Cardiovascular Diseases and Internal Medicine, Mayo Clinic Rochester, Rochester, Minnesota.

Address reprint requests to Dr. M. M. Redfield, Division of Cardiovascular Diseases, Mayo Clinic Rochester, 200 First Street SW, Rochester, MN 55905.

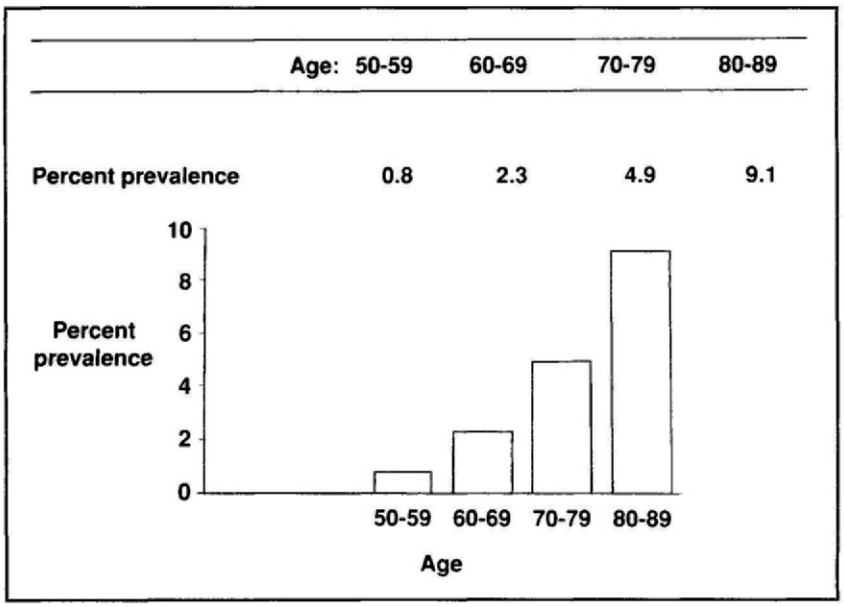

Fig. 1. Estimated prevalence of congestive heart failure (based on clinical diagnosis) from Framingham study. Prevalence of heart failure increases dramatically in very elderly patients. (Modified from Kannel WB, Belanger AJ. Epidemiology of heart failure. Am Heart J 1991; 121:951-957. By permission.)

veloping in persons with hypertension versus normotensive persons was approximately twofold in men and threefold in women, and investigators estimate that hypertension accounts for 39% of cases of CHF in men and 59% in women.[7] The recognition that hypertension produces diastolic dysfunction, which can cause clinical heart failure in the absence of systolic dysfunction, clarifies these figures. Most of the recent trials of medical therapy for CHF cite ischemic heart disease as the most common cause of CHF, and these trials indicate that few patients with CHF have dilated cardiomyopathy thought to be due to hypertension in the absence of coronary artery disease. All these trials, however, stipulated that the enrolled patients have a decreased ejection fraction, and most were younger than 65 years of age. Thus, although ischemic heart disease probably accounts for most cases of CHF associated with systolic dysfunction, hypertension predisposes to heart failure through its cumulative effects to produce left ventricular hypertrophy and fibrosis, altered coronary vascular endothelial function, coronary microvascular disease with reduced coronary flow reserve, and epicardial coronary artery atherosclerosis and myocardial infarction. These structural and functional cardiac and coronary vascular perturbations result in CHF due to impaired left ventricular relaxation and reduced compliance (diastolic dysfunction) with or without decreased systolic function.

Coronary Artery Disease.—The second major factor responsible for CHF in elderly patients is the increased prevalence and severity of epicardial coronary artery disease. Autopsy studies suggest that 60% of subjects older than age 65 years have at least one coronary artery with greater than 75% stenosis. In the Framingham study, both angina pectoris and previous myocardial infarction were independent predictors of subsequent development of CHF. Even though mortality rates from acute myocardial infarction and coronary artery disease in general are declining, more patients have systolic and diastolic ventricular dysfunction due to coronary artery disease and are thus at risk for development of CHF.

Age-Related Changes in Cardiac Structure and Function.—Even in the absence of hypertension or coronary artery disease, degenerative changes in cardiac structure and function occur. Although few investigators believe that these changes can produce CHF in the absence of concomitant cardiovascular disease, such changes may predispose elderly patients to CHF in light of any specific degree of hypertension or coronary artery disease. Notable among these "age-related" changes is impairment of left ventricular relaxation, which has been documented with Doppler echocardiography in elderly subjects free of cardiovascular disease. The clinical significance of these alterations relative to the development of CHF remains uncertain.

DIFFERENCES OF CHF IN ELDERLY PATIENTS VERSUS YOUNGER PATIENTS

Because most patients with CHF are elderly, an appropriate question might be whether CHF differs in younger patients.

As a clinical syndrome, CHF is an extremely heterogeneous condition, but elderly patients do tend to differ in several important respects.

"Systolic" Versus "Diastolic" Dysfunction.—One of the most profound developments in our understanding of cardiovascular pathophysiology in recent years has been the recognition of the clinical significance of left ventricular diastolic dysfunction.[8] Abnormalities in cardiac and coronary vascular structure, myocyte function, and loading conditions result in impairment of left ventricular relaxation and decreased compliance of the ventricle to such a degree that extremely high pressures are needed to fill the ventricle during diastole. Although systolic dysfunction never occurs in the absence of concomitant diastolic dysfunction, diastolic dysfunction frequently occurs in the absence of impaired systolic function. Investigators have long recognized that uncommon cardiovascular diseases such as hypertrophic cardiomyopathy and rare restrictive cardiomyopathies as well as constrictive pericarditis could cause isolated "diastolic heart failure," and we now know that most patients with isolated diastolic heart failure have hypertensive heart disease with or without concomitant coronary artery disease. Furthermore, data from more than 31 small noncontrolled studies as well as preliminary data from the Framingham study and the Cardiovascular Health Study indicate that 30 to 50% of patients with clinical CHF have normal systolic function and that *the rate of CHF with normal systolic function increases dramatically with advancing age*. Unfortunately, the signs and symptoms of diastolic heart failure do not differ from those of CHF due to systolic dysfunction, and our ability to diagnose and treat diastolic heart failure confidently is limited.

Manifestation.—In general, elderly patients have more advanced CHF than do younger patients because they tend to be more sedentary and thus do not note symptoms or do not receive a diagnosis of CHF until their cardiac limitation is advanced. Manifestation can be atypical, especially in frail or demented patients who may have lethargy, fatigue, or confusion. Diagnosis is complicated by the plethora of other conditions that may affect exercise tolerance or produce dyspnea, fatigue, or edema in the elderly population. Obesity, orthopedic limitations, pulmonary disease, or simple deconditioning may cause dyspnea and exercise intolerance. Venous disease, obesity, inactivity, renal disease, or medications may cause edema. Countless comorbidities including depression and dementia may produce fatigue. Concomitant illnesses tend to precipitate exacerbations of CHF due to excess load placed on the heart because of hypertension, renal disease with fluid retention, and high-output states due to anemia, thyroid disease, or infection. Elderly patients are often treated with negative inotropic agents such as calcium channel antagonists or nonsteroidal anti-inflammatory drugs and hormonal agents that promote fluid retention. They are prone to recurrent episodes of CHF due to various factors. Optimal doses of medication may not be used because of concern about potential side effects. Elderly patients may be noncompliant because they do not understand, cannot tolerate, or cannot afford the multidrug regimen often needed for the treatment of CHF.

Etiologic Factors.—In comparison with younger patients, fewer elderly patients with CHF will have idiopathic dilated cardiomyopathy, and more will have hypertensive heart disease, coronary artery disease, and degenerative aortic stenosis. In some elderly patients with hypertension, the clinical picture resembles that seen in hypertrophic cardiomyopathy, with asymmetric basal septal hypertrophy, dynamic left ventricular outflow tract obstruction, mitral annular calcification, small hyperdynamic and hypertrophied left ventricle, and left atrial enlargement. Such patients, however, represent a small portion of elderly patients with hypertensive heart disease and CHF. The acute onset of severe CHF symptoms in a patient with normal systolic function, including "flash pulmonary edema," has been described in elderly patients with severe coronary artery disease, especially in the setting of hypertension and left ventricular hypertrophy.

Associated Mortality.—Most of the currently quoted data concerning mortality in patients with CHF are from large multicenter studies that have evaluated drug therapies for CHF. These data cannot be reliably extrapolated to elderly patients with CHF in the community setting because this type of study generally conducted in a referral setting does not include elderly patients and is limited to patients with systolic dysfunction. The mean age of patients in the recent major trials of vasodilator therapy for CHF was 58.5 to 60.5 years. Limited population-based data in CHF cohorts with large numbers of elderly patients provide insight into the prognosis for elderly patients with CHF and indicate 1-year mortality rates of 20%.[3,9] A study of very elderly men with CHF (mean age, 82 years) reported 1- and 5-year mortality rates of 30 and 50%, respectively.[10] Whether patients with CHF and normal systolic function have better survival than those with CHF and reduced ejection fraction is controversial,[9,10] and better data concerning mortality in elderly patients with CHF in the community are needed.

ASSESSMENT OF ELDERLY PATIENTS WITH SUSPECTED CHF

The diagnosis of CHF in elderly patients must begin with a high index of suspicion. The physician must then focus on performing studies that will allow confirmation of the diagnosis, definition of the type of ventricular dysfunction, determination of the type or types of underlying cardiovascular disease, and, of importance, recognition of the presence of comorbidities that must be treated concomitantly or that may

alter the therapeutic approach or provoke future exacerbations. Detailed recommendations for the assessment and management of patients with CHF have recently been published as clinical practice guidelines prepared by the American Heart Association and the American College of Cardiology Joint Committee on CHF as well as by a panel of heart failure experts commissioned by the Agency for Health Care Policy and Research.[11,12] These concise, well-written documents review the evidence for each recommendation and are certainly applicable to patients of all ages with CHF.

To diagnose CHF, the physician should elicit a thorough history, perform a physical examination, and obtain a chest roentgenogram, electrocardiogram, complete blood cell count, creatinine level, electrolytes, and a sensitive thyroid-stimulating hormone level. If CHF is suspected, echocardiography or radionuclide ventriculography (multiple gated acquisition scanning) is recommended to determine ventricular size and ejection fraction. Echocardiography can also assess diastolic function and valvular function and can aid in detection of other etiologic clues such as regional wall motion abnormalities or ventricular hypertrophy. Further assessment is done on an individual basis, with an emphasis on clarification of comorbidities that may explain or contribute to the patient's symptoms and the evaluation for coronary artery disease. The degree of aggressiveness varies widely depending on the severity of patients' symptoms, whether they are candidates for revascularization, and their current and potential independence in living and activity goals. The heterogeneity of elderly patients with CHF makes algorithm-based evaluation difficult, but guidelines can be offered regarding two often complex issues.

Determination of "Diastolic Heart Failure".—The diagnosis of diastolic heart failure can be extremely difficult because the noninvasive assessment of diastolic function is not clear-cut, and thus direct confirmation of the presence or absence of diastolic heart failure is difficult. One diagnostic approach is outlined in Figure 2. If symptoms are suggestive of heart failure and no likely noncardiac condition is thought to be prominently contributing to symptoms or signs, an assessment of systolic function should be done *during symptoms if possible*. If the ejection fraction is normal, diastolic heart failure is likely if other associated conditions are present, including a history of hypertension, coronary artery disease, or valvular disease even if the valvular disease has been corrected surgically. Advanced age, female gender, presence of diabetes mellitus, and chest roentgenographic findings typical of CHF also make the diagnosis more likely. Two-dimensional echocardiography (if performed correctly) offers clues that support the diagnosis of diastolic heart failure. If left ventricular hypertrophy, regional wall motion abnormality, left atrial enlargement, or severe valvular disease is present, a diagnosis of diastolic heart failure is likely.

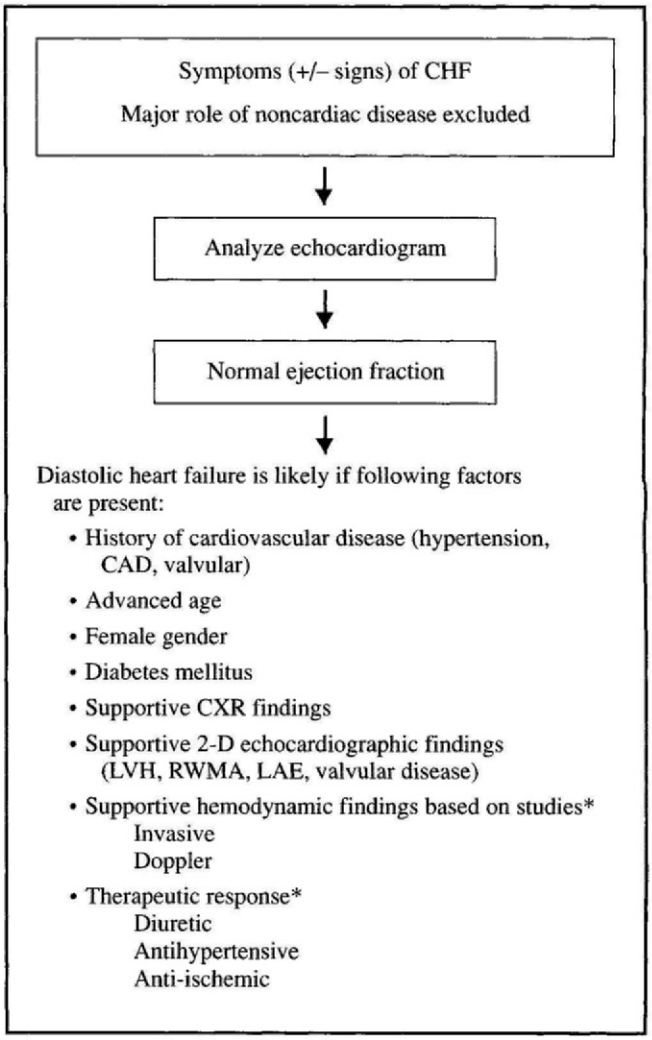

Fig. 2. Suggested algorithm for diagnosis of diastolic heart failure. *CAD* = coronary artery disease; *CHF* = congestive heart failure; *CXR* = chest x-ray; *LAE* = left atrial enlargement; *LVH* = left ventricular hypertrophy; *RWMA* = regional wall motion abnormality. * = see text for further details.

Supportive hemodynamic findings may be available if a pulmonary artery catheter was placed or if left ventricular diastolic pressure is measured during coronary angiography. Doppler echocardiography can provide clues to the presence of diastolic dysfunction and increased left ventricular diastolic pressures. Doppler analysis may indicate the presence of abnormal relaxation or suggest increased left ventricular diastolic pressure. Of note, however, Doppler assessment of filling pressures, especially in the presence of normal systolic function, continues to evolve, and use of this complex assessment is not yet integrated into daily clinical practice in most echocardiographic laboratories. Furthermore, findings that may be characteristic during severe symptoms may resolve once filling pressures are normalized by diuretic

therapy. Therefore, performing the assessment while the patient is most symptomatic is important. Finally, the response of the patient's symptoms to treatment of diastolic dysfunction is often extremely helpful in establishing the diagnosis. Diuretics, control of blood pressure, and control of ischemia should result in diminishment of symptoms due to diastolic heart failure.

Coronary Angiography in the Evaluation of Heart Failure.—In very elderly patients, assessment and management are often complicated by reluctance of the physician to use costly methods because these patients are at increased risk for side effects from invasive procedures, and survival and treatment benefit may be limited. In patients who are otherwise good candidates for revascularization, coronary angiography should be considered if they have angina or if extensive ischemia is demonstrated on perfusion stress imaging or stress echocardiography. Age alone should not be an exclusion factor for the use of coronary angiography and catheter- or surgical-based revascularization for ischemia in the setting of CHF. Improved results from angioplasty in patients with multivessel disease make it an attractive approach in elderly patients, but even surgical revascularization may be appropriate and cost-effective in patients with refractory symptoms and repeated hospitalizations.

TREATMENT OF CHF DUE TO SYSTOLIC DYSFUNCTION

The treatment of CHF in elderly patients has not been rigorously studied. As previously mentioned, most of the major trials of vasodilator therapy have excluded elderly patients. Nonetheless, no evidence exists to suggest that the approach should be fundamentally different other than the recognition that elderly patients may have increased side effects. The cornerstone of therapy for systolic dysfunction is vasodilator agents, and maximal doses should be used. Most specifically, either angiotensin-converting enzyme (ACE) inhibitors or the combination of hydralazine and isosorbide dinitrate should be used. Diuretics and digoxin are used as needed for symptom control. Adjuvant therapy should focus on additional medication needed to control hypertension and treat ischemia. The use of antiarrhythmics and anticoagulation must be considered on an individual basis. As with all patients, but perhaps more importantly in elderly patients, emphasis should be on simplicity of the drug regimen, cost considerations, and monitoring of the patient. Often, elderly patients require education and support from family members or structured home or institutional-based supportive nursing care.

Clearly, renal function deteriorates with age, and this deterioration is accelerated by vascular disease, hypertension, and diabetes. Thus, elderly patients are more sensitive to ACE inhibitors, more refractory to diuretics, and at increased risk for digoxin toxicity. Hepatic function also deteriorates in elderly patients. In addition, they have decreased β-adrenergic responsiveness, which may make them less sensitive to β-blocking agents. Moreover, cardiovascular reflexes are blunted, and elderly patients have increased susceptibility to nitrates and volume depletion.

Vasodilators.—Therapy with ACE inhibitors should be initiated in elderly patients with systolic dysfunction and CHF unless bilateral renal artery stenosis is strongly suspected. Renal dysfunction unrelated to renal artery stenosis is not a contraindication to ACE inhibitor therapy but may necessitate a reduction in the dose. Preliminary studies in humans and in animals indicate that maximal doses, such as those used in the randomized trials, are needed to obtain the optimal benefit from ACE inhibitor therapy. Thus, the appropriate approach to elderly patients should be to start with low doses and monitor carefully but not necessarily aim for a lower maximal dose. No clinically significant difference is noted among the ACE inhibitors, and choice of agents should be based on considerations that will improve compliance, such as lower cost and once-a-day administration. Initial and goal dosages of captopril, enalapril, lisinopril, and hydralazine-isosorbide dinitrate are listed in Table 1. Patients should be assessed weekly while the dose is being increased, and supine and standing blood pressure, potassium, and creatinine levels should be monitored. Side effects will be decreased if the patient is not taking too high a dose of diuretics prior to the initiation of ACE inhibitor therapy. Thus, an ACE inhibitor should be initiated early, and diuretic use should be minimized or even discontinued briefly while ACE inhibitors are being instituted. Minimal increases in creatinine or potassium levels may be tolerated as long as they are monitored closely. Of importance, because blood pressure levels may be chronically low in patients with CHF, only symptomatic hypotension should be used as a criterion to reduce or discontinue upward titration of the dose. Moreover, use of a systolic pressure of less than 100 mm Hg or other strict guidelines for maintaining an ACE inhibitor dose should be avoided in the absence of symptoms of hypotension.

Table 1.—**Suggested Dosages of Vasodilators in the Treatment of Systolic Congestive Heart Failure***

Vasodilator	Dosages	
	Initial	Goal
Captopril	6.25 mg t.i.d.	50 mg t.i.d.
Enalapril	2.5 mg b.i.d.	10 mg b.i.d.
Lisinopril	5 mg/day	20 mg/day
Hydralazine/isosorbide dinitrate	10/5 mg t.i.d.	75/40 mg t.i.d.

*b.i.d. = twice a day; t.i.d. = three times a day.

If the patient cannot tolerate the ACE inhibitor because of cough or deterioration in renal function, the only currently proven efficacious substitution is the combination regimen of hydralazine and isosorbide dinitrate. This regimen has proved effective on the basis of the V-HeFT (Vasodilator-Heart Failure Trials); however, it is less effective than ACE inhibitors, and dosing is done three to four times a day. The doses of these agents used to treat heart failure greatly exceed those normally used to treat ischemia or hypertension. A 10-mg dose of hydralazine three times a day combined with 5 mg of nitrates three times a day should be used at the onset, and then doses should be adjusted incrementally; the blood pressure levels and symptoms should be monitored. The goal is to reach a dosage of 75 mg of hydralazine and 30 to 40 mg of isosorbide dinitrate three times a day. Although interest is emerging in the use of losartan potassium (an angiotensin II receptor blocker) in the treatment of heart failure, this agent has not been extensively tested in patients with CHF. It offers no advantage relative to renal insufficiency. It is inappropriate as monotherapy. Indeed, in most trials of CHF in which losartan is used, the strategy is to add it to ACE inhibitors to provide additional blockade of the renin-angiotensin system. Although the new generation calcium channel antagonists amlodipine besylate and felodipine have been tested in patients with CHF, only amlodipine produced clinical improvement; however, it did not reduce mortality. Of importance, these trials were conducted with use of amlodipine in addition to standard therapy with ACE inhibitors, and amlodipine is an unacceptable substitute for ACE inhibitor therapy.

Diuretics.—Diuretic agents are necessary in most patients with symptomatic CHF. Because of age-related deterioration in renal function, a loop diuretic such as furosemide is usually needed. The minimal dose of diuretic needed to control symptoms should be used. Electrolytes must be meticulously assessed on an ongoing basis. The possibility of adverse electrolyte disturbances as well as excessive or inadequate diuresis in the setting of intercurrent illnesses or alterations in oral intake or bowel habits must be recognized. For the patient refractory to standard doses of loop diuretics, addition of the thiazide diuretic metolazone 30 to 60 minutes before the loop diuretic can provide a substantial increase in diuresis. The potential for excessive diuresis and severe hypokalemia is real, and thus combination diuretic therapy must be closely monitored.

Digoxin.—Repeated studies have now demonstrated that, in the patient with severe symptoms, digoxin decreases the severity of symptoms. Recent data from the Digoxin Trial indicated that digoxin therapy for patients with mild to moderate CHF had no significant effect on survival, although hospitalizations for CHF were reduced, and episodes of digoxin toxicity were relatively uncommon. This trial included few patients with severe CHF and, unfortunately, few very elderly patients; the mean age was 63 years. Thus, the specific role of digoxin in very elderly patients remains unclear. Because of age-related impairments in renal function, the dose of digoxin must be adjusted and monitored carefully. Symptoms of digoxin toxicity can be underreported in elderly patients, and the potential for alterations in the dose of digoxin because of intercurrent illness and related changes in renal function must be recognized.

Adjuvant Drug Therapy.—After doses of ACE inhibitors, diuretics, and digoxin are instituted and adjusted, the need for further antihypertensive therapy must be considered in the patient with persistent hypertension who is receiving the maximally tolerated dose of ACE inhibitors. In the patient with heart failure, the new generation calcium antagonists such as amlodipine and felodipine are attractive choices because they are administered once a day, and both have been shown to be unassociated with an increase in symptoms or mortality; the older generation calcium channel blockers such as verapamil hydrochloride, diltiazem hydrochloride, and nifedipine seemed to worsen symptoms and increase mortality in patients with CHF. Otherwise, agents such as hydralazine or nitrates may also be beneficial. The role of losartan in the patient with heart failure is unexplored but potentially attractive.

The role of β-blockers in the treatment of systolic failure is still being investigated. No study has yet definitively established the efficacy of β-blockers in patients with systolic CHF. Numerous smaller studies suggest that β-blockers reduce mortality, improve systolic function, and decrease symptoms in patients with CHF. Currently, a large multicenter trial is under way. If its findings support those of previous smaller trials, then β-blockers may become part of the standard therapy for patients with CHF. Of interest, more than 95% of patients with CHF can tolerate β-blocker therapy if it is initiated and monitored appropriately. Whether this type of therapy will be as effective in elderly patients who have reduced β-adrenergic responsiveness is unclear.

Antiarrhythmic Therapy.—Atrial fibrillation is extremely common in elderly patients, especially those with CHF. If atrial fibrillation is acute or of recent onset and seemingly associated with an increase in severity of CHF, cardioversion should be performed if possible. Selection of long-term antiarrhythmic therapy for atrial fibrillation in the patient with heart failure is difficult because many drugs have negative inotropic effects. Amiodarone, administered in low doses, is an attractive option, and this agent should be considered. Treatment of ventricular arrhythmias should focus only on those that are symptomatic, and in the patient with CHF, therapy should be chosen after consultation with an electrophysiologist or cardiologist if possible.

Anticoagulation.—The use of systemic anticoagulation for patients with systolic dysfunction and sinus rhythm remains extremely controversial, and convincing recent data to support anticoagulation in this setting are lacking. Practice guidelines vary with respect to recommendations. In patients in sinus rhythm with severe systolic dysfunction (ejection fraction, less than 20%), anticoagulant therapy should be considered if they have had a previous embolic episode. Nevertheless, because of the high risk-to-benefit ratio associated with anticoagulant therapy in elderly patients, its use in most other elderly patients in sinus rhythm is not recommended. In patients with atrial fibrillation, anticoagulation should be done if other factors indicate that they are candidates for long-term anticoagulant therapy. Aspirin therapy for elderly patients is ineffective for reducing the risk of stroke associated with atrial fibrillation. Aspirin use should be considered in patients with coronary artery disease.

MANAGEMENT OF CHF DUE TO ISOLATED DIASTOLIC DYSFUNCTION

Pharmacologic.—The appropriate management of diastolic heart failure is currently undefined. The cornerstone of therapy rests on treatment of the underlying cardiovascular disease—hypertension, valvular disease, or coronary artery disease. Because ACE inhibitors induce regression of left ventricular hypertrophy and may have some theoretic independent effects on diastolic function, they should be considered if an antihypertensive agent is needed. Care must be exercised in patients with an inducible left ventricular outflow tract gradient, such as those with a rare hypertrophic cardiomyopathy or hypertensive hypertrophic cardiomyopathy, because vasodilators can exacerbate the inducible left ventricular outflow tract gradient. Control of ischemia with β-blockers, nitrates, and calcium channel blockers or revascularization is appropriate in patients whose diastolic dysfunction is related to coronary artery disease. Most patients will require diuretics to control congestive symptoms. Diuretic therapy must be closely monitored, however, because reduction of the filling pressure to lower than that needed for adequate filling of the left ventricle can result in hypotension. Calcium channel antagonists and β-blockers improve diastolic function through their effects on hypertension, left ventricular hypertrophy, and coronary artery disease, not by means of an intrinsic beneficial effect on diastolic function. In patients with diastolic heart failure, loss of the atrial contribution to left ventricular filling may be least tolerated, and thus every effort should be made to maintain sinus rhythm and control exercise heart rate in these patients.

Nonpharmacologic.—Diet is important in the management of CHF, with emphasis on a low-sodium diet for patients with severe symptoms and control of fluid intake for patients with class III or IV CHF, especially those prone to hyponatremia. Calorie supplementation may be necessary in patients with cardiac cachexia. When possible, patients should participate in an exercise program, inasmuch as this approach has been demonstrated to improve exercise tolerance in patients with heart failure.

Intervention to Prevent Rehospitalization.—A growing body of literature discusses strategies to prevent rehospitalization in elderly patients with CHF. Elderly patients are often noncompliant with therapy because of a lack of understanding of complex drug regimens, intolerance of side effects, and financial concerns. Thus, they are at increased risk for rehospitalization for heart failure. A recent prospective, randomized trial of the effect of a nurse-directed multidisciplinary intervention on readmission rates within 90 days after hospital dismissal reported a 50% reduction in readmission rates for patients participating in this type of comprehensive program, which included patient and family education, dietary education, social service consultation, medication education, and intensive follow-up. Although the effects on readmission, multiple readmission rates, and quality-of-life scores were impressive, the overall cost saving was relatively modest—less than $500 per patient. Nonetheless, within the constraints of each individual situation, emphasis should be placed on education, follow-up, and supportive services.

SUMMARY

More than 10% of very elderly patients have CHF. The elderly population is at increased risk for diastolic heart failure, which may be difficult to diagnose and treat. Appropriate therapy for systolic heart failure is clear-cut but may be difficult to implement because of the presence of concomitant disease, the cost-intensive nature of monitoring and adjustment of therapy, and the difficulty of decisions regarding the use of expensive diagnostic and therapeutic technology in elderly patients. Continued clinical and basic research is needed for better determination of the appropriate diagnostic and therapeutic approaches to elderly patients with CHF.

REFERENCES

1. Kannel WB, Ho K, Thom T. Changing epidemiological features of cardiac failure. Br Heart J 1994; 72(Suppl):S3-S9
2. Schocken DD, Arrieta MI, Leaverton PE, Ross EA. Prevalence and mortality rate of congestive heart failure in the United States. J Am Coll Cardiol 1992; 20:301-306
3. Rodeheffer RJ, Jacobsen SJ, Gersh BJ, Kottke TE, McCann HA, Bailey KR, et al. The incidence and prevalence of congestive heart failure in Rochester, Minnesota. Mayo Clin Proc 1993; 68:1143-1150
4. Marantz PR, Alderman MH, Tobin JN. Diagnostic heterogeneity in clinical trials for congestive heart failure. Ann Intern Med 1988; 109:55-61

5. O'Connell JB, Bristow MR. Economic impact of heart failure in the United States: time for a different approach. J Heart Lung Transplant 1994; 13(Suppl):S107-S112
6. Smith WM. Hypertension in the elderly. In: Izzo JL Jr, Black HR, editors. Hypertension Primer. Dallas (TX): American Heart Association, 1993: 205-206
7. Levy D, Larson MG, Vasan RS, Kannel WB, Ho KK. The progression from hypertension to congestive heart failure. JAMA 1996; 275:1557-1562
8. Vasan RS, Benjamin EJ, Levy D. Prevalence, clinical features and prognosis of diastolic heart failure: an epidemiologic perspective. J Am Coll Cardiol 1995; 26:1565-1574
9. Vasan RS, Benjamin EJ, Evans JC, Larson MG, Reiss CK, Levy D. Prognosis of diastolic heart failure: Framingham Heart Study [abstract]. Circulation 1995; 92(Suppl 1):I-665
10. Taffet GE, Teasdale TA, Bleyer AJ, Kutka NJ, Luchi RJ. Survival of elderly men with congestive heart failure. Age Ageing 1992; 21:49-55
11. Guidelines for the evaluation and management of heart failure: report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on Evaluation and Management of Heart Failure). Circulation 1995; 92:2764-2784
12. Konstam MA, Dracup K, Bottorff MB, Brooks NH, Dacey RA, Dunbar SB, et al. Heart Failure: Evaluation and Care of Patients With Left-Ventricular Systolic Dysfunction. Clinical Practice Guideline No. 11. Rockville (MD): Agency for Health Care Policy and Research, 1994 June (Publication No. AHCPR 94-0612)

Questions About Congestive Heart Failure

(See article, pages 453 to 460)

1. An 80-year-old man with a history of hypertension has progressive shortness of breath, increased jugular venous pressure, ankle edema, regular pulses, and rales detected at both lung bases. Which *one* of the following is the *most needed* test to guide therapy?
   a. Electrocardiography
   b. Chest roentgenography
   c. Echocardiography
   d. Spirometry
   e. Serum iron studies

2. An 82-year-old woman with long-standing hypertension has symptoms and signs of congestive heart failure. Echocardiography shows hyperdynamic ejection fraction, left ventricular hypertrophy, and left ventricular outflow obstruction. Which *one* of the following therapies is *inappropriate*?
   a. Digoxin
   b. Diuretic
   c. Verapamil hydrochloride
   d. Diltiazem hydrochloride
   e. β-Blocker

3. A 78-year-old man with a history of severe coronary artery disease, diabetes mellitus, and congestive heart failure has a known ejection fraction of less than 15% and has been recently treated for gout. At assessment, he has exacerbation of previously stable congestive heart failure. Which *one* of the following is *least helpful* in the diagnostic evaluation?
   a. Repeated echocardiography
   b. Questions about use of nonsteroidal anti-inflammatory drugs
   c. Serum creatinine determination
   d. Serum electrolytes
   e. Electrocardiography

4. A 78-year-old man with systolic heart failure has increasing symptoms while taking lisinopril (5 mg daily), digoxin (0.25 mg daily), and furosemide (80 mg daily). His creatinine level is 1.1 mg/dL, and his blood pressure is 140/85 mm Hg. Which *one* of the following is the *most appropriate* first therapeutic adjustment?
   a. Increase dose of furosemide
   b. Add nitrates
   c. Increase dose of lisinopril
   d. Add amlodipine besylate
   e. Add metolazone

5. A 78-year-old man has congestive heart failure with systolic dysfunction (ejection fraction, 25%) and known bilateral renal artery stenosis. Which *one* of the following is the *most appropriate* vasodilator?
   a. Amlodipine
   b. Prazosin hydrochloride
   c. Angiotensin-converting enzyme inhibitor
   d. Losartan potassium
   e. Hydralazine and isosorbide dinitrate

Correct answers:
1. *c*, 2. *a*, 3. *a*, 4. *c*, 5. *e*