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The heart failure pandemic: Changing patterns, costs, and treatment strategies

■ ABSTRACT

Heart failure is the most important public health problem in cardiovascular medicine, and is increasing in both prevalence and expense. Programs that use an interdisciplinary team to improve outpatient treatment and prevent hospitalizations will help improve care and control costs. But the most important long-term strategy for dealing with the heart failure pandemic is more aggressive primary and secondary prevention.

■ KEY POINTS

Although deaths due to coronary artery disease and hypertension have declined significantly over the past 40 years, deaths due to heart failure have increased fourfold since 1968.

Heart failure is not always inexorably progressive and irreversible. Often it can be effectively treated, and some forms of left ventricular dysfunction are reversible (eg, hibernating myocardium, acute dilated cardiomyopathy).

In controlled studies, disease management programs reduced hospital readmissions by 56% to 85% while improving the patients' quality of life. These programs provided intensive education and follow-up, were coordinated by nurses, and incorporated care by dietitians, discharge planners, and geriatric cardiologists.

RECENT SUCCESSES in treating acute coronary artery disease, combined with the aging of the American population, are creating a pandemic of chronic heart failure in this country. This fact has profound implications for the American health care system as it attempts to control costs, because care for heart failure is complex and expensive. And despite a better understanding of the nature of heart failure, and new medical and surgical treatments, the prognosis for heart failure patients remains poor.

Primary care physicians will play a pivotal role in the care of patients with heart failure. This article, the first in a series on new developments in diagnosing and treating heart failure, reviews the changing definition of heart failure, the economic costs of the heart failure pandemic, and possible strategies for controlling those costs while improving patient outcomes.

■ THE CHANGING DEFINITION OF HEART FAILURE

The clinical presentation and spectrum of heart failure have changed over the past 50 years (see **HEART FAILURE IS NOT NECESSARILY 'CONGESTIVE'** on the next page). Then, heart failure was considered primarily an edematous disorder, and hypertension and valvular heart disease were the most frequent causes. Physicians attempted to control pulmonary and peripheral congestion with diuretics. As the disease slowly progressed, patients generally died of biventricular failure, anasarca, or renal insufficiency.

Heart failure is not necessarily 'congestive'

TODAY, THE INITIALISM "CHF" should stand for *chronic* heart failure rather than *congestive* heart failure, as congestion is often absent. Significant left ventricular dysfunction may be present even when the patient is New York Heart Association (NYHA) functional class I or II, and before edema and congestion become obvious. In fact, many patients now undergo echocardiography, and, if left ventricular dysfunction is documented, begin ACE inhibitor therapy even if they have minimal or no symptoms. This approach has data to support it: the SOLVD (Studies of Left Ventricular Dysfunction) prevention trial demonstrated that starting therapy in asymptomatic patients reduced exacerbations of heart failure and the need for hospitalization.¹¹

Heart failure is a complex disease that may be unrecognized even after a careful history and physical examination. Overt congestion may be absent even in many patients presenting for evaluation for heart transplantation with profound exercise intolerance, fatigue, anorexia, and dyspnea on exertion. And patients who cough when supine or when exercising but have clear lungs on auscultation, no audible S₃ gallop, and no

jugular venous distension may have marked elevation of the pulmonary capillary wedge pressure when measured by catheterization.

Complicating the diagnosis, dysfunction may be systolic or diastolic. Left ventricular systolic dysfunction does not automatically mean heart failure, but may be the basis of the heart failure syndrome in a particular patient. Conversely, a patient with normal left ventricular systolic function may have florid, clinical congestive heart failure due to diastolic dysfunction.

Because patients with chronic heart failure may not exhibit the usual physical signs of congestive heart failure,¹⁵ clinicians must pay careful attention to subtle physical findings and, perhaps more important, the patients' symptoms, to accurately determine the level of cardiac compensation. For example, pulmonary rales and a third heart sound may be absent in patients with low cardiac output and an elevated left ventricular end-diastolic pressure. Reduced pulse pressure, a displaced apical impulse, and positive hepatojugular reflux with resting tachycardia and signs of reduced peripheral perfusion will confirm the presence of advanced heart failure and reduced cardiac output.

Today, symptomatic heart failure is most often characterized by effort intolerance (dyspnea) and fatigue, and the most common cause is coronary artery disease. With the advent of angiotensin-converting enzyme (ACE) inhibitors and the routine use of echocardiography, physicians can intervene earlier and more effectively, altering the natural history of the disease. Yet, one fact has not changed at all: heart failure remains chronic and lethal, with 5-year survival rates of less than 40% from the time of diagnosis.

■ THE INCREASING PREVALENCE OF HEART FAILURE

Heart failure is common, affecting 2 to 4 million Americans.¹⁻³ And although the definition of heart failure is not standardized the

prevalence is clearly increasing. In 1990, some 700,000 patients were discharged from the hospital with heart failure, a fourfold increase since 1971.³ Also in 1990, some 708,000 patients were newly diagnosed with heart failure, and 280,000 patients died of it,⁴ resulting in a net increase of 428,000 cases (12%) in just one year.

The incidence (and therefore the prevalence) of heart failure increases with age. In the Framingham study,^{3,5} the annual incidence was 3 per 1,000 in men 50 to 59 years old, vs 27 per 1,000 in men 80 to 89 years old. Women had rates approximately one third lower than did men (FIGURE 1). Approximately half of patients with heart failure are 65 years of age or older.

Two factors are at work: the aging of the US population and, paradoxically, advances in managing coronary artery disease, valvular



A 'STAGING' EVALUATION FOR HEART FAILURE

Even though "the heart failure syndrome" remains a clinical diagnosis that is based more on the history and physical examination than on objective measures (eg, the ejection fraction), many patients with significant left ventricular dysfunction on the basis of echocardiographic findings or other techniques require a thorough "staging" evaluation, consisting of measurement of right heart pressures and a metabolic stress test.

Many patients with very low ejection fractions (< 20%) have a paucity of symptoms, are well compensated, and should be treated medically. This can be confirmed with right heart catheterization and metabolic stress testing.

Other patients appear to have symptoms that seem out of proportion to the findings on physical examination, and right heart catheterization and metabolic stress testing will confirm the compensation.

In patients that appear to have advanced symptoms despite optimal medical therapy, staging will confirm the need for heart transplant listing.

Finally, patients with documented reduced ejection fraction by echocardiography require further investigation to exclude coronary artery dis-

ease and other potentially treatable etiologies of left ventricular dysfunction.

Such testing can exclude reversible or treatable causes of heart failure such as valvular disease or thyroid heart disease. In addition, right heart catheterization may reveal severe hemodynamic abnormalities that were not evident by physical examination, and may reveal the need for more intense medical therapy.

Metabolic stress testing with measurement of exercise time, anaerobic threshold, and peak oxygen consumption is the basis for quantifying functional impairment and determining prognosis. Peak oxygen consumption is used to determine if a patient needs advanced therapies such as cardiac transplantation and to establish a baseline from which to measure clinical improvement or deterioration.¹⁶

Heart failure is not always inexorably progressive and irreversible. Often it can be effectively treated, and some forms of left ventricular dysfunction are reversible (eg, hibernating myocardium, acute dilated cardiomyopathy). Thus, heart failure requires recognition, definition of its etiology and treatment options, implementation of therapy, assessment, and follow-up of treatment efficacy.

heart disease, and hypertension. More people are surviving to old age, including more heart attack survivors, creating an enlarging pool of aging patients who are likely to develop worsening systolic or diastolic function and ventricular remodeling leading to the syndrome of heart failure. The prevalence of heart failure is projected to nearly double to 5.7 million cases by the year 2030.⁶

Risk factors for heart failure

Heart failure is a lethal end-stage sequela of various types of heart disease. Effective medical and surgical interventions have reduced premature deaths; however, the prevalence of heart failure is still increasing because the predisposing conditions are palliated but not cured.

Risk factors for heart failure identified in the Framingham study¹ are hypertension,

coronary artery disease, cigarette smoking, electrocardiographic left ventricular hypertrophy, valvular heart disease, and diabetes mellitus. Of these, coronary artery disease deserves special attention. Framingham data indicate that from 1948 to 1988 the age-adjusted prevalence of coronary artery disease in men with new congestive heart failure increased by 46% per calendar decade ($P < .05$). At the same time, the age-adjusted prevalence of coronary artery disease among all men *decreased* by 8% per calendar decade ($P < .05$).¹ Primary prevention of coronary artery disease should reduce the prevalence of heart failure considerably.

■ HEART FAILURE MORTALITY IS STILL HIGH

Although deaths due to coronary artery disease and hypertension have declined signifi-

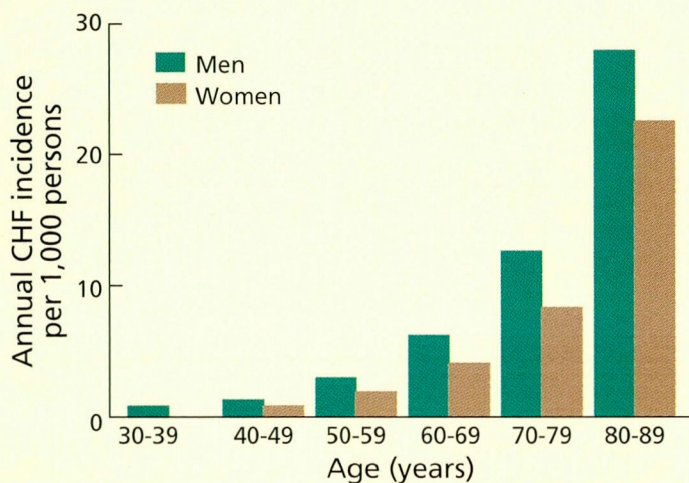


FIGURE 1. The annual incidence of congestive heart failure by age in men and women in the Framingham Heart Study.

SOURCE: REPRINTED WITH PERMISSION FROM THE AMERICAN COLLEGE OF CARDIOLOGY, (JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY 1993; 22(SUPPL A):6A13A).

Deaths due to heart failure have increased four-fold since 1968

cantly over the past 40 years, deaths due to heart failure have increased fourfold since 1968.³ As indicated above, the 5-year survival rate is less than 40% from the time of diagnosis. The mortality rate from heart failure increases with advancing age. At all ages, death rates due to heart failure are greater for the African American population.

In spite of advances in pharmacologic therapy for heart failure in the past decade, only heart transplantation has a major impact on mortality. Unfortunately, each year only 2,200 to 2,400 patients receive heart transplants,⁷ out of approximately 200,000 patients in New York Heart Association (NYHA) class IV. Thus, only approximately 1.2% of patients who might benefit from this life-sustaining therapy receive it.

■ HOSPITALIZATION RATES ARE CLIMBING

Heart failure accounts for more than 600,000 hospital admissions per year—more than for any other disorder and almost twice as many as for all other cardiovascular disorders combined.⁶ And this number is increasing, both in the elderly and overall.^{3,8} Hospital admissions

for heart failure in persons older than 65 years tripled in the years 1972 through 1990, from 55 per 10,000 persons per year to more than 150.³ Overall, hospital admissions for heart failure rose fourfold in the years 1971 through 1990, from 165,000 to 722,000.³

■ OUTPATIENT VISITS

Heart failure ranks second only to essential hypertension as a cardiovascular reason for outpatient visits. O'Connell and Bristow⁴ reported that 3,458,000 persons with heart failure were seen as outpatients in 1990, and each averaged 3.4 visits, for a total of 11,396,000 visits.

■ HEART FAILURE IS DISABLING AND EXPENSIVE

The economic and human costs of heart failure are tremendous and growing.

The financial costs

In 1991, the Health Care Financing Administration (HCFA) spent \$5.45 billion for heart failure (DRG 127)—4.8% of the total Medicare DRG budget.⁴ In contrast, in the same year HCFA spent \$2.24 billion for all cancer-related diagnoses. Also in 1991, heart failure accounted for 5.4% of the total Federal health care expenditure. (Of note, heart transplantation represents only 0.7% of the total budget for heart failure).

Inpatient care is particularly expensive and cost-ineffective compared with outpatient care. O'Connell and Bristow⁴ estimate that each patient with heart failure incurs an average of \$4,238 in outpatient costs per year. In contrast, a single hospitalization can cost more than twice as much. According to the same investigators, the average hospitalization for heart failure lasts 7 days and costs \$10,148.

Approximately 35% of patients with heart failure need to be hospitalized in any given year. Further, many patients need multiple hospitalizations, particularly elderly patients with multiple comorbid conditions (of whom 50% have three or more). Indeed, in one study, as many as 47% of patients needed to be readmitted within 3 months (FIGURE 2).⁹ Another study showed that heart failure patients are most vul-

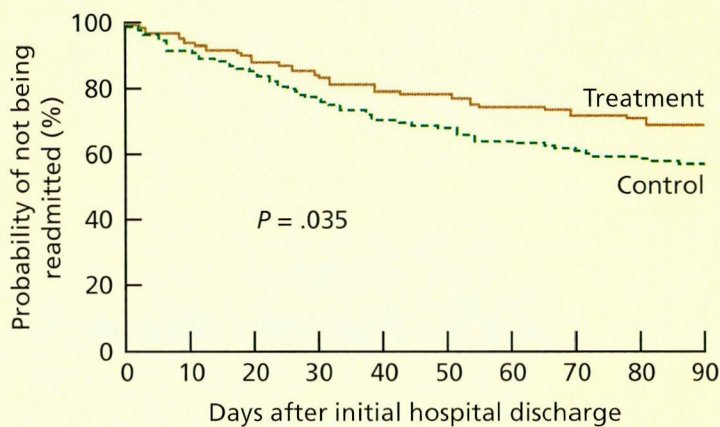


FIGURE 2. Kaplan-Meier curves for the probability of not being readmitted to the hospital after a hospitalization for heart failure. Treatment consisted of a nurse-directed program of diet, education, and follow-up.

SOURCE: FROM RICH ET AL, REFERENCE 9 REPRINTED WITH PERMISSION OF THE NEW ENGLAND JOURNAL OF MEDICINE.

Cost-effective heart failure care can be good care

nerable for readmission in the first 30 days after hospital discharge and that 22% to 42% of all patients admitted under DRG 127 are readmitted within 90 days.⁶

The human costs

Heart failure also exacts a price for the patient and family. Successful heart failure management requires the patient to make marked changes in his or her lifestyle, which often impinge on the lives of family members and caregivers as well. Although many patients with heart failure can live a limited, but reasonable, lifestyle for many years, most are severely limited. Aside from the health care costs, this limitation can have enormous economic and societal implications, as both the patient and the primary caregiver (often the spouse) are removed from the work force.

Many hospital admissions are preventable

Some admissions are unavoidable, such as those for progression of disease. However, many could be avoided through better education for physicians and patients.¹⁰ Avoidable reasons for admissions include:

- Inappropriate treatment plans, such as lack of education regarding salt and fluid

restriction, or not addressing contributing causes such as atrial fibrillation with poor rate control.

- Patient noncompliance with prescribed regimens.
- Use of detrimental drug therapy in certain settings, such as type Ic antiarrhythmic agents (eg, flecainide), nonsteroidal anti-inflammatory drugs, and first-generation calcium antagonists in patients with heart failure.
- Under-use of ACE inhibitors, which are proven to improve survival and retard progression of disease.¹¹ (Cardiologists and internists are more likely to prescribe these drugs than family practice physicians.¹⁰)

CONTROLLING COST AND IMPROVING CARE: REDUCING HOSPITALIZATIONS

With the rise of managed, capitated health care, physicians and hospitals are under pressure to control costs. Fortunately, cost-effective care of heart failure can be good care. In fact, the best way to save money is to keep patients “well compensated”—and therefore out of the hospital.

As I pointed out above, hospital care is expensive. One strategy to cut costs is to reduce the length of hospital stay. However, a more cost-effective solution is to make the hospital stay more *effective*—to use the time in the hospital to enroll the patient in a program of education and follow-up so that he or she stays healthy after going home and does not require readmission to the hospital. In a demonstration project,⁶ initiatives to prevent readmission resulted in a 43% greater reduction in total hospital days than did initiatives designed to shorten length of stay.

Four recent studies (TABLE 1) demonstrated the efficacy and cost-effectiveness of education and follow-up programs.

Rich et al⁹ randomly assigned elderly patients hospitalized for heart failure to enter an intervention program or usual care. Nurses directed the program and provided intensive education and follow-up through telephone calls and home visits. Registered dietitians gave each patient individualized assessment and instruction. Social workers

**TABLE 1****Patient education and follow-up programs reduce need for hospital admissions**

INVESTIGATORS	NO. IN PROGRAM	FOLLOW-UP (MONTHS)	REDUCTION IN CARDIAC ADMISSIONS	P VALUE	REDUCTION IN TOTAL ADMISSIONS	P VALUE
Rich et al ⁹	142	3	56%	.04	44%	.02
Kornowski et al ¹²	42	12	72%	.001	62%	.001
Fonarow et al ¹³	214	6	—	—	85%	.0001
West et al ¹⁴	51	6	87%	.001	74%	.001

helped coordinate discharge planning and care after discharge. Geriatric cardiologists reviewed medications and follow-up care. At 90 days, patients in the program had accrued 56.2% fewer readmissions for heart failure than did those in the control group ($P < .04$), and enjoyed a better quality of life (FIGURE 2).

Other studies¹²⁻¹⁴ did not use a control group, but rather compared the rate of hospitalizations and quality of life in groups of patients before and after they entered a heart failure program. All reached similar conclusions. In fact, in one study,¹² the readmission rate was 85% lower in the 6 months after patients entered the program.

The Cleveland Clinic will shortly begin a clinical trial that will include 120 patients hospitalized with Class II or III heart failure. Half of these patients will be randomized at discharge to undertake a program of supervised exercise, intensive education, and monitoring of symptoms, to assess the cost-effectiveness and clinical efficacy of exercise and education for heart failure patients.

■ TOWARDS AN INTEGRATED STRATEGY FOR TREATING HEART FAILURE

These exciting, timely reports suggest that heart failure, a chronic illness, might be more effectively managed by using specialized physicians and intensive nursing and education programs. In the “chronic care model” of patient care there is an emphasis on liberal access to specialized physician and nursing care.

Keys to this strategy to confront the epidemic of heart failure include:

- A goal of reducing inpatient costs

- Increased investment in outpatient programs to treat heart failure
- Initiatives to prevent hospital readmissions (rather than solely initiatives to reduce length of stay)
- Resources concentrated on “high risk” patients, eg, those with a history of frequent readmissions
- An interdisciplinary team of specialists in heart failure
- Extensive patient education.

The role of the primary care physician

The primary care physician plays a pivotal role in the ongoing care of patients with heart failure. This disease is not an isolated encounter such as acute pharyngitis or bacterial pneumonia; rather it is an “epic of care.” Patients and their families develop relationships with their health care providers. The physician must have the expertise to manage the patient through the phases of his or her illness, effect lifestyle changes through education, and use a multidisciplinary team for effective chronic disease management.

The role of the heart failure team

But when patients with advanced heart failure remain symptomatic despite standard medical therapy, they may benefit from evaluation by an experienced heart failure team, consisting of physicians, nurses, dietitians, and rehabilitation specialists. Such a team should offer:

- Detailed evaluation to “stage” the disease and assure appropriate diagnosis and treatment.

Patient education and follow-up are cost-effective




- Close patient monitoring at intervals tailored to the individual patient needs (direct patient and telephone contact).
- Immediate access to team members and timely responses to patient crises.
- Comprehensive and continuing patient education.

■ PREVENTING HEART FAILURE

The impact of heart failure for our society will continue to grow until effective strategies to prevent it are adopted.

Primary prevention strategies include use of cholesterol-lowering drugs such as the "statins" to slow the progression of coronary artery disease and prevent myocardial infarctions in high-risk patients, antihypertensive treatment, and reduction in the vectorial transmission of Chagas disease.

Secondary prevention strategies include use of ACE inhibitors after an anterior myocardial infarction to retard left ventricular remodeling and the development of heart failure.

Primary prevention is the solution to the challenge; however, secondary prevention strategies to alleviate morbidity should be our immediate focus to reduce the economic burden of this devastating pandemic. 

Fewer than 2% of patients receive transplants

■ REFERENCES

1. Ho KKL, Pinsky JL, Kannel WB, Levy D. The epidemiology of heart failure: the Framingham study. *J Am Coll Cardiol* 1993; 22; 4(Suppl A):6A-13A.
2. Kannel WB, Belanger AJ. Epidemiology of heart failure. *Am Heart J* 1991; 121:951-57.
3. Kannel WB, Ho K, Thom, T. Changing epidemiological features of cardiac failure. *Br Heart J* 1994; 72(2 Suppl):S3-S9.
4. O'Connell JB, Bristow MR. Economic impact of heart failure in the United States: time for a different approach. *J Heart Lung Transplant* 1993; 13(4):S107-S112.
5. Starling RC. The health care impact of heart failure. In Topol EJ (editor). *The Textbook of Cardiovascular Medicine*. Philadelphia: Lippincott-Raven Publishers, 1997:2205-2214.
6. Field JL. Beyond four walls: research summary for clinicians and administrators on CHF management. *Cardiology Preeminence Roundtable*, 1994; 11.
7. Mudge GH, Goldstein S, Addonizio LJ, et al. 24th Bethesda conference: Cardiac transplantation. Task Force 3: Recipient guidelines/prioritization. *J Am Coll Cardiol* 1993; 22:21-31.
8. Ghali JK, Cooper R, Ford E. Trends in hospitalization rates for heart failure in the United States, 1973-1986. *Arch Intern Med* 1990; 150:769-773.
9. Rich MW, Beckham V, Wittenberg C, Leven C, Freedland K, Carney R. A multidisciplinary intervention to prevent the readmission of elderly patients with congestive heart failure. *N Engl J Med* 1995; 333:1190-1195.
10. Edep ME, Shah NB, Tateo IM, Massie BM. Differences between primary care physicians and cardiologists in management of congestive heart failure: relation to practice guidelines. *J Am Coll Cardiol* 1997; 30:518-26.
11. SOLVD Investigators. Effect of enalapril on survival in patients with reduced left ventricular ejection fractions and congestive heart failure. *N Engl J Med* 1991; 325:293-302.
12. Kornowski R, Zeeli D, Averbuch M, et al. Intensive home-care surveillance prevents hospitalization and improves morbidity rates among elderly patients with severe congestive heart failure. *Am Heart J* 1995; 129:762-66.
13. Fonarow GC, Stevenson LW, Walden JA, et al. Impact of a comprehensive heart failure management program on hospital readmission and functional status of patients with advanced heart failure. *J Am Coll Cardiol* 1997; 30:725-732.
14. West JA, Miller NH, Parker KM, et al. A comprehensive management system for heart failure improves clinical outcomes and reduces medical resource utilization. *Am J Cardiol* 1997; 79:58-63.
15. Stevenson LW, Perloff JK. The limited reliability of physical signs for estimating hemodynamics in chronic heart failure. *JAMA* 1989; 261:884-888.
16. Mancini DM, Eisen H, Kussmaul W, Mull R, Edmunds LH Jr, Wilson JR. Value of peak exercise oxygen consumption for optimal timing of cardiac transplantation in ambulatory patients with heart failure. *Circulation* 1991; 83:778-786.

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