Journal of the American College of Cardiology Vol. 52, No. 6, 2008

Published by Elsevier Inc.
ISSN 0735-1097/08/$34.00
doi:10.1016/j.jacc.2008.04.037

EDITORIAL COMMENT

Worsening Heart Failure Hospitalization Epidemic

We Do Not Know How to Prevent and We Do Not Know How to Treat!*

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Until the late 1980s, there were no known medical treatments available to improve survival in patients with heart failure (HF). Since then, there has been a steady increase in research, resulting in multiple drug- and device-related treatment options for these patients. Despite these improvements, however, major challenges loom. The number of cases and deaths attributable to HF has increased despite advances in treatment and a decline in other major cardiovascular diseases over the same interval. Currently more than 5 million patients in the U.S. have HF, and more than 550,000 are diagnosed annually. Heart failure leads to 12 to 15 million office visits and 6.5 million hospital days, and more than 53,000 patients die of HF as a primary cause annually (1). Parallel trends are seen globally (2).

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U.S. population demographics are changing. According to the White House Conference on Aging 2005, the 78 million "baby boomers" are aging, and as a result, approximately 1 in 5 Americans are expected to be older than 65 years by 2050 (3). These trends are projected to have significant impacts on health, health care, and health care economics because the use of formal and informal services is strongly correlated with age. Heart failure is primarily a disease of the elderly, with an incidence rate of approximately 10 in 1,000 persons annually after age 65 years; approximately 80% of patients hospitalized with HF are older than age 65 years (1). The increasing age of the population is expected to worsen the HF epidemic.

Acutely decompensated heart failure (ADHF) resulting in hospitalization poses specific problems. First, ADHF marks a fundamental change in the natural history of the disease progression. Mortality rates in the year following HF hospitalization are higher than in nonhospitalized patients, and HF hospitalization remains one of the most important risk factors for mortality (4). Second, HF hospitalization begets further hospitalization; these patients are particularly prone to readmission, with recurrent hospitalization rates of 50% within 6 months of discharge (1). Third, HF hospitalization remains the single most important driver of the more than $30 billion for cost of care for these patients annually (5). Thus, any reduction in HF hospitalization is likely to result in substantial clinical and economic gains.

In light of these facts, the report in this issue of the *Journal* by Fang et al. (6) is of alarming importance. The investigators assessed the trends in HF hospitalization using the National Hospital Discharge Survey data from 1979 to 2004. During this time, the number of hospitalizations for HF patients tripled to nearly 4 million in 2004. One-third of these were primarily HF-related hospitalizations, resulting in more than 1 million annual hospitalizations for mainly HF exacerbation; the rest were admissions with HF as an additional comorbidity. Not surprisingly, HF hospitalization rates increased with age, and more than 80% of the hospitalizations were among the elderly. What is obvious is that the HF hospitalization epidemic is worsening, and at least the short- to intermediate-term future looks suboptimal. Unless focused measures are taken, the clinical and financial burden to society is only going to escalate. However, what is not obvious is why, despite improvements in therapeutic options and outcomes for cardiovascular diseases in general, do we see these dismal trends for HF hospitalizations? Root causes for this trend are many; a few are postulated herein.

1. We do not know how to treat ADHF. Despite the progress in the treatment of patients with chronic HF, the research effort significantly lags behind for patients with ADHF. Currently there are no clinical trials that have shown improvement in all-cause mortality for patients with ADHF, and most guidelines are opinion based rather than evidence based.

2. We do not understand the taxonomy of ADHF syndromes. It is likely that patients who present with ADHF represent a variety of different specific pathophysiologic subgroups; currently we treat all patients similarly, primarily focusing on diuresis. Understanding the underlying hemodynamic and pathophysiologic subgroups and subsequent targeted therapy may represent an improvement opportunity.

3. We do not know how to effectively and safely diurese patients. Currently, loop diuretics remain the main means for achieving diuresis. Diuretics are associated with worsening renal function, worsening neurohormonal activation profiles, and at least an epidemiologic association with

*Editorials published in the *Journal of the American College of Cardiology* reflect the views of the authors and do not necessarily represent the views of *JACC* or the American College of Cardiology.

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JACC Vol. 52, No. 6, 2008
August 5, 2008:435–7

worse outcomes. Alternate safer options are currently being investigated.

4. There is a limited understanding of total body fluid volume and compartment distribution. Although diuresis remains the mainstay of therapy, we currently have a limited understanding of the quantitative fluid volume and compartment distribution in ADHF. It is possible that some patients with ADHF (e.g., those with normal ejection fraction and uncontrolled hypertension) may have fluid redistribution rather than overload. Actively diuresing these patients may only worsen the primary hemodynamic abnormality (elevated systemic vascular resistance), predisposing them to complications. Even in patients who are total body fluid overloaded, the rate of fluid re-equilibration between extravascular and intravascular space (plasma refill rate), rate of diuresis, role of oncotic pressure, and so on may all play an important role.

5. When should we discharge patients? What goals to achieve? Accuracy of surrogates of volume? Recent data suggests that many patients with ADHF are discharged with <5 lbs or no loss in weight from admission (7). There are currently no guidelines of when a patient should be discharged, and this decision is often based on subjective improvement in resting signs and symptoms, which tend to be insensitive markers of fluid overload. Other surrogates of volumes are also not ideal either; for example, the pulmonary artery occlusive pressure or the plasma B-type natriuretic peptide levels may not always represent the overall volume status. Even if these do represent overall volume status in any given individual, when these surrogate markers of volume can be safely reduced without complications such as hypotension or renal failure is poorly understood.

6. Fallacy of averages. Most information regarding ADHF is based on cumulative averages of data that do not identify and describe the multiple separate ADHF syndromes. Hence, generalized statements are made, such as worsening renal function is associated with worse outcomes (but we do not worry about creatinine rise with angiotensin II modulation) or that diuretics worsens renal function and outcomes (and yet diuretics are the most commonly used drug in ADHF and many patients are safely diuresed without affecting renal function).

7. Patient management versus disease management. Recent data suggest that focused approaches to increase compliance with quality measures do not necessarily improve HF outcomes (8). Also, HF patients present with a huge comorbidity burden that can lead to hospitalization either due to comorbidity exacerbation, worsening HF, or both (9). Interestingly, Fang et al. (6) show that the increase in hospitalizations among HF patients with noncardiovascular disease listed as the first diagnosis increased the most over time. It is simplistic to believe that focusing only on HF medications and ignoring the comorbidities will result in significant improvement in outcome. Screening and treatment of comorbid conditions with a multidisciplinary integrated approach is more likely to improve care for these patients.

8. Length of stay and misaligned economic incentives. In order to increase the profitability of HF hospitalization, shorter length of stay is a universal goal across all hospital system. Currently the usual length of stay for HF hospitalization is about 4 to 5 days in the U.S. The pressures from the hospital administration to discharge patients quickly in order to achieve more net margin and to subsequently fill the bed with another "more profitable" patient may lead to premature discharge prior to achieving optimal therapy for congestion and of the other comorbid conditions. Coupling this with a lack of infrastructures to closely follow patients soon after discharge may lead to increased readmission rates.

9. Inadequate post-discharge follow-up. The pressure to reduce length of stay and the possibility of discharge without reaching therapeutic goals underscores the importance of aggressive and timely outpatient care. A large proportion of the hospitalization burden for HF represents early rehospitalization, suggesting the possibility that outpatient care is not provided optimally to these patients. Post-discharge support has been shown to reduce readmission rate. (10). For example, in a randomized trial comparing usual care with a single home visit after discharge, Inglis et al. (11) showed sustained event-free survival benefit in the intervention arm among HF patients. The investigators noted that home visits revealed that 40% of patients were found to have undiagnosed early clinical deterioration, subjects were in general unable to recognize signs of potential health crisis, and most exhibited poor self-care behaviors or were consuming harmful agents such as nonsteroidal anti-inflammatory drugs. Although the intervention was a "single visit," all of these issues were addressed and patients with signs of clinical deterioration were immediately referred to their physician for remedial actions. Home visits for all HF patients is a Utopian fantasy; most patients do not even get a clinic follow-up for several weeks, if not months, after discharge. Identification of high risk patients pre-discharge and appropriate timely post-discharge follow-up can certainly help reduce the HF hospitalization crisis.

Anyone for heart failure prevention? A rapidly recognized fact in the U.S. health care market is the passive versus active health perception by the society (i.e., equating health with the lack of acute sickness or symptoms). Therefore, the biggest sector of health care research is built around treatment rather than prevention. The overall HF burden and subsequently the hospitalization risks will likely not improve unless HF incidence is decreased. This is unlikely without reducing the burden and treatment of HF risk factors such as hypertension and diabetes. It is interesting to note that Fang et al. (6) report that the 2 variables that increased parallel with the increasing HF hospitalizations rates were the prevalence of hypertension and diabetes. Focused HF prevention efforts are currently rudimentary at best.

In conclusion, we have to accept the following facts. First, the HF epidemic is here and there is no reason to be optimistic that it is not going to get worse. Second, our scientific knowledge base for ADHF is preliminary. Third, multidisciplinary teams including cardiologists, emergency physicians, hospitalists, primary care physicians, nurse practitioners, and other specialists must work together to curb this growing problem. Fourth, optimal outpatient HF therapy, both before hospitalization and especially soon after discharge, needs emphasis. Finally, the time for increasing HF prevention effort is here. Active understanding of the pathophysiology of and improvement in health care delivery models for ADHF syndromes must be considered an imperative for the national health care agenda. Fang et al. (6) should be congratulated for bringing to light and quantifying this important issue.

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