

MAYO CLINIC
PROCEEDINGSObservations and Reflections on the Burden
of Hospitalizations for Heart Failure

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In this issue of *Mayo Clinic Proceedings*, Chamberlain et al¹ report on retrospective research that helps quantify the timing, precipitating factors, and burden of hospitalizations associated with a diagnosis of heart failure. The authors discovered in a population-based study of Olmsted County, Minnesota, that residents who had incident heart failure experienced high rates of hospitalizations, particularly within the first 30 days after heart failure diagnosis, and most of the hospitalizations were for noncardiovascular causes. On the basis of these and related data, the authors advise that integrated health care should be used to evaluate patients with heart failure, with special attention directed toward diagnosing and managing comorbidities to improve overall health and reduce hospitalizations.

We will examine the growing burden of hospitalization for patients with heart failure, comparing and contrasting the findings of Chamberlain et al¹ with those from other investigations.

SCOPE OF HEART FAILURE

Heart failure is a major public health problem. Despite a noticeable decline in mortality and morbidity from most cardiovascular diseases, the prevalence of heart failure has increased worldwide,^{2,3} whereas the incidence has plateaued.⁴ Curtis et al⁵ reported that between 1994 and 2003 the prevalence of heart failure in a US Medicare population increased from 90 to 121 per 1000 subjects ($P < .01$). However, the population-wide incidence trends of heart failure in Olmsted County residents did not significantly change between 1979 and 2000, with overall incidences of 3.78 and 2.89 per 1000 person-years among men and women,

respectively.⁴ Moreover, despite an earlier 2004 report by Roger et al⁴ that 5-year age-adjusted survival has improved in Olmsted County residents from 43% in 1979-1984 to 52% in 1996-2000 ($P < .001$)—likely as a result of early diagnosis and advances in therapy—survival is still poor (as is the case in other locales). Because of the large number of patients with heart failure, and the disappointing morbidity and mortality rates worldwide, heart failure is sometimes characterized as “epidemic,” “pandemic,” or “syndemic.”^{2,3}

THE BURDEN OF HOSPITALIZATIONS

One of the major issues related to the epidemic of heart failure is the increase in hospitalizations. It has been reported that hospital discharges for heart failure have increased by 155% during the past 20 years.⁴

As the prevalence of heart failure increases, more patients, especially older patients, are being hospitalized. Furthermore, the natural history of heart failure is characterized by clinical exacerbations that downstream contribute to a need for hospitalization. Multiple hospitalizations—either in an individual patient or in populations of patients—place a burden on patients, health care systems, and society.^{2,3}

Most of the studies regarding the patterns and timing of hospitalizations have been restricted to patients with an initial hospitalization for heart failure, avoiding patients who are diagnosed in the outpatient settings.⁶⁻⁸ Most studies also have had short follow-up of 30 days⁷ or 1 year after the initial diagnosis,^{6,9} giving insufficient data to determine whether the first 30 days after heart failure diagnosis is the most important time frame for increased risk of hospitalization. More recently, there has

been a shift toward hospitalizations for patients who have heart failure with preserved systolic function and, despite this shift, the hospitalization rates for cardiovascular causes in patients with heart failure have not changed over time; however, hospitalizations for noncardiovascular causes have increased.¹⁰

Unfortunately, the clinical practices of heart failure specialists, and research into the delivery of clinical care for patients with heart failure and the natural history of the disease, have not changed in synchrony with our understanding of heart failure pathology. The reality is that we have inadequately shifted the *heart failure* label to the earliest stages of heart failure diagnosis: that is, stages A and B, through which most, if not all patients with heart failure pass before a “chart diagnosis” of heart failure and a short journey to hospitalization.¹¹

A very large portion of these patients traditionally labeled with heart failure also carry diagnoses of chronic obstructive pulmonary disease, diabetes mellitus, or prior myocardial infarction—all risk factors for heart failure. However, as reported by Chamberlain et al,¹ the presence of these (and other) coexisting diseases must be optimally diagnosed and managed if we are to ultimately reduce the burden of hospitalization for the populations of patients who already carry a diagnosis of heart failure or will someday develop overt heart failure.^{1,11}

The report of Chamberlain et al¹ expands greatly our knowledge on the timing and burden of hospitalizations after an initial diagnosis of heart failure, and allows us to develop important insights into the design of effective hospitalization prevention strategies. The investigators demonstrated that over the 2 years after diagnosis, the rates of hospitalization were highest during the first 30 days and much lower thereafter, and hospitalization rates did not differ by sex, type of heart failure (preserved vs reduced ejection fraction), or clinical care venue (inpatient vs outpatient setting). Patients with myocardial infarction, chronic obstructive pulmonary disease, cancer, and dementia, as well as those diagnosed with heart failure as inpatients and who had long hospital stays (>5 days), had an increased risk of being hospitalized or rehospitalized within 30 days. Although the proportion of hospitalizations

due to heart failure or other cardiovascular diseases was greatest during the first 30 days, more than half of the hospitalizations were due to noncardiovascular causes, and few were due to heart failure.

TIMING OF HOSPITALIZATIONS AFTER HEART FAILURE

The Chamberlain et al¹ research, and most of the previous studies, has shown convincing evidence that patients with heart failure experience a great number of hospitalizations. However, several studies differ about the timing of hospitalizations of these patients. The reason for the differences may relate to the fact that some studies have focused on patients who were diagnosed with heart failure while hospitalized,⁶⁻⁸ or who experienced their first hospitalization shortly after an initial outpatient diagnosis of heart failure.⁹ In addition, some studies have recorded only cardiovascular hospitalizations as a clinical outcome.⁶⁻⁸

Dharmarajan et al⁸ evaluated health care delivery in a population of Medicare patients and discovered that within the first 30 days after a heart failure hospitalization, readmissions were common; that is, most readmissions occurred in the first 15 days, and 35% of these were due to heart failure. In addition, the pattern of diagnoses for readmission did not differ by patients' demographic characteristics or time after discharge.⁸

The Chamberlain et al¹ research discovered almost the same median time to hospitalization to 30-day readmission of 9 days (in contrast to 12 days in the Dharmarajan et al⁸ Medicare study), and no differences in the number of hospitalizations by sex. In contrast, there was only a 17% readmission rate related to heart failure in the Chamberlain et al¹ report, as compared with the 35% readmission rate reported by Dharmarajan et al.⁸ The differences may reflect the distinct patient populations, as well as reliance on clinical data for the diagnosis of heart failure in the Chamberlain et al¹ report compared with claims data in the Dharmarajan et al⁸ Medicare population.

Another important issue is that Chamberlain et al¹ included all patients with heart failure who were diagnosed as inpatients or outpatients and recorded all hospitalizations after the diagnosis of heart failure, instead of only the first rehospitalization within 30 days.

Another report by Sangaralingham et al⁹ included patient data from a large commercial insurance database, Optum Laboratories. Patients who had an initial diagnosis of heart failure while treated as either an inpatient or an outpatient were followed for 1 year, and all hospitalizations subsequent to the initial heart failure diagnosis were recorded. This study reported the highest rates of readmissions within the first 30 days (ie, 35%), but only 13% of hospitalizations within the first year were attributed to heart failure. Similarly, the study by Chamberlain et al¹ demonstrated that 13% of all hospitalizations over the 2-year follow-up were related to heart failure. In addition, in the Chamberlain et al¹ research, the rates of hospitalizations over time did not differ by type of heart failure (preserved vs reduced ejection fraction) or sex, and hospitalizations for cardiovascular causes (13% heart failure, 24% other cardiovascular causes) were fewer than for noncardiovascular causes (63%).

The Efficacy of Vasopressin Antagonism in Heart Failure Outcome Study with Tolvaptan (EVEREST) research¹² discovered that in this distinct patient population, most hospitalizations occurred at a median of 9.9 months of follow-up and were related to cardiovascular causes; specifically, 46% of hospitalizations were due to heart failure. However, unlike the population-based research of Chamberlain et al,¹ EVEREST enrolled patients who were hospitalized with worsening heart failure and had an ejection fraction of 40% or more, thus explaining the higher proportion of heart failure hospitalizations.

When the available data are considered in aggregate, it is clear that the Chamberlain et al¹ report in this issue of the *Proceedings* makes an outstanding and unique contribution to the understanding of the epidemiology and health care requirements of patients who have heart failure. As such, the research should have utility when exploring new approaches to the diagnosis and treatment of patients with heart failure. This approach fits nicely into the matrix described by Diderot,¹³ who wrote that “[t]here are three principal means of acquiring knowledge ... observation of nature, reflection, and experimentation. Observation collects facts; reflection combines them; experimentation verifies the result of that combination.”

Of note, Chamberlain et al discovered that the rate of hospitalizations within 30 days is similar for patients with heart failure who are diagnosed in the inpatient or outpatient settings and in patients with heart failure with preserved or reduced ejection fraction. Although the latter is an important and simple fact, its relevance may be that to avoid hospitalizations for patients with heart failure, identification of these patients and management of risk factors before they become symptomatic will be paramount. Second, the minority of rehospitalizations in patients with the diagnosis of heart failure are due to heart failure per se and around two-thirds are related to noncardiovascular causes. The only cardiovascular comorbidity that was predictive of hospitalization at 30 days was prior myocardial infarction. More importantly, the other predictors of hospitalizations were noncardiovascular conditions or comorbidities, including chronic obstructive pulmonary disease, cancer, and dementia. Thus, interventions directed at comorbidities in patients with heart failure may be more effective at decreasing hospitalizations than specific interventions for heart failure. Finally, perhaps the most important clinical implication of the Chamberlain et al research is that there is a need for a more comprehensive and integrated approach in the management of patients with heart failure and the associated comorbidities to reduce the burden of hospitalizations and improve patients' quality of life. The early recognition and treatment of patients before they become symptomatic will be also important to avoid future hospitalizations in the natural history of heart failure.

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