Approximately 800,000 times a year, an emergency physician admits a patient with symptomatic heart failure (HF). Yet only a minority of emergency department patients with HF are severely ill as a result of pulmonary edema, myocardial ischemia, or cardiogenic shock. The majority of patients are not in need of an acute intervention beyond decongestion, and few patients during hospitalization undergo invasive diagnostic testing or therapeutic procedures that require intensive monitoring. Although hospitalization is clearly an inflection point, marking a threshold that independently predicts a worse outcome, the exact impact of hospitalization on post-discharge events has not been well elucidated. Thus, large subsets of patients with HF are hospitalized without a clear need for time-sensitive therapies or procedures. The authors estimate that up to 50% of emergency department patients with HF could be safely discharged after a brief period of observation, thus avoiding unnecessary admissions and minimizing readmissions. Observation unit management may be beneficial for low-risk and intermediate-risk patients with HF as continued treatment, and more precise risk stratification may ensue, avoiding inpatient admission. Whether observation unit management is comparable with or superior to the current approach must be determined in a randomized clinical trial. Critical end points include time to symptom resolution and discharge, post-discharge event rates, and a cost-effective analysis of each management strategy. It is the authors’ strong assertion that now is the time for such a trial and that the results will be critically important if we are to effectively influence hospitalizations for HF in the near future.

(J Am Coll Cardiol 2013;61:121–6) © 2013 by the American College of Cardiology Foundation

Is Hospital Admission for Heart Failure Really Necessary?
The Role of the Emergency Department and Observation Unit in Preventing Hospitalization and Rehospitalization

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Manuscript received July 12, 2012; revised manuscript received August 22, 2012, accepted August 30, 2012.
have gone through an evolution of therapies on the basis of a better understanding of pathophysiology and aimed at improving outcomes. Patients with acute coronary syndromes are now treated with aggressive medical therapy in the ED, including early definitive interventions, and at hospital discharge, patients are treated with appropriate secondary prevention measures aimed at minimizing acute coronary syndrome recurrence and readmissions. Recently, there have been similar advances in the outpatient management of HF. Patients with systolic dysfunction now benefit from angiotensin-converting enzyme inhibitors or aldosterone receptor antagonists, beta-blockers, resynchronization therapy, and implantable defibrillators. Outcomes have improved largely because of these improvements in outpatient therapy, but acute care pathways have not consistently optimized the use of evidence-based, guideline-driven care. Two critical unmet needs remain. Those patients with HF and preserved systolic function have no therapy of proven benefit. Furthermore, specific ED-based therapeutic interventions lack a solid evidence base. Regardless of ejection fraction, patients with HF have a high rate of early post-discharge events, with mortality and/or rehospitalization affecting approximately 33% of patients within 60 to 90 days. However, it is not clear that hospitalization per se is the answer to decreasing these post-discharge event rates, while it is reasonably clear that optimizing process-of-care strategies is associated with better short-term and long-term outcomes. As we continue to test new therapies to reduce symptoms and improve outcomes in HF, and as we struggle to reduce the enormous costs associated with hospitalizations for HF, it is desirable to evaluate alternatives to hospitalization.

Although hospitalization is clearly an inflection point, marking a threshold that independently predicts a worse outcome, the exact impact of hospitalization on post-discharge events has not been well elucidated. This is especially the case because many HF hospitalizations are driven by gaps in the process of care rather than worsening pathophysiology. Further research is required to determine if hospitalization is merely a marker of high risk, if treatment or lack of treatment somehow affects post-discharge outcomes, or if certain hospitalizations have no impact on outcomes at all. Several registry findings suggest that for some patients, hospitalization may not significantly affect the high event rate. First, the majority of patients are not in need of an acute intervention beyond decongestion. Although most are still admitted to the hospital, in part because of complex medical comorbidities, the treatment received is solely intravenous diuretic agents. Second, few patients during hospitalization undergo invasive diagnostic testing or therapeutic procedures that require intense monitoring. Third, patients who require intravenous inotropic agents, mechanical circulatory support, or hemodynamic monitoring account for a minority of admissions. Thus, a large subset of patients with HF are hospitalized without a clear need for time-sensitive therapies or procedures.

**Abbreviations and Acronyms**

- **ED** = emergency department
- **HF** = heart failure
- **OU** = observation unit

### Emergency Department Disposition for Acute Heart Failure

Currently, about 10% to 20% of ED presentations for HF are discharged directly home. Selecting the proper patient for ED-based management is important, because simply triaging a larger number of patients to discharge from the ED is not the answer. Patients discharged directly from the ED have higher post-discharge event rates than the 20% to 30% encountered after discharge from an inpatient setting. Improving initial risk stratification to safely increase ED discharges, or transition low-risk patients to alternative treatment pathways, thus avoiding hospitalization, is crucial to conserving health care resources, if this can be accomplished with similar clinical outcomes as conventional strategies. Importantly, many patients who return to the ED soon after discharge are also admitted to the hospital, but approximately 40% of these admissions are for noncardiac reasons. The majority of these noncardiac readmissions also present for initial evaluation to the ED. Regardless of etiology, reducing preventable 30-day readmissions for patients discharged after HF hospitalization is a national quality improvement initiative, with financial consequences for hospitals that have high rates of readmission.

We postulate that a 2-level targeted ED evaluation is imperative to determine an ED patient’s risk profile and discharge eligibility. The first level of risk stratification explores 3 broad areas during the initial ED evaluation to identify patients with high-risk features: (1) important precipitants, such as ischemia, uncontrolled arrhythmias, and infection; (2) presenting hemodynamic status, such as hypoxia, low blood pressure, and cardiogenic shock; and (3) other confounding or contributing conditions, such as renal dysfunction, hyponatremia, chronic obstructive lung disease, and diabetes. Simple diagnostic testing and physical examination can identify the vast majority of these potential high-risk features. Thus, status at the time of initial presentation will determine a large component of the risk profile associated with early ED disposition decision making.

Concurrent with the diagnostic workup, ED treatment is also begun. This is largely in the form of intravenous diuretic agents and topical or sublingual nitroglycerin. Evaluation after initial treatment is an important second level of ED risk stratification. Patients generally take 1 of 3 pathways after ED therapy, and depending on their response, the remaining balance of risk can be determined. The first group is composed of low-risk patients who respond to initial therapy, returning quickly to their baseline.
and not exhibiting any high-risk features. They may be eligible for ED discharge, in lieu of or after a brief period of observation (20). The second group constitutes the high-risk patients, representing about 20% of all ED patients, who develop a worsening clinical profile after therapy. This profile includes continued symptoms, worsening renal function, hypotension, or an elevated troponin. These patients would be poor candidates for ED discharge and should be promptly triaged to an inpatient unit for early interventions and further care (21). The third group consists of patients with intermediate risk, who have a partial response to therapy, in which symptoms diminish partially, with none of the high-risk features developing. However, because of their incomplete response, they require continued treatment and observation.

This ED-based, 2-level risk stratification provides a foundation for disposition decision making. Those deemed at high risk, either at initial evaluation or after initial therapy, should be admitted to the hospital for more comprehensive evaluation, treatment, and risk assessment. However, in those without high-risk features, we propose an alternative to conventional hospitalization.

**Alternatives to Hospitalization in Patients Not Eligible for Emergency Department Discharge**

Patients who are hospitalized for HF receive ongoing acute therapy with the goal of optimizing volume status, leading to symptom reduction and thus facilitating discharge. These patients with HF are in need of an “inpatient equivalent,” whereby acute therapy can be delivered, inexpensive testing can be conducted, an effective care transition can be planned, and inpatient hospitalization can be avoided. The importance of this is highlighted by the fact that the National Heart, Lung, and Blood Institute has identified effective alternatives to hospital admission in ED patients with HF as a high priority (22). We believe there is a sizable subset of ED patients with HF who would benefit from a period of observation and treatment, thus avoiding inpatient admission.

Investing in a new ED approach to patients with HF is instrumental if we aim to reduce hospital admissions and readmissions. Because more than 80% of HF admissions and readmissions originate in the ED, emergency physicians serve an important role as gatekeepers for inpatients with HF. They are ideally positioned to facilitate a paradigm shift away from hospital admission and toward observation unit (OU) management. We estimate that up to 50% of patients with HF could be safely discharged from the ED after a brief period of observation, thus avoiding unnecessary admissions and minimizing readmissions (23,24). This would be a significant change to our current approach of nearly universal hospitalization in ED patients with HF who currently cannot be discharged directly from the ED. Conservatively, changing the disposition decision from admission to an OU stay in merely 5% of the 400,000 “non-high-risk” patients would result in savings of 80,000 hospital days and more than $80 million annually in the United States (20,000 patients at an average cost savings of $4,000 each) (25,26).

Importantly, the OU is an ideal place to address many of the issues that hamper ED discharge and have been associated with early readmission in patients with HF (Table 2). OU management is compelling for HF management for several other reasons. First, a high proportion of patients experience improvement in dyspnea during their ED stays as a result of standard therapy (27). Many have complete resolution within 24 hours of initial therapy, which is the typical time period of observation. Second, the monitoring of blood pressure, heart rate, urine output, and body weight can be readily provided in the OU. Third, the simple diagnostic testing that occurs during an inpatient admission, such as electrolyte testing, echocardiography, B-type natriuretic peptide or N-terminal pro-B-type natriuretic peptide, and serial troponin measurements can easily be performed in the OU. Fourth, HF education and arranging outpatient follow-up are key components of OU management. These 2

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Initial Approach to ED Patients With HF Identifying Important Acute Precipitants, Hemodynamic Status, and Other Contributing Conditions</th>
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</thead>
<tbody>
<tr>
<td><strong>Prognostic Factor</strong></td>
<td><strong>Assessment</strong></td>
</tr>
<tr>
<td>Acute precipitants</td>
<td></td>
</tr>
<tr>
<td>Ischemia</td>
<td>ECG and troponin</td>
</tr>
<tr>
<td>Infection</td>
<td>Chest radiography, physical exam, urinalysis</td>
</tr>
<tr>
<td>Arrhythmia</td>
<td>ECG</td>
</tr>
<tr>
<td>Hemodynamic status</td>
<td></td>
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<tr>
<td>Hypotension</td>
<td>Vital signs</td>
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<tr>
<td>Hypoxia</td>
<td>Pulse oximetry</td>
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<tr>
<td>Organ perfusion</td>
<td>Mental status, capillary refill</td>
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<tr>
<td>Contributing conditions</td>
<td></td>
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<tr>
<td>Renal dysfunction</td>
<td>BUN, creatinine</td>
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<tr>
<td>Hyponatremia</td>
<td>Serum sodium level</td>
</tr>
<tr>
<td>COPD</td>
<td>Pulse oximetry</td>
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<tr>
<td>Diabetes</td>
<td>Blood glucose</td>
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</tbody>
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BUN = blood urea nitrogen; COPD = chronic obstructive pulmonary disease; ECG = electrocardiography; ED = emergency department; HF = heart failure; NIV = noninvasive ventilation.
few financial incentives for selecting an OU stay over inpatient hospitalization for HF. However, that has changed as the Centers for Medicare and Medicaid Services provide reimbursement for OU-based HF care while instituting penalties for excessive hospital readmissions.

There are several necessary steps to maximize OU use and optimize patient management: 1) at the local level, increased collaboration among emergency physicians, cardiologists, hospitalists, and primary care physicians to ensure continuity of care from ED admission through hospital discharge and outpatient follow-up; 2) at the national level, the dissemination of successful protocols, including patient selection and therapeutic pathways; and 3) from a research perspective, patient selection, comparative outcome, and cost-effectiveness studies further identifying optimal OU patients and protocols that maximize health care resource utilization.

### Future Directions

Evidence-based therapies have resulted in improvements in the outpatient management of HF (33). Despite an increasingly complex population of patients, the overall length of hospital stay has decreased. However, post-discharge event rates remain disturbingly high, and it is not clear that hospitalization mitigates these event rates. While we continue to explore clinical trials evaluating therapies aimed at reducing subsequent events, simultaneous efforts using novel management strategies are needed. Emergency physicians are key stakeholders in this process, because the ED is the point of triage and disposition for the majority of patients with HF who are considered for hospital admission. A focused initial ED evaluation using readily available baseline data is the first step in identifying patients with HF who may be eligible for ED discharge. The response to therapy initiated in the ED constitutes the second level of risk assessment. OU management may be beneficial for low-risk and intermediate-risk patients with HF as continued treatment and more precise risk stratification may ensue, avoiding inpatient admission and readmission and dispositioning patients to an appropriate level of care in the hospital. Alternatives to hospitalization, such as

### Table 2

**Common Observation Unit Interventions That May Facilitate Safe and Early Discharge and Avoid Inpatient Admission**

<table>
<thead>
<tr>
<th>Issue to Be Addressed</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Observe response to therapy</td>
<td>1. Vital signs, dyspnea testing, urine output</td>
</tr>
<tr>
<td>2. Identify high-risk features</td>
<td>2. Serial troponin and ECG, electrolytes, renal function</td>
</tr>
<tr>
<td>3. Routine diagnostic testing</td>
<td>3. Echocardiography</td>
</tr>
<tr>
<td>4. HF education</td>
<td>4. Educational pamphlets, videos, and personalized teaching by nurse practitioner</td>
</tr>
<tr>
<td>5. Guideline-directed medical therapy for HF</td>
<td>5. Prescriptions filled before discharge, documented plan for dose titration and provision of close monitoring</td>
</tr>
<tr>
<td>6. Arrange early follow-up</td>
<td>6. HF team member meets with patient at time of discharge and arranges follow-up in &lt;7 days</td>
</tr>
<tr>
<td>7. Optimize medication regimen</td>
<td>7. HF team member ensures proper regimen individualizing to the patient’s EF and comorbidities</td>
</tr>
</tbody>
</table>

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; ECG = electrocardiography; EF = ejection fraction; HF = heart failure.

key tasks are associated with decreased readmission, are incorporated in recently updated American College of Cardiology and American Heart Association performance measures, and are key components of OU management (28–30). Nonetheless, OU management for HF continues to be vastly underused.

The purpose of an OU is to simultaneously treat and risk-stratify patients while determining the need for hospitalization. The typical entry point for OU admission is the ED, where initial evaluation and treatment occur. Consensus guidelines have been developed to identify appropriate ED patients with HF for OU management (31) (Table 3). Although patients found to be at high risk would be ineligible for OU management, more than 50% of ED patients qualify for OU management. After OU evaluation, the 75% of patients who have responded to therapy, have no identifiable high-risk features, and have satisfactory follow-up care plans are discharged home. Their rates of readmission are similar to or better than those who are managed in an inpatient setting (32). Patients with inadequate responses to initial therapy or with high-risk features identified during their OU stays are admitted to the hospital for further management. The OU has been used to safely discharge and conserve resources in ED patients with HF (32).

The interventions in the OU are not complex or costly and in fact conserve significant resources compared with admission. If the OU is safe and efficient and minimizes health care expenditures, why have OUs not been universally implemented? The need for skillful coordination of the transition of care and the absence of a robust database to demonstrate noninferiority, if not superiority, to conventional care remain significant hurdles. Previously, there were
the one we propose, are crucial to our overall goal of allocating resources to those high-risk patients in need of intense evaluation and therapy, while facilitating the outpatient management of lower-risk patients.

Whether our proposed risk assessment and disposition strategy is comparable or superior to the current approach must be compared in a randomized clinical trial. We now propose such a trial and have summarized the research algorithm in Figure 1. Patients who are initially evaluated in the ED and found to be at high risk for inpatient morbidity and mortality are admitted to an inpatient setting for immediate intense evaluation and therapy. Those patients who are initially triaged as at intermediate or low risk and have some response to initial therapy are randomized to either OU or inpatient management. Critical end points include time to symptom resolution and discharge, post-discharge event rates, and a cost-effective analysis of each management strategy. With a sample size of 700 patients (power = 0.91, alpha = 0.05), the study would be able to detect a 35% reduction in the odds that the number of bed days exceeds any chosen cutoff. It is our strong assertion that now is the time for such a trial and that the results will be

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**Figure 1** ED Patient Enrollment in a Randomized OU Trial of Acute HF Management

Patient flow from initial emergency department (ED) presentation and baseline assessment through randomization and outpatient follow-up. The proposed endpoints are also provided.

HF = heart failure; OU = observation unit; QOL = quality of life; SCD = sudden cardiac death.
critically important if we are to effectively influence hospitalizations for HF in the near future.

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REFERENCES


Key Words: emergency department • heart failure • hospitalization • observation unit.