

Who Is Managing Acute Decompensated Heart Failure? The Need for a Multidisciplinary Approach

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Acute decompensated heart failure (ADHF) is a common disorder that is frequently managed by hospitalists. This management is expected to expand over the next several years because of a continuing increase in the number of ADHF admissions coupled with a plateau or possible decline in the number of practicing cardiologists (Figure 1).^{1–14} In addition, 12% of fellowship training positions in cardiology were eliminated between 1995 and 2001, and the fact that the current number of training positions is inadequate to meet future demands is not recognized.^{15,16} Given the severity of this disorder, the limited data from randomized, controlled clinical trials,¹⁷ and the limitations of current treatment, this management can be both challenging and rewarding. The goal of this special supplement of the *Journal of Hospital Medicine* is to assist hospitalists in this endeavor by summarizing the currently available data and treatment options and presenting a rational evidence-based algorithm for the management of ADHF.

A multidisciplinary approach to heart failure has been shown to reduce cost, decrease length of stay, curtail readmissions, and improve compliance.^{18–20} By leading and coordinating teams of physicians, pharmacists, nurses, nutritionists, physical therapists, and case managers and by developing and implementing indications for cardiology consultation, hospitalists can facilitate this multidisciplinary approach.^{21,22} However, it is important to remember that hospitalists do not replace cardiologists, who remain a valuable and key component of this multidisciplinary team. Their input is vital in developing care pathways and criteria for consultation, and they, along with primary care physicians, will be the primary source of patient care following hospital discharge. Good communication between hospitalists and cardiologists is essential to optimize the care of patients with ADHF.

Maximizing the efficacy of ADHF care requires a thorough understanding of (1) the causes and potential treatments for the patient's acute decompensation, (2) the management of the patient's chronic heart failure, and (3) potential future therapies. Strategies to improve the continuum of heart failure care have been employed to help improve patient outcomes.²³ For example, hospital-based disease management programs have consistently been shown to optimize care and reduce rehospitalization rates in patients with heart failure.²⁴ These programs involve a multidisciplinary, multifaceted approach to care in order to provide a continuum of care extending from hospitalization and into a patient's home environment.

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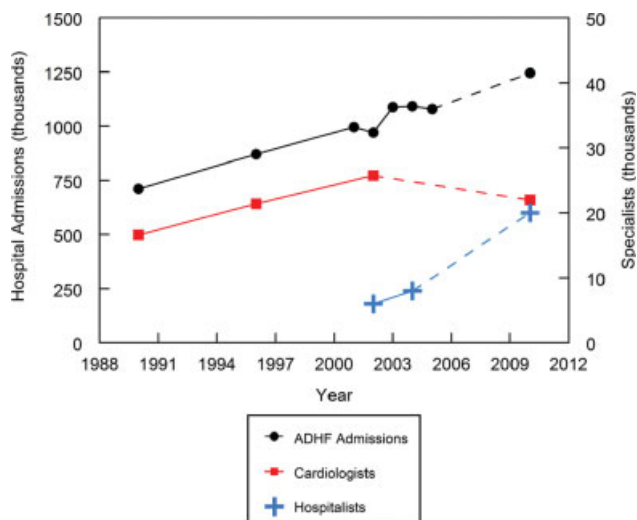


FIGURE 1. (—) Actual number of admissions and (- -) estimated number of admissions for acute decompensated heart failure (AHDF) in the United States and the number of specialists available to handle this workload. Actual numbers for ADHF admissions over time were extracted from National Hospital Discharge Summary publications,¹⁻⁷ and the estimated number of ADHF admissions in 2010 was calculated by multiplication of the prevalence of ADHF admission in various age groups from 2004 National Hospital Discharge Summary data⁸ by the estimated number of individuals in each of these age groups in 2010 according to US Census estimates.⁹ Actual numbers of cardiologists were extracted from Foot et al.¹⁰ and the 35th Bethesda Conference.¹¹ The estimated number of cardiologists in 2010 was calculated on the basis of the statement in the Bethesda Conference report that the number of cardiologists is expected to fall to 5 per 100,000 individuals in 2020 and the estimated population in 2020 according to US Census estimates. This number was then extrapolated back to 2010 with linear interpolation. Actual and estimated numbers of hospitalists were extracted from Baudendistel and Wachter,¹² Wachter,¹³ and Amin.¹⁴

Because of their practice location and experience, hospitalists are uniquely suited to influence acute inpatient care.²⁵ They see patients in a variety of hospital settings and consequently tend to think of the entire system and not just an isolated component or patient.¹⁴ In addition, they have a vested interest in hospital quality improvement measures and are frequently involved in evaluating policies and procedures and developing and implementing clinical pathways, guidelines, and decision-support tools.²⁶ Data demonstrate that compliance is greater with evidence-based guidelines and core performance measures when inpatient care is directed by a hospitalist.²⁷⁻³⁰ Improved compliance with selected quality

measures in patients with acute myocardial infarction and congestive heart failure has been observed when hospitals implement standardized admission and discharge orders.^{31,32}

Numerous transitions, such as outpatient to inpatient, intensive care unit to ward, and ward to home, occur during hospitalization, and these transitions are frequently associated with changes in the patient's medication regimen. During an acute illness, chronic medications may be held or discontinued, long-acting medications may be changed to short-acting ones to better titrate dose and achieve tighter control, and closed formularies may necessitate substituting 1 medication for another.³³ A breakdown in communication during hospitalization-associated transitions commonly affects medication regimens and can adversely impact patient care.³⁴⁻³⁶ In a prospective evaluation, 53.6% [95% confidence interval (CI): 45.7%-61.6%] of patients admitted to the hospital had at least 1 unintended discrepancy between their admission medication orders and their chronic outpatient regimen; 38.6% of these discrepancies were considered a potential threat to the patient.³⁴ Likewise, 49% of patients being discharged from the hospital in another evaluation had an unexplained discrepancy between their preadmission and discharge medications.³⁶ As a result, the Joint Commission on Accreditation of Healthcare Organizations now requires accredited facilities to perform medication reconciliation whenever a patient changes service, setting, provider, or level of care and new medication orders are written.³⁷ This reconciliation is especially important in patients with heart failure, for whom polypharmacy is common and noncompliance with appropriate treatment regimens substantially increases readmission rates.³⁸⁻⁴²

During these transition periods, hospitalists can play an important role in bridging the communication gap and providing this medication reconciliation.³³ For example, actively involving hospitalists in all aspects of the reconciliation process at 1 institution resulted in a 4-fold increase in consistency with preadmission medications.⁴³ Similarly, because of the number of discharge summaries that they write, hospitalists are well suited to lead implementation of new policies and procedures to ensure compliance with recent changes in the Joint Commission on Accreditation of Healthcare Organizations requirements regarding these summaries.

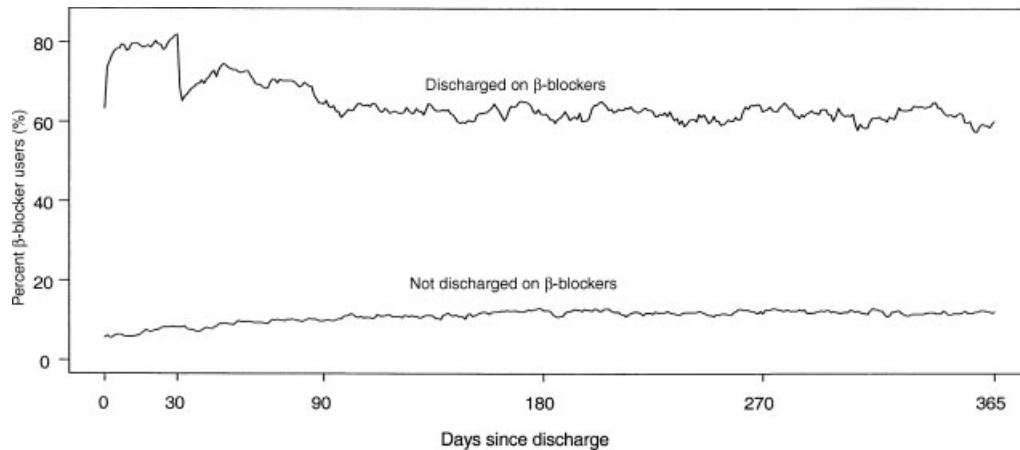


FIGURE 2. The percent of β -blocker use over the first year following acute myocardial infarction in patients who were or were not prescribed a β -blocker at the time of hospital discharge. Reprinted with permission from the *Journal of the American College of Cardiology*.⁴⁴ Copyright 2002, American College of Cardiology Foundation.

In addition to playing an active role in acute patient management, hospitalists can substantially influence long-term care and outcomes. Consequently, hospitalists must be well versed in the management of chronic heart failure. Patients are intensely focused on their illness during the hospitalization period, and this focus enhances opportunities for meaningful education and behavior modification. Numerous studies have demonstrated that adherence to long-term therapy is improved when this therapy is initiated before or at hospital discharge.⁴⁴⁻⁴⁶ In an evaluation of data from the Organized Program To Initiate Lifesaving Treatment in Hospitalized Patients with Heart Failure Registry (OPTIMIZE-HF), the prescription of a β -blocker at discharge was associated with a significant reduction in 60- to 90-day mortality [hazard ratio (HR): 0.48; 95% CI: 0.30-0.79], and prescription of an angiotensin-converting enzyme inhibitor or angiotensin receptor blocker at discharge was associated with a significant reduction in 60- to 90-day mortality and/or rehospitalization (HR: 0.51; 95% CI: 0.34-0.78).⁴⁷ In the Cardiac Hospitalization Atherosclerosis Management Program (CHAMP), emphasizing initiation of chronic therapy prior to hospital discharge was associated with 3.0-fold greater angiotensin-converting enzyme inhibitor use and 3.2-fold greater β -blocker use at 1 year (both $P < 0.01$).⁴⁸ Similarly, in patients surviving acute myocardial infarction, the strongest predictor of β -blocker use at 30 days

following discharge was receipt of a β -blocker prescription at the time of discharge (HR: 15.8; 95% CI: 10.8-23.3), and this beneficial effect was sustained for up to a year (Figure 2).⁴⁴ Likewise, in patients with ADHF, the prevalence of β -blocker therapy at 60 days was significantly increased when this therapy was initiated before discharge (91%) versus after discharge (73%; $P < 0.001$).⁴⁵ This predischarge initiation of chronic therapy has been shown to reduce morbidity and mortality.

An awareness of new therapies for ADHF that are in late stages of clinical development can improve understanding of the complex pathophysiology of ADHF and enhance appropriate adaptation of these therapies once they become clinically available. These new therapies represent an attempt to improve on existing therapies, and consequently, they fall into the same 3 general categories as current therapies: diuretics, vasodilators, and inotropic agents.^{48,49} Vasopressin receptor antagonists and adenosine receptor antagonists represent an attempt to stimulate aquaresis without inducing hyponatremia, hypokalemia, diminished glomerular filtration, or adverse neurohormonal activation;⁴⁸⁻⁵⁴ endothelin receptor antagonists and newer natriuretic peptides represent an attempt to stimulate vasodilation and improve cardiac output without diminishing renal function;^{49,55} and myosin activators and sodium-potassium adenosine triphosphatase inhibitors represent an attempt to enhance contractility

TABLE 1
Investigational Therapies for Acute Decompensated Heart Failure

Class/MOA	Agent(s)	Advantages/Disadvantages	References
Vasopressin receptor antagonists	Tolvaptan Conivaptan Lixivaptan SR-121463b	<ul style="list-style-type: none"> • Induce aquaresis without natriuresis • Potentially avoid hyponatremia and hypokalemia 	deGoma et al. ⁴⁸ Tang and Hobbs ⁴⁹ Konstam et al. ⁵⁰ Schrier et al. ⁵¹ Schweiger and Zdanowicz ⁵²
Adenosine A1 receptor antagonists	Rolofylline BG-9719 BG-9928	<ul style="list-style-type: none"> • Increase renal blood flow • Increase intraglomerular hydraulic pressure • May produce diuresis without adversely affecting glomerular filtration and renal function 	Tang and Hobbs ⁴⁹ deGoma et al. ⁴⁸ Givertz et al. ⁵³ Greenberg et al. ⁵⁴
Endothelin receptor antagonists	Tezosentan	<ul style="list-style-type: none"> • Potent vasodilator • Improves cardiac output • Hemodynamic effects have not translated into an improvement in heart failure symptoms or risk of death. 	Tang and Hobbs ⁴⁹ McMurray et al. ⁵⁵
Natriuretic peptides	Ularitide	<ul style="list-style-type: none"> • Resists inactivation by neutral endopeptidase • Improves filling pressures and dyspnea scores • No apparent deleterious effect on short-term renal function 	deGoma et al. ⁴⁸ Mitrovic et al. ⁵⁹
Myosin activators	CK-1827452	<ul style="list-style-type: none"> • Tries to dissociate inotropy from arrhythmogenicity • Enhances contractility by targeting myocardial myosin, the force generating cardiac enzymes • Still very early in clinical development (just entered phase 2) 	deGoma et al. ⁴⁸ Cytokinetics ⁵⁶
Sodium-potassium ATPase inhibitors	Istaroxime	<ul style="list-style-type: none"> • Tries to dissociate inotropy from arrhythmogenicity • Enhances contractility by stimulating calcium entry into the sarcolemmal Na/Ca exchanger • Lusitropic • Still very early in clinical development (just completed first phase 2 trial) 	deGoma et al. ⁴⁸ Blair et al. ⁵⁷ Cleland et al. ⁵⁸

Abbreviations: ATPase, adenosine triphosphatase; MOA, mechanism of action.

without inducing arrhythmogenicity or increasing mortality risk⁴⁸⁻⁵⁹ (Table 1).

Finally, although major advancements in the medical therapy of heart failure patients have substantially improved outcomes,⁶⁰ technological advances in mechanical devices,⁶¹ including automatic implantable cardioverter defibrillators, cardiac resynchronization therapy, and ventricular assist devices, as well as advances in the surgical treatment of heart failure,⁶² have also been used to support the failing heart. Heart failure patients being treated with mechanical devices, as well as those following cardiac transplant, require unique care. As more mechanical and surgical innovations emerge, nonpharmacologic therapy will continue to evolve as a cornerstone of the management strategy in heart failure patients. Hospitalists will need to rely on care pathways, criteria for consultation, and good communication with cardiologists to optimize the care of these patients.

Hospitalists should work with their cardiology colleagues in their local institution to develop appropriate criteria for cardiology consultation, and everyone should be educated on these criteria.

The subsequent discussions in this supplement expand on these topics. First, I review the presentation and early recognition, risk stratification, and treatment of patients with ADHF and the role of the hospitalist in this assessment and treatment process. Next, Dr. Khan and Dr. Heywood review the role of diuretics, vasodilators, and ultrafiltration in the management of patients with volume overload and high filling pressures and conclude with a discussion of potential future pharmacologic treatment options, such as tolvaptan and rolofylline, and nonpharmacologic modalities, such as wireless hemodynamic monitoring through implanted devices. Finally, Dr. Michota and I discuss bridging the gap between evidence and practice in the management of patients with

ADHF. We review the evidence-based guidelines that are currently available; discuss the appropriate location for treatment based on the patient's initial history and physical, radiographic, and laboratory findings; provide a practical algorithm for this treatment; and discuss means to transition care from the inpatient setting to the outpatient setting in a manner that enhances compliance with long-term therapy and reduces recidivism. Given the anticipated growth in ADHF and the need for hospitalists to manage this disease together with cardiologists and others, we believe that the provided information will be helpful in the management of ADHF.

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