Team-based Care for Advanced Heart Failure

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KEYWORDS

• Heart failure • LVAD • Multidisciplinary team

KEY POINTS

- Advanced heart failure (AHF) is the end stage of the heart failure (HF) syndrome, with steadily increasing prevalence, significant morbidity, high mortality, and rising costs.
- Multidisciplinary team-based care of patients with AHF has been shown to reduce the risk of hospitalization, death, and health care costs in randomized controlled trials.
- Left ventricular assist devices (LVADs) have been shown to improve morbidity, mortality, quality of life, and functional capacity in patients with AHF.
- Multidisciplinary team-based care of LVAD-supported patients seems to be effective; however, supporting evidence is derived from nonrandomized studies.

INTRODUCTION

HF is an important cause of morbidity and mortality and poses a significant burden to health care systems worldwide. In the United States, over 5 million adults live with HF and 825,000 new cases are diagnosed annually.[1] HF accounts for a large proportion of medical expenditures and is now the leading cause of hospitalization in the Medicare population. Annually, more than 1 million patients are hospitalized with a primary diagnosis of HF, with half of these hospitalizations occurring in the advanced stages of the disease.[1] The prevalence of AHF has been estimated between 5% and 25% of the HF population, but data are limited.[2,3]

Advances in medical and device therapy have altered the natural history of HF by delaying the progression of the disease and improving survival, which has resulted in a growing number of patients with AHF. In general, AHF is defined as HF that is refractory to optimal medical therapy, including disease-modifying agents and cardiac resynchronization therapy.[4] Although a unified working definition for AHF is not available, diagnostic criteria and findings that can be useful in identifying patients with AHF have been described (**Box 1**).[4,5] The Interagency Registry for Mechanically Assisted Circulatory Support (INTERMACS) has developed 7 profiles that can further stratify patients with AHF, and it has been shown to correlate with outcomes after ventricular assist device implantation.[6]

The total cost for HF is estimated to be approximately 31 million per year and is projected to increase to 70 billion by 2030. Most of the expenditure is likely attributable to patients with AHF, in part due to the high rates of hospitalization, office visits, medical therapy, and indirect medical care experienced by these patients. In a recent study evaluating resource use in the last 180 days of life in Medicare beneficiaries with HF, 80% of patients were hospitalized in the last 6 months of life, with an increase in days in intensive care units and a cost increase from $28,766

The authors have no financial disclosures.

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Heart Failure Clin 11 (2015) 467–477
http://dx.doi.org/10.1016/j.hfc.2015.03.009
1551-7136/15/$ – see front matter

Box 1
Diagnostic criteria and clinical events identifying patients with AHF

1. Diagnostic criteria
   a. Advanced NYHA functional class (NYHA class III-IV)
   b. Episodes of HF decompensation, characterized by either volume overload or reduced cardiac output
   c. Objective evidence of severe cardiac dysfunction shown by one of the following:
      i. LVEF less than 30%
      ii. Pseudonormal or restrictive mitral inflow pattern
      iii. PCWP greater than 16 mm Hg and/or RAP greater than 12 mm Hg
      iv. Elevated BNP or NT-proBNP plasma levels in the absence of noncardiac causes
   d. Severe impairment of functional capacity shown by one of the following:
      i. Inability to exercise
      ii. Distance walked in 6 minutes less than or equal to 300 m
      iii. Peak oxygen consumption (Vo_2) less than 12 to 14 mL/kg/min
   e. History of 1 or more HF hospitalization in the past 6 months
   f. Presence of all the previous features despite "attempts to optimize" therapy, unless these are poorly tolerated or contraindicated, and cardiac resynchronization therapy when indicated
2. Clinical events that suggest AHF
   a. Frequent ($\geq$2) HF hospitalizations or ED visits in the past 12 months
   b. Progressive decline in renal function
   c. Cardiac cachexia
   d. Intolerance to ACE inhibitors because of hypotension or worsening renal function
   e. Intolerance to β-blockers because of hypotension or worsening HF
   f. Frequent systolic blood pressure less than 90 mm Hg
   g. Persistent dyspnea with dressing or bathing requiring rest
   h. Inability to walk 1 block on the level ground because of dyspnea or fatigue
   i. Escalation of diuretics to maintain euvolemia (furosemide dose >160 mg/d or use of metolazone)
   j. Progressive decline in serum sodium levels (<133 mEq/L)
   k. Frequent ICD shocks

Abbreviations: ACE, angiotensin converting enzyme; BNP, B-type natriuretic peptide; ED, emergency department; ICD, implantable cardioverter-defibrillator; LVEF, left ventricular ejection fraction; NT-proBNP, N-terminal pro-B-type natriuretic peptide; NYHA, New York Heart Association; PWCP, pulmonary capillary wedge pressure; RAP, right atrial pressure; Vo_2, oxygen consumption.

Adapted from Yancy CW, Jessup M, Bozkurt B, et al. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on practice guidelines. Circulation 2013;128(16):e240–327; and Metra M, Ponikowski P, Dickstein K, et al. Advanced chronic heart failure: a position statement from the Study Group on Advanced Heart Failure of the Heart Failure Association of the European Society of Cardiology. Eur J Heart Fail 2007;9(6–7):684–94, with permission.

to $36,216 per patient.[7] Recent data on the comparative cost-effectiveness of advanced therapies for this group of patients suggest that although heart transplant is a life-prolonging and cost-effective therapy, the use of long-term mechanical circulatory support requires additional improvement in its adverse event profile and quality of life to reach an acceptable cost-effectiveness threshold.[8]

Thus, the growing number of patients with AHF in conjunction with the high complexity of their management and rising health care costs requires the development and implementation of health care models that allow for optimal and