# Cardiac Resynchronization Therapy and Implantable Cardioverter Defibrillator Therapy in Advanced Heart Failure

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**KEYWORDS**

• Heart failure • CIED • Defibrillator • Cardiac resynchronization therapy • Arrhythmia

**KEY POINTS**

- Cardiac implanted electronic devices (CIED) have improved survival and quality of life in patients with advanced heart failure.
- The role of implantable cardioverter defibrillators (ICD) has expanded. As clinical experience with ICDs matures, targeted antitachycardia therapies demonstrate survival and quality of life benefit.
- Cardiac resynchronization therapy addresses electrical dyssynchrony, can reverse pathologic remodeling of the left ventricle, and improves quality of life scores, measures of functional capacity, and survival.
- Although the presence of ventricular arrhythmia can portend poorer outcomes, the role and long-term management of CIEDs remains to be determined.

## INTRODUCTION

Patients with heart failure represent a significant clinical and financial burden to the US health care system. In 2012, the prevalence of heart failure in the United States was 2.4%.[1] Among patients older than 80 years of age, the prevalence of heart failure is 12%. The lifetime risk of developing heart failure is 1 in 9 males and 1 in 6 for females.[2] Projections estimate that by 2030 more than 8 million people will have heart failure and the annual direct costs for heart failure care will increase to $53 billion dollars.[1] Advanced heart failure, as defined in this article, refers to patients with New York Heart Association (NYHA) functional class III or IV symptoms, inclusive of patients with American College of Cardiology/American Heart Association stage D heart failure who are listed for cardiac transplant or living with mechanical circulatory support. Fortunately, survival has improved over time, but this is overshadowed by the sobering mortality rate of 50% within 5 years of heart failure diagnosis.[3]

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Cardiac implantable electronic devices include the implantable cardioverter-defibrillator (ICD) and cardiac resynchronization therapy (CRT) devices. These devices play an increasing role in heart failure management and have been shown to significantly improve long-term clinical outcomes in patients with moderate to severe heart failure symptoms (Fig. 1).

The role of ICD and CRT therapy has continually expanded. Data from quality improvement registries such as the Get With The Guidelines Heart Failure program has demonstrated an overall increase of ICD use among eligible patients from 30% to 50%.[4] Although the trend of appropriate ICD implantation is promising, it also suggests a large undertreated group of heart failure patients to whom greater effort must be directed so as to narrow the therapeutic gap among those patients for whom such devices are indicated. Patients with advanced heart failure can have limited 1-year survival and are

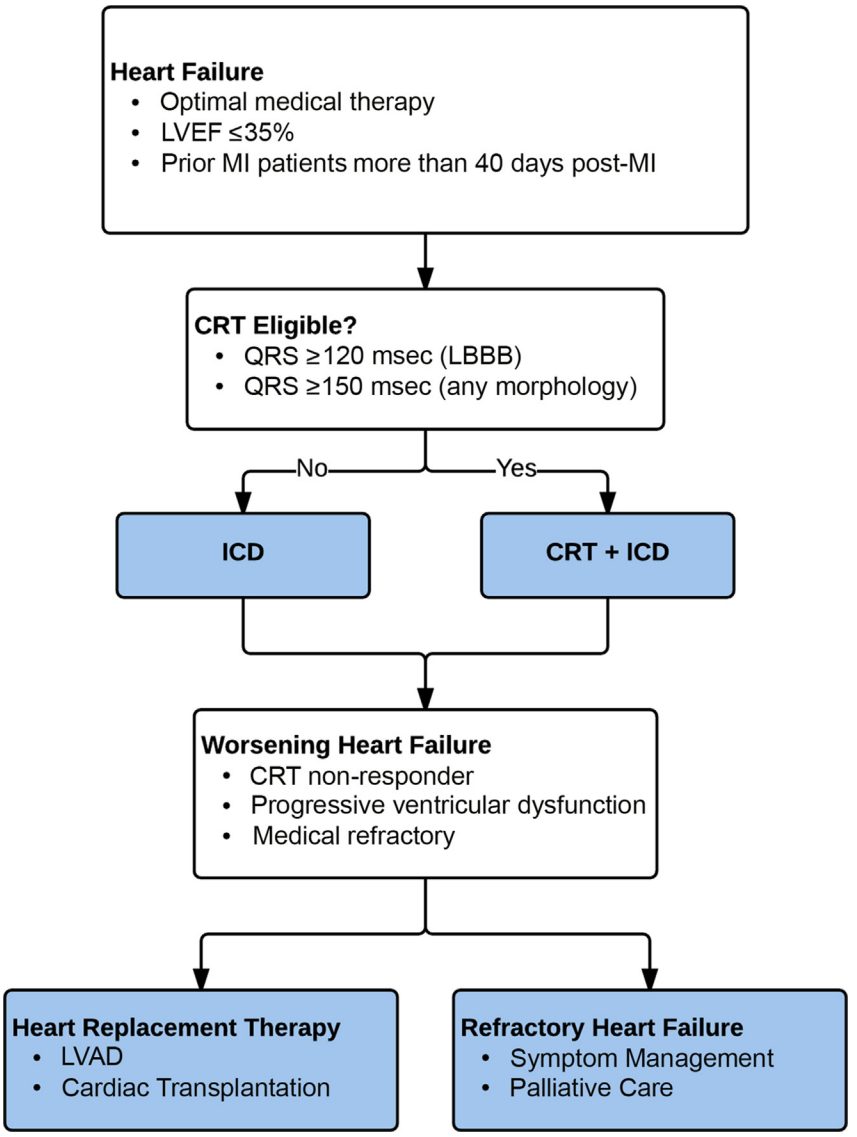


**Fig. 1.** Cardiac implanted electronic device algorithm in management of heart failure with reduced ejection fraction. Initial evaluation starts with identification of patients who benefit from implantable cardioverter defibrillator (ICD) for primary prevention. These patients should be on optimal medical therapy as part of their treatment strategy. A waiting period of 40 days applies for patients who have a reduced ejection fraction as a result of a myocardial infarction before they qualify for an ICD. Patients with wide QRS duration should be considered for a cardiac resynchronization therapy (CRT). LBBB, left bundle branch block; LVAD, left ventricular assist device; LVEF, left ventricular ejection fraction; MI, myocardial infarction.