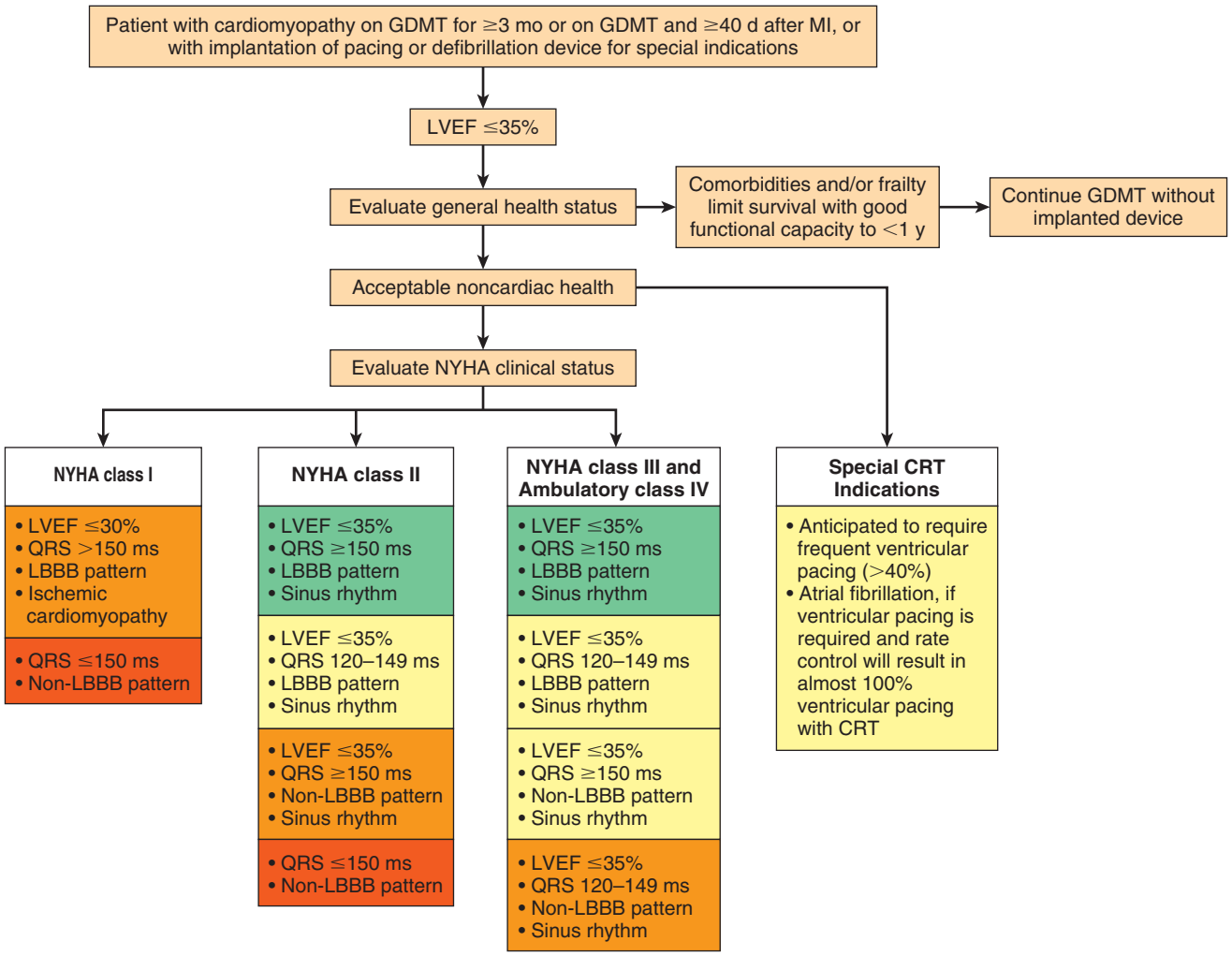

FIGURE 5-8 Left ventricular ejection fraction (LVEF) and New York Heart Association (NYHA) functional class that correlates with the American College of Cardiology and American Heart Association (ACC/AHA) guidelines for recommendations for defibrillators and cardiac resynchronization therapy (CRT). Class I recommendations are shown in *green*, class IIa recommendations are shown in *yellow*, class IIb recommendations are shown in *orange*, and class III recommendations are shown in *red*. GDMT, Guideline-directed medical therapy; LBBB, left bundle branch block; MI, myocardial infarction.

Stage D Heart Failure

Despite optimal medical therapy, many patients with HF fail to have significant improvement in symptoms. In these instances, a trial of hemodynamically guided (i.e., using a Swan-Ganz catheter) HF therapy may be necessary to optimize volume status and perfusion and to assess the degree of impairment of the cardiac index.

This approach allows assessment of candidacy for advanced HF therapies, such as cardiac transplantation and mechanical circulatory support with ventricular assist devices. One commonly used agent is milrinone, an intravenous phosphodiesterase inhibitor that has similar effects on contractility and afterload. Administration increases the cardiac index and promotes spontaneous diuresis. In patients with markedly elevated systemic vascular resistance, the use of intravenous vasodilators (e.g., nitroglycerin, sodium nitroprusside) can significantly reduce afterload and may improve cardiac output.

If the previously described measures fail to produce a satisfactory diuretic response, dopamine given in doses ranging from 2 to 5 μg/kg/min may facilitate sodium and water excretion by stimulating renal dopaminergic receptors. Table 5-5 shows the clinical signs and laboratory values that a clinician should recognize in patients with stage D or advanced HF. The Interagency Registry for Mechanically Assisted Circulatory Support (INTERMACS) scale is used to appropriately risk-stratify these patients for potential mechanical circulatory support.

Mechanical Circulatory Support

Two permanent ventricular assist devices (VADs) are approved by the U.S. Food and Drug Administration. The first device is the HeartMate II, which is an axial flow device that is approved for bridge-to-transplantation use and for destination therapy in transplantation-ineligible patients. The second device is a third-generation VAD called Heartware (HVAD), which is a centrifugal pump. Both pumps require chronic anticoagulation and antiplatelet therapy. The current estimated aggregate survival rate is approximately 80% at 1 year and approximately 70% at 2 years.