

**Appropriate Use Criteria for ICD/CRT – Online Appendix
Indications by Appropriate Use Ratings**

Table 1. Appropriate Indications (Median Score 7-9)

Indication		Appropriate Use Score (1-9)
Section 1: Secondary Prevention		
CAD: VF or Hemodynamically Unstable VT Associated With Acute (<48 hours) MI (Newly Diagnosed, No Prior Assessment of LVEF)		
Total Revascularization Completed After Cardiac Arrest		
3.	<ul style="list-style-type: none"> • VF or polymorphic VT during acute (<48 hours) MI • NSVT 4 days post MI • Inducible VT/VF at EPS ≥4 days after revascularization • LVEF 36-49% 	A (7)
3.	<ul style="list-style-type: none"> • VF or polymorphic VT during acute (<48 hours) MI • NSVT 4 days post MI • Inducible VT/VF at EPS ≥4 days after revascularization • LVEF ≤35% 	A (8)
Obstructive CAD With Coronary Anatomy Not Amenable to Revascularization		
6.	<ul style="list-style-type: none"> • VF or polymorphic VT during acute (<48 hours) MI • No EPS done • LVEF ≤35% 	A (7)
CAD: VF or Hemodynamically Unstable VT <48 Hours (Acute) Post-Elective Revascularization		
7.	<ul style="list-style-type: none"> • No evidence for acute coronary occlusion, restenosis, preceding infarct, or other clearly reversible cause • LVEF ≤35% 	A (7)
CAD: VF or Hemodynamically Unstable VT [No Recent MI (≤40 days) Prior to VF/VT and/or No Recent Revascularization (≤3 Months) Prior to VF/VT]		
8.	<ul style="list-style-type: none"> • No identifiable transient and completely reversible causes • No need for revascularization identified by cath performed following VF/VT • LVEF ≥50% 	A (9)
8.	<ul style="list-style-type: none"> • No identifiable transient and completely reversible causes • No need for revascularization identified by cath performed following VF/VT • LVEF 36-49% 	A (9)
8.	<ul style="list-style-type: none"> • No identifiable transient and completely reversible causes • No need for revascularization identified by cath performed following VF/VT • LVEF ≤35% 	A (9)
9.	<ul style="list-style-type: none"> • No revascularization performed (significant CAD present at cath performed following VF/VT, but coronary anatomy not amenable to revascularization) • LVEF ≥50% 	A (9)

9.	<ul style="list-style-type: none"> No revascularization performed (significant CAD present at cath performed following VF/VT, but coronary anatomy not amenable to revascularization) LVEF 36-49% 	A (9)
9.	<ul style="list-style-type: none"> No revascularization performed (significant CAD present at cath performed following VF/VT, but coronary anatomy not amenable to revascularization) LVEF \leq35% 	A (9)
10.	<ul style="list-style-type: none"> Significant CAD identified at cath performed following VF/VT Complete revascularization performed after cardiac arrest LVEF 36-49% 	A (7)
10.	<ul style="list-style-type: none"> Significant CAD identified at cath performed following VF/VT Complete revascularization performed after cardiac arrest LVEF \leq35% 	A (7)
11.	<ul style="list-style-type: none"> Significant CAD identified at cath performed following VF/VT Incomplete revascularization performed after cardiac arrest LVEF \geq50% 	A (7)
11.	<ul style="list-style-type: none"> Significant CAD identified at cath performed following VF/VT Incomplete revascularization performed after cardiac arrest LVEF 36-49% 	A (8)
11.	<ul style="list-style-type: none"> Significant CAD identified at cath performed following VF/VT Incomplete revascularization performed after cardiac arrest LVEF \leq35% 	A (9)
CAD: VF or Hemodynamically Unstable VT During Exercise Testing Associated With Significant CAD		
12.	<ul style="list-style-type: none"> No revascularization performed (significant CAD present at cath performed following VF/VT, but coronary anatomy not amenable to revascularization) LVEF \geq50% 	A (9)
12.	<ul style="list-style-type: none"> No revascularization performed (significant CAD present at cath performed following VF/VT, but coronary anatomy not amenable to revascularization) LVEF 36-49% 	A (9)
12.	<ul style="list-style-type: none"> No revascularization performed (significant CAD present at cath performed following VF/VT, but coronary anatomy not amenable to revascularization) LVEF \leq35% 	A (9)
13.	<ul style="list-style-type: none"> Significant CAD identified at cath performed following VF/VT Complete revascularization performed after cardiac arrest LVEF \leq35% 	A (7)
14.	<ul style="list-style-type: none"> Significant CAD identified at cath performed following VF/VT Incomplete revascularization performed after cardiac arrest LVEF \geq50% 	A (7)
14.	<ul style="list-style-type: none"> Significant CAD identified at cath performed following VF/VT Incomplete revascularization performed after cardiac arrest LVEF 36-49% 	A (7)
14.	<ul style="list-style-type: none"> Significant CAD identified at cath performed following VF/VT Incomplete revascularization performed after cardiac arrest LVEF \leq35% 	A (8)

No CAD: VF or Hemodynamically Unstable VT		
15.	<ul style="list-style-type: none"> Dilated nonischemic cardiomyopathy LVEF \geq50% 	A (9)
15.	<ul style="list-style-type: none"> Dilated nonischemic cardiomyopathy LVEF 36-49% 	A (9)
15.	<ul style="list-style-type: none"> Dilated nonischemic cardiomyopathy LVEF \leq35% 	A (9)
VF/Hemodynamically Unstable VT Associated With Other Structural Heart Disease		
18.	<ul style="list-style-type: none"> Myocardial sarcoidosis 	A (9)
20.	<ul style="list-style-type: none"> Giant cell myocarditis 	A (8)
Genetic Diseases with Sustained VT/VF		
22.	<ul style="list-style-type: none"> Congenital Long QT 	A (9)
23.	<ul style="list-style-type: none"> Short QT 	A (9)
24.	<ul style="list-style-type: none"> Catecholaminergic Polymorphic VT 	A (9)
25.	<ul style="list-style-type: none"> Brugada syndrome 	A (9)
26.	<ul style="list-style-type: none"> ARVC with successful ablation of all inducible monomorphic VTs 	A (9)
27.	<ul style="list-style-type: none"> ARVC with unsuccessful attempt to ablate an inducible VT 	A (9)
28.	<ul style="list-style-type: none"> ARVC without attempted ablation 	A (9)
29.	<ul style="list-style-type: none"> Hypertrophic cardiomyopathy 	A (9)
No Structural Heart Disease (LVEF \geq50%) or Known Genetic Causes of Sustained VT/VF		
Idiopathic VF With Normal Ventricular Function		
32.	<ul style="list-style-type: none"> No family history of sudden cardiac death 	A (9)
33.	<ul style="list-style-type: none"> First degree relative with sudden cardiac death 	A (9)
Syncope in Patients Without Structural Heart Disease		
Unexplained Syncope in a Patient With Long QT Syndrome		
41.	<ul style="list-style-type: none"> While on treatment with beta blockers 	A (9)
42.	<ul style="list-style-type: none"> Not being treated with beta blockers 	A (7)
Unexplained Syncope in a Patient With Brugada ECG Pattern		
43.	<ul style="list-style-type: none"> No EPS performed 	A (8)
44.	<ul style="list-style-type: none"> EPS performed No ventricular arrhythmias induced 	A (8)
45.	<ul style="list-style-type: none"> EPS performed Sustained VT/VF induced 	A (9)
Unexplained Syncope in a Patient With Catecholaminergic Polymorphic VT		
46.	<ul style="list-style-type: none"> While on treatment with beta blockers 	A (8)

47.	<ul style="list-style-type: none"> Not being treated with beta blockers 	A (8)
Syncope in Patients With Coronary Artery Disease		
Unexplained Syncope With Prior MI and No Acute MI LVEF 36-49%		
52.	<ul style="list-style-type: none"> Electrophysiology study revealed inducible sustained VT/VF 	A (9)
Unexplained Syncope With Prior MI and No Acute MI LVEF ≤35%		
53.	<ul style="list-style-type: none"> EPS not performed 	A (9)
54.	<ul style="list-style-type: none"> Inducible VT/VF at EPS 	A (9)
55.	<ul style="list-style-type: none"> Not inducible at EPS 	A (8)
Syncope in Patients With Nonischemic Structural Heart Disease		
Unexplained Syncope in a Patient With Left Ventricular Hypertrophy Without Criteria for Hypertrophic Cardiomyopathy		
56.	<ul style="list-style-type: none"> Left ventricular hypertrophy/hypertensive heart disease LVEF ≤35% 	A (8)
Unexplained Syncope in a Patient With Nonischemic Cardiomyopathy		
57.	<ul style="list-style-type: none"> Nonischemic dilated cardiomyopathy LVEF ≤35% 	A (8)
58.	<ul style="list-style-type: none"> Left ventricular non-compaction LVEF 36-49% 	A (7)
58.	<ul style="list-style-type: none"> Left ventricular non-compaction LVEF ≤35% 	A (8)
59.	<ul style="list-style-type: none"> Hypertrophic cardiomyopathy 	A (8)
61.	<ul style="list-style-type: none"> Tetralogy of Fallot with prior corrective surgery 	A (7)
Unexplained Syncope in a Patient With Arrhythmogenic Right Ventricular Cardiomyopathy		
62.	<ul style="list-style-type: none"> No EPS performed 	A (7)
63.	<ul style="list-style-type: none"> No inducible VT/VF at EPS 	A (7)
64.	<ul style="list-style-type: none"> Inducible VT/VF at EPS All inducible VTs successfully ablated 	A (7)
65.	<ul style="list-style-type: none"> Inducible VT/VF at EPS Ablation unsuccessful 	A (8)
Sustained Hemodynamically Stable Monomorphic VT Associated With Structural Heart Disease		
66.	<ul style="list-style-type: none"> CAD and prior MI LVEF ≥50% 	A (7)
66.	<ul style="list-style-type: none"> CAD and prior MI LVEF 36-49% 	A (7)
66.	<ul style="list-style-type: none"> CAD and prior MI LVEF ≤35% 	A (9)

67.	<ul style="list-style-type: none"> CAD and prior MI All inducible VTs successfully ablated LVEF \leq35% 	A (9)
68.	<ul style="list-style-type: none"> CAD and prior MI Troponin elevation thought to be secondary to VT All inducible VTs successfully ablated LVEF 36-49% 	A (7)
68.	<ul style="list-style-type: none"> CAD and prior MI Troponin elevation thought to be secondary to VT All inducible VTs successfully ablated LVEF \leq35% 	A (8)
69.	<ul style="list-style-type: none"> Nonischemic dilated cardiomyopathy LVEF \geq50% 	A (7)
69.	<ul style="list-style-type: none"> Nonischemic dilated cardiomyopathy LVEF 36-49% 	A (7)
69.	<ul style="list-style-type: none"> Nonischemic dilated cardiomyopathy LVEF \leq35% 	A (9)
70.	<ul style="list-style-type: none"> Nonischemic dilated cardiomyopathy All inducible VTs successfully ablated LVEF 36-49% 	A (7)
70.	<ul style="list-style-type: none"> Nonischemic dilated cardiomyopathy All inducible VTs successfully ablated LVEF \leq35% 	A (8)
71.	<ul style="list-style-type: none"> Bundle branch reentry successfully ablated in a patient with nonischemic cardiomyopathy LVEF 36-49% 	A (7)
71.	<ul style="list-style-type: none"> Bundle branch reentry successfully ablated in a patient with nonischemic cardiomyopathy LVEF \leq35% 	A (8)
Section 2: Primary Prevention		
Post Acute Myocardial Infarction (\leq40 Days) LVEF \leq30%		
Revascularized After Acute MI		
75.	<ul style="list-style-type: none"> Asymptomatic NSVT ($>$4 days post MI) EPS with inducible sustained VT (EPS performed after revascularization, within 30 days of MI) 	A (7)
76.	<ul style="list-style-type: none"> Asymptomatic NSVT ($>$4 days post MI) EPS with inducible sustained VT (EPS performed after revascularization, between 30 and 40 days after MI) 	A (8)
Not Revascularized		
Obstructive CAD With Coronary Anatomy Not Amenable to Revascularization		
81.	<ul style="list-style-type: none"> Asymptomatic NSVT ($>$4 days post MI) EPS with inducible sustained VT (EPS performed within 30 days of MI) 	A (7)
82.	<ul style="list-style-type: none"> Asymptomatic NSVT ($>$4 days post MI) EPS with inducible sustained VT (EPS performed between 30 and 40 days after MI) 	A (8)
Post Acute Myocardial Infarction (\leq40 Days) LVEF 31-40%		

Revascularized for Acute MI		
87.	<ul style="list-style-type: none"> Asymptomatic NSVT (>4 days post MI) EPS with inducible sustained VT (EPS performed after revascularization, within 30 days of MI) 	A (7)
88.	<ul style="list-style-type: none"> Asymptomatic NSVT (>4 days post MI) EPS with inducible sustained VT (EPS performed after revascularization, between 30 and 40 days after MI) 	A (7)
Post Acute Myocardial Infarction (≤40 days) and Pre-Existing Chronic Cardiomyopathy (≥3 Months)		
91.	<ul style="list-style-type: none"> LVEF ≤30% due to old infarction NYHA Class I 	A (8)
92.	<ul style="list-style-type: none"> LVEF ≤35% due to old infarction NYHA Class II-III 	A (9)
93.	<ul style="list-style-type: none"> LVEF ≤35% due to nonischemic causes NYHA Class II-III 	A (8)
Post Myocardial Infarction (≤40 days) and Need for Guideline-Directed Pacemaker Therapy Post MI (e.g., SSS, CHB, or Other Indications for Permanent Pacemaker)		
94.	<ul style="list-style-type: none"> LVEF ≤35% 	A (7)
Post Myocardial Infarction (>40 days) With Ischemic Cardiomyopathy		
No Recent PCI or CABG (≤3 Months)		
96.	<ul style="list-style-type: none"> LVEF ≤30% NYHA Class I 	A (8)
96.	<ul style="list-style-type: none"> LVEF ≤30% NYHA Class II 	A (9)
96.	<ul style="list-style-type: none"> LVEF ≤30% NYHA Class III 	A (9)
97.	<ul style="list-style-type: none"> LVEF 31-35% NYHA Class I 	A (7)
97.	<ul style="list-style-type: none"> LVEF 31-35% NYHA Class II 	A (9)
97.	<ul style="list-style-type: none"> LVEF 31-35% NYHA Class III 	A (9)
100.	<ul style="list-style-type: none"> LVEF 36-40% Asymptomatic NSVT EPS with inducible sustained VT/VF 	A (8)
Recent PCI or CABG (≤3 Months)		
102.	<ul style="list-style-type: none"> Pre-existing documented cardiomyopathy LVEF ≤35% on guideline-directed medical therapy >3 months prior to PCI/CABG 	A (8)
103.	<ul style="list-style-type: none"> LVEF ≤35% Need for ppm post-revascularization (e.g., SSS, CHB, or other guideline-directed indications for permanent pacemaker) 	A (8)

Duration of Guideline-Directed Medical Therapy for Ischemic Cardiomyopathy Without Recent MI (Revascularization Not Indicated)		
106.	<ul style="list-style-type: none"> LVEF ≤35% On guideline-directed medical therapy <3 months NSVT EPS with inducible sustained VT 	A (8)
107.	<ul style="list-style-type: none"> LVEF ≤35% On guideline-directed medical therapy ≥3 months 	A (9)
Nonischemic Cardiomyopathy		
At Least 3 Months on Guideline-Directed Medical Therapy		
110.	<ul style="list-style-type: none"> LVEF ≤30% NYHA Class I 	A (7)
110.	<ul style="list-style-type: none"> LVEF ≤30% NYHA Class II-III 	A (9)
111.	<ul style="list-style-type: none"> LVEF 31-35% NYHA Class I 	A (7)
111.	<ul style="list-style-type: none"> LVEF 31-35% NYHA Class II-III 	A (9)
Recent Valve Surgery (i.e., Same Hospitalization or <3 Months) Which Included Incidental Bypass Graft		
113.	<ul style="list-style-type: none"> LVEF ≤35% Need for pacemaker and LV function not felt likely to improve 	A (7)
Specific Etiologies		
114.	<ul style="list-style-type: none"> Sarcoid heart disease LVEF ≤35% 	A (8)
115.	<ul style="list-style-type: none"> Myotonic dystrophy LVEF ≤35% 	A (8)
116.	<ul style="list-style-type: none"> Chagas disease LVEF ≤35% 	A (8)
119.	<ul style="list-style-type: none"> Giant cell myocarditis LVEF ≤35% 	A (8)
119.	<ul style="list-style-type: none"> Giant cell myocarditis LVEFF >35% 	A (7)
120.	<ul style="list-style-type: none"> Peripartum cardiomyopathy Persists >3 months postpartum LVEF ≤35% 	A (8)
Genetic Conditions (Excludes Syncope and Sustained VT, Covered in Section 1)		
121.	<ul style="list-style-type: none"> Hypertrophic cardiomyopathy with 1 or more risk factors 	A (7)
122.	<ul style="list-style-type: none"> Arrhythmogenic right ventricular dysplasia/cardiomyopathy with no symptoms due to arrhythmia 	A (7)
Congenital Long QT Syndrome With 1 or More Risk Factors		

124.	<ul style="list-style-type: none"> Receiving guideline-directed medical therapy 	A (7)
Catecholaminergic Polymorphic VT With Nonsustained VT (Without Syncope)		
125.	<ul style="list-style-type: none"> Not receiving beta blockers, flecainide, or propafenone 	A (7)
126.	<ul style="list-style-type: none"> Receiving beta blockers 	A (7)
127.	<ul style="list-style-type: none"> Not tolerating or breakthrough nonsustained ventricular arrhythmias on beta blockers 	A (8)
Incidentally Discovered Brugada by ECG (Type I ECG Pattern) In the Absence of Symptoms or Family History of Sudden Cardiac Death		
129.	<ul style="list-style-type: none"> Inducible VT or VF at EPS 	A (7)
Familial Dilated/Nonischemic Cardiomyopathy (RV/LV) Associated With Sudden Cardiac Death		
131.	<ul style="list-style-type: none"> Evidence of structural cardiac disease but LVEF >35% 	A (7)
133.	<ul style="list-style-type: none"> LV non-compaction with LVEF >35% 	A (7)
Section 3: Comorbidities		
Special Conditions/Comorbidities in Patients for Primary Prevention (Meeting Indications of ICD Implant Related to HF Diagnosis With LVEF ≤30% on Guideline-Directed Medical Therapy >3 Months)		
Renal Disease		
141.	<ul style="list-style-type: none"> Severe symptomatic peripheral vascular disease (e.g., peripheral interventions or clinical claudication) NYHA Class II 	A (7)
141.	<ul style="list-style-type: none"> Severe symptomatic peripheral vascular disease (e.g., peripheral interventions or clinical claudication) NYHA Class III 	A (7)
Class IV Heart Failure		
147.	<ul style="list-style-type: none"> On waiting list for heart transplant 	A (8)
Section 4: ICD Generator Replacement at ERI		
Primary Prevention ICD at Initial Implant		
No Clinically Relevant Ventricular Arrhythmias on ICD Since Implant		
151.	<ul style="list-style-type: none"> Patient received primary prevention ICD when LVEF was ≤35% LVEF now unchanged 	A (8)
No Clinically Relevant Ventricular Arrhythmias on ICD Since Implant (Now Has Prognosis <1 Year)		
154.	<ul style="list-style-type: none"> Patient received primary prevention ICD Pacemaker dependent Replace with a pacemaker 	A (8)
Clinically Relevant Ventricular Arrhythmias on ICD Since Implant		
156.	<ul style="list-style-type: none"> Patient received primary prevention ICD when LVEF was ≤35% LVEF now unchanged 	A (9)
157.	<ul style="list-style-type: none"> Patient received primary prevention ICD when LVEF was ≤35% LVEF now 36-49% 	A (8)
158.	<ul style="list-style-type: none"> Patient received primary prevention ICD when LVEF was ≤35% LVEF now ≥50% (normalized) 	A (8)

Secondary Prevention ICD at Initial Implant		
160.	<ul style="list-style-type: none"> • Patient received secondary prevention ICD • No ventricular arrhythmia since initial implant 	A (8)
161.	<ul style="list-style-type: none"> • Patient received secondary prevention ICD • Had ventricular tachyarrhythmias in the monitor zone lasting >30 seconds, but no treated ventricular arrhythmias since initial implant 	A (9)
162.	<ul style="list-style-type: none"> • Patient received secondary prevention ICD • Had ventricular arrhythmias receiving ICD therapy since implant 	A (9)
Primary Prevention at Initial Implant: Replacement of CRT-ICD for ERI		
163.	<ul style="list-style-type: none"> • Patient received a CRT-ICD when LVEF was $\leq 35\%$ • LVEF now unchanged (despite clinical improvement) • Replace With CRT-ICD 	A (9)
164.	<ul style="list-style-type: none"> • Patient received a CRT-ICD when LVEF was $\leq 35\%$ • LVEF now 36-49% • Replace With CRT-ICD 	A (8)
165.	<ul style="list-style-type: none"> • Patient received a CRT-ICD when LVEF was $\leq 35\%$ • LVEF now $\geq 50\%$ (normalized) • Replace With CRT-ICD 	A (7)
Secondary Prevention at Initial Implant: Replacement of CRT-ICD for ERI		
166.	<ul style="list-style-type: none"> • Patient received a CRT-ICD when LVEF was $\leq 35\%$ • LVEF now unchanged (despite clinical improvement) • Replace With CRT-ICD 	A (9)
167.	<ul style="list-style-type: none"> • Patient received a CRT-ICD when LVEF was $\leq 35\%$ • LVEF now 36-49% • Replace With CRT-ICD 	A (9)
168.	<ul style="list-style-type: none"> • Patient received a CRT-ICD when LVEF was $\leq 35\%$ • LVEF now $\geq 50\%$ (normalized) • Replace With CRT-ICD 	A (8)
Section 5: Dual Chamber ICD (As Opposed to Single Chamber ICD for Patients Who Meet Criteria for ICD Implantation)		
Conduction System Abnormalities Sinus Node Dysfunction Who Meets Criteria for ICD		
169.	<ul style="list-style-type: none"> • Sinus node dysfunction (includes sinus pauses, chronotropic incompetence, or marked sinus bradycardia that results from drug therapy required to treat other conditions) • Symptomatic 	A (9)
170.	<ul style="list-style-type: none"> • Resting sinus bradycardia (resting heart rate <50 bpm) • Asymptomatic 	A (7)
Conduction System Abnormalities AV Conduction Disease Who Meets Criteria for ICD (Narrow QRS <120 msec)		
171.	<ul style="list-style-type: none"> • Third degree AV block or advanced second degree AV block (Mobitz II AV block or high degree AV block) • Symptomatic • CRT not indicated 	A (9)

172.	<ul style="list-style-type: none"> • Third degree AV block or advanced second degree AV block (Mobitz II AV block or high degree AV block) • Asymptomatic • CRT not indicated 	A (8)
Conduction System Abnormalities Bundle Branch Block		
180.	<ul style="list-style-type: none"> • Alternating RBBB and LBBB • CRT not indicated 	A (8)
Conduction System Abnormalities Acute MI or Ischemic Event		
181.	<ul style="list-style-type: none"> • Transient AV block thought to be secondary to ischemia • Status post successful revascularization • Chronic Wide QRS (≥ 120 msec) 	A (7)
182.	<ul style="list-style-type: none"> • Transient AV block thought to be secondary to ischemia • Not amenable to revascularization • Chronic Wide QRS (≥ 120 msec) 	A (7)
Conduction System Abnormalities Cardiac Valve Surgery		
184.	<ul style="list-style-type: none"> • New LBBB and first degree AV block 	A (7)
Tachyarrhythmias		
Atrial Arrhythmias or “Supraventricular Tachycardia (SVT)” and “No Standard Pacing Indications”		
186.	<ul style="list-style-type: none"> • Paroxysmal atrial arrhythmias 	A (7)
Slow Ventricular Arrhythmias Known		
190.	<ul style="list-style-type: none"> • Active patient • Known “slow VT” that overlaps with sinus tachycardia rate 	A (8)
Genetic Disorders		
191.	<ul style="list-style-type: none"> • Congenital Long QT Syndrome • ICD for secondary prevention 	A (7)
192.	<ul style="list-style-type: none"> • Congenital Long QT Syndrome • ICD for primary prevention 	A (7)
Section 6: CRT – No Prior Implant		
Ischemic Cardiomyopathy LVEF $\leq 30\%$		
196.	<ul style="list-style-type: none"> • QRS 120-149 msec • LBBB • Sinus rhythm • NYHA Class II 	A (7)
196.	<ul style="list-style-type: none"> • QRS 120-149 msec • LBBB • Sinus rhythm • NYHA Class III-amb IV 	A (8)

197.	<ul style="list-style-type: none"> • QRS \geq150 msec • LBBB • Sinus rhythm • NYHA Class I 	A (7)
197.	<ul style="list-style-type: none"> • QRS \geq150 msec • LBBB • Sinus rhythm • NYHA Class II 	A (8)
197.	<ul style="list-style-type: none"> • QRS \geq150 msec • LBBB • Sinus rhythm • NYHA Class III-amb IV 	A (9)
199.	<ul style="list-style-type: none"> • QRS \geq150 msec • Non-LBBB • Sinus rhythm • NYHA Class III-amb IV 	A (7)
Ischemic Cardiomyopathy LVEF 31-35%		
201.	<ul style="list-style-type: none"> • QRS 120-149 msec • LBBB • Sinus rhythm • NYHA Class II 	A (7)
201.	<ul style="list-style-type: none"> • QRS 120-149 msec • LBBB • Sinus rhythm • NYHA Class III-amb IV 	A (8)
202.	<ul style="list-style-type: none"> • QRS \geq150 msec • LBBB • Sinus rhythm • NYHA Class II 	A (8)
202.	<ul style="list-style-type: none"> • QRS \geq150 msec • LBBB • Sinus rhythm • NYHA Class III-amb IV 	A (9)
204.	<ul style="list-style-type: none"> • QRS \geq150 msec • Non-LBBB • Sinus rhythm • NYHA Class III-amb IV 	A (7)
Nonischemic Cardiomyopathy LVEF \leq30%		
206.	<ul style="list-style-type: none"> • QRS 120-149 msec • LBBB • Sinus rhythm • NYHA Class II 	A (7)

206.	<ul style="list-style-type: none"> • QRS 120-149 msec • LBBB • Sinus rhythm • NYHA Class III-amb IV 	A (8)
207.	<ul style="list-style-type: none"> • QRS \geq150 msec • LBBB • Sinus rhythm • NYHA Class II 	A (9)
207.	<ul style="list-style-type: none"> • QRS \geq150 msec • LBBB • Sinus rhythm • NYHA Class III-amb IV 	A (9)
209.	<ul style="list-style-type: none"> • QRS \geq150 msec • Non-LBBB • Sinus rhythm • NYHA Class III-amb IV 	A (8)
Nonischemic Cardiomyopathy LVEF 31-35%		
211.	<ul style="list-style-type: none"> • QRS 120-149 msec • LBBB • Sinus rhythm • NYHA Class II 	A (7)
211.	<ul style="list-style-type: none"> • QRS 120-149 msec • LBBB • Sinus rhythm • NYHA Class III-amb IV 	A (8)
212.	<ul style="list-style-type: none"> • QRS \geq150 msec • LBBB • Sinus rhythm • NYHA Class II 	A (8)
212.	<ul style="list-style-type: none"> • QRS \geq150 msec • LBBB • Sinus rhythm • NYHA Class III-amb IV 	A (9)
214.	<ul style="list-style-type: none"> • QRS \geq150 msec • Non-LBBB • Sinus rhythm • NYHA Class III-amb IV 	A (7)
Pre-existing or Anticipated RV Pacing With a Clinical Indication for ICD or Pacemaker Implantation		
Intrinsic Narrow QRS, LVEF \leq35%		
225.	<ul style="list-style-type: none"> • RV pacing anticipated $>$40% • NYHA Class I-II 	A (7)
225.	<ul style="list-style-type: none"> • RV pacing anticipated $>$40% • NYHA Class III-amb IV 	A (8)
Refractory Class III/IV CHF $<$3 Months Post Revascularization and/or \leq40 Days Post MI		

No Other Indication for Ventricular Pacing LVEF ≤35%		
228.	<ul style="list-style-type: none"> • QRS 120-149 msec • LBBB 	A (7)
229.	<ul style="list-style-type: none"> • QRS ≥150 msec • LBBB 	A (8)
231.	<ul style="list-style-type: none"> • QRS ≥150 msec • Non-LBBB 	A (7)

Table 2. May Be Appropriate Indications (Median Score 4-6)

Indication		Appropriate Use Score (1-9)
Section 1: Secondary Prevention		
CAD: VF or Hemodynamically Unstable VT Associated With Acute (<48 hours) MI (Newly Diagnosed, No Prior Assessment of LVEF)		
Total Revascularization Completed After Cardiac Arrest		
1.	<ul style="list-style-type: none"> • Single episode VF or polymorphic VT during acute (<48 hours) MI • LVEF ≤35% 	M (4)
2.	<ul style="list-style-type: none"> • Recurrent VF or polymorphic VT during acute (<48 hours) MI • LVEF ≤35% 	M (5)
3.	<ul style="list-style-type: none"> • VF or polymorphic VT during acute (<48 hours) MI • NSVT 4 days post MI • Inducible VT/VF at EPS ≥4 days after revascularization • LVEF ≥50% 	M (5)
No Revascularization Indicated (i.e., No Significant CAD)		
4.	<ul style="list-style-type: none"> • Single episode VF or polymorphic VT during acute (<48 hours) MI • LVEF ≤35% 	M (4)
5.	<ul style="list-style-type: none"> • Recurrent VF or polymorphic VT during acute (<48 hours) MI • LVEF ≤35% 	M (5)
Obstructive CAD With Coronary Anatomy Not Amenable to Revascularization		
6.	<ul style="list-style-type: none"> • VF or polymorphic VT during acute (<48 hours) MI • No EPS done • LVEF ≥50% 	M (5)
6.	<ul style="list-style-type: none"> • VF or polymorphic VT during acute (<48 hours) MI • No EPS done • LVEF 36-49% 	M (5)
CAD: VF or Hemodynamically Unstable VT <48 Hours (Acute) Post-Elective Revascularization		
7.	<ul style="list-style-type: none"> • No evidence for acute coronary occlusion, restenosis, preceding infarct, or other clearly reversible cause • LVEF ≥50% 	M (6)

7.	<ul style="list-style-type: none"> No evidence for acute coronary occlusion, restenosis, preceding infarct, or other clearly reversible cause LVEF 36-49% 	M (6)
CAD: VF or Hemodynamically Unstable VT [No Recent MI (≤40 days) Prior to VF/VT and/or No Recent Revascularization (≤3 Months) Prior to VF/VT]		
10.	<ul style="list-style-type: none"> Significant CAD identified at cath performed following VF/VT Complete revascularization performed after cardiac arrest LVEF ≥50% 	M (5)
CAD: VF or Hemodynamically Unstable VT During Exercise Testing Associated With Significant CAD		
13.	<ul style="list-style-type: none"> Significant CAD identified at cath performed following VF/VT Complete revascularization performed after cardiac arrest LVEF ≥50% 	M (5)
13.	<ul style="list-style-type: none"> Significant CAD identified at cath performed following VF/VT Complete revascularization performed after cardiac arrest LVEF 36-49% 	M (6)
No CAD: VF or Hemodynamically Unstable VT		
16.	<ul style="list-style-type: none"> VT/VF associated with cocaine abuse LVEF 36-49% 	M (4)
16.	<ul style="list-style-type: none"> VT/VF associated with cocaine abuse LVEF ≤35% 	M (5)
Severe Valvular Disease VT/VF <48 Hours After Surgical Repair or Replacement of Aortic or Mitral Valve		
17.	<ul style="list-style-type: none"> No evidence of post-operative valvular dysfunction LVEF ≥50% 	M (5)
17.	<ul style="list-style-type: none"> No evidence of post-operative valvular dysfunction LVEF 36-49% 	M (6)
17.	<ul style="list-style-type: none"> No evidence of post-operative valvular dysfunction LVEF ≤35% 	M (6)
VF/Hemodynamically Unstable VT Associated With Other Structural Heart Disease		
19.	<ul style="list-style-type: none"> Myocarditis; not giant cell myocarditis 	M (5)
21.	<ul style="list-style-type: none"> Takatsubo cardiomyopathy (stress induced cardiomyopathy, apical ballooning syndrome) ≥48 hours of onset of symptoms 	M (5)
No Structural Heart Disease (LVEF ≥50%) or Known Genetic Causes of Sustained VT/VF		
Other Causes		
34.	<ul style="list-style-type: none"> Bradycardia dependent VT/VF 	M (5)
Syncope in Patients With Coronary Artery Disease		
Unexplained Syncope With Prior MI and No Acute MI LVEF 36-49%		
50.	<ul style="list-style-type: none"> Electrophysiology study failed to define a cause of syncope Nonobstructive CAD; revascularization not indicated 	M (5)

51.	<ul style="list-style-type: none"> Electrophysiology study failed to define a cause of syncope Obstructive CAD; not amenable to revascularization 	M (6)
Syncope in Patients With Nonischemic Structural Heart Disease		
Unexplained Syncope in a Patient With Left Ventricular Hypertrophy Without Criteria for Hypertrophic Cardiomyopathy		
56.	<ul style="list-style-type: none"> Left ventricular hypertrophy/hypertensive heart disease LVEF 36-49% 	M (5)
Unexplained Syncope in a Patient With Nonischemic Cardiomyopathy		
57.	<ul style="list-style-type: none"> Nonischemic dilated cardiomyopathy LVEF \geq50% 	M (4)
57.	<ul style="list-style-type: none"> Nonischemic dilated cardiomyopathy LVEF 36-49% 	M (6)
58.	<ul style="list-style-type: none"> Left ventricular non-compaction LVEF \geq50% 	M (6)
60.	<ul style="list-style-type: none"> Cardiac amyloidosis 	M (6)
Sustained Hemodynamically Stable Monomorphic VT Associated With Structural Heart Disease		
67.	<ul style="list-style-type: none"> CAD and prior MI All inducible VTs successfully ablated LVEF \geq50% 	M (6)
67.	<ul style="list-style-type: none"> CAD and prior MI All inducible VTs successfully ablated LVEF 36-49% 	M (6)
68.	<ul style="list-style-type: none"> CAD and prior MI Troponin elevation thought to be secondary to VT All inducible VTs successfully ablated LVEF \geq50% 	M (5)
70.	<ul style="list-style-type: none"> Nonischemic dilated cardiomyopathy All inducible VTs successfully ablated LVEF \geq50% 	M (5)
71.	<ul style="list-style-type: none"> Bundle branch reentry successfully ablated in a patient with nonischemic cardiomyopathy LVEF \geq50% 	M (4)
Section 2: Primary Prevention		
Post Acute Myocardial Infarction (\leq40 Days) LVEF \leq30%		
Revascularized After Acute MI		
78.	<ul style="list-style-type: none"> Asymptomatic NSVT ($>$4 days post MI) EPS without inducible VT (EPS performed after revascularization, between 30 and 40 days after MI) 	M (4)
Not Revascularized		
Obstructive CAD With Coronary Anatomy Not Amenable to Revascularization		
80.	<ul style="list-style-type: none"> Asymptomatic NSVT ($>$4 days post MI) No EPS performed 	M (4)
83.	<ul style="list-style-type: none"> Asymptomatic NSVT ($>$4 days post MI) EPS without inducible VT (EPS performed within 30 days of MI) 	M (4)

84.	<ul style="list-style-type: none"> Asymptomatic NSVT (>4 days post MI) EPS without inducible VT(EPS performed between 30 and 40 days after MI) 	M (4)
Post Myocardial Infarction (≤40 days) and Need for Guideline-Directed Pacemaker Therapy Post MI (e.g., SSS, CHB, or Other Indications for Permanent Pacemaker)		
95.	<ul style="list-style-type: none"> LVEF 36-40% 	M (6)
Post Myocardial Infarction (>40 days) With Ischemic Cardiomyopathy		
No Recent PCI or CABG (≤3 Months)		
98.	<ul style="list-style-type: none"> LVEF 36-40% Asymptomatic NSVT No EPS 	M (5)
99.	<ul style="list-style-type: none"> LVEF 36-40% Asymptomatic NSVT EPS without inducible VT/VF 	M (5)
Recent PCI or CABG (≤3 Months)		
101.	<ul style="list-style-type: none"> No known pre-existing cardiomyopathy LVEF ≤35% 	M (6)
104.	<ul style="list-style-type: none"> LVEF 36-40% Need for ppm post-revascularization (e.g., SSS, CHB, or other guideline-directed indications for permanent pacemaker) 	M (6)
Duration of Guideline-Directed Medical Therapy for Ischemic Cardiomyopathy Without Recent MI (Revascularization Not Indicated)		
105.	<ul style="list-style-type: none"> LVEF ≤35% On guideline-directed medical therapy for <3 months 	M (5)
Nonischemic Cardiomyopathy		
Treatment Since Diagnosis <3 Months Newly Diagnosed Cardiomyopathy With Narrow QRS		
108.	<ul style="list-style-type: none"> LVEF ≤30% NYHA Class II-III 	M (4)
At Least 3 Months on Guideline-Directed Medical Therapy		
112.	<ul style="list-style-type: none"> LVEF 36-40% 	M (4)
Specific Etiologies		
114.	<ul style="list-style-type: none"> Sarcoid heart disease LVEF >35% 	M (6)
115.	<ul style="list-style-type: none"> Myotonic dystrophy LVEF >35% 	M (5)
116.	<ul style="list-style-type: none"> Chagas disease LVEF >35% 	M (6)
117.	<ul style="list-style-type: none"> Amyloidosis with heart failure LVEF ≤35% 	M (6)
117.	<ul style="list-style-type: none"> Amyloidosis with heart failure LVEF >35% 	M (5)

120.	<ul style="list-style-type: none"> Peripartum cardiomyopathy Persists >3 months postpartum LVEF >35% 	M (4)
Genetic Conditions (Excludes Syncope and Sustained VT, Covered in Section 1)		
Congenital Long QT Syndrome With 1 or More Risk Factors		
123.	<ul style="list-style-type: none"> Not receiving guideline-directed medical therapy 	M (6)
Familial Dilated/Nonischemic Cardiomyopathy (RV/LV) Associated With Sudden Cardiac Death		
132.	<ul style="list-style-type: none"> Normal ECG and echo but carrying the implicated gene 	M (6)
Section 3: Comorbidities		
Special Conditions/Comorbidities in Patients for Primary Prevention (Meeting Indications of ICD Implant Related to HF Diagnosis With LVEF ≤30% on Guideline-Directed Medical Therapy >3 Months)		
Life Expectancy		
135.	<ul style="list-style-type: none"> Noncardiac disease with life expectancy 1-2 years 	M (4)
Elderly		
136.	<ul style="list-style-type: none"> 80-89 years old NYHA Class I 	M (4)
136.	<ul style="list-style-type: none"> 80-89 years old NYHA Class II 	M (5)
136.	<ul style="list-style-type: none"> 80-89 years old NYHA Class III 	M (5)
137.	<ul style="list-style-type: none"> ≥90 years old NYHA Class II 	M (4)
137.	<ul style="list-style-type: none"> ≥90 years old NYHA Class III 	M (4)
Cognitive Impairment		
138.	<ul style="list-style-type: none"> Not able to understand or provide informed consent Health care proxy consents to ICD 	M (4)
Renal Disease		
141.	<ul style="list-style-type: none"> Severe symptomatic peripheral vascular disease (e.g., peripheral interventions or clinical claudication) NYHA Class I 	M (6)
142.	<ul style="list-style-type: none"> Chronic kidney disease on dialysis Not a candidate for renal transplant NYHA Class I 	M (5)
142.	<ul style="list-style-type: none"> Chronic kidney disease on dialysis Not a candidate for renal transplant NYHA Class II 	M (6)
142.	<ul style="list-style-type: none"> Chronic kidney disease on dialysis Not a candidate for renal transplant NYHA Class III 	M (6)

143.	<ul style="list-style-type: none"> Chronic kidney disease with CrCl <30 cc, not yet on dialysis but candidate for dialysis NYHA Class I 	M (6)
143.	<ul style="list-style-type: none"> Chronic kidney disease with CrCl <30 cc, not yet on dialysis but candidate for dialysis NYHA Class II 	M (6)
143.	<ul style="list-style-type: none"> Chronic kidney disease with CrCl <30 cc, not yet on dialysis but candidate for dialysis NYHA Class III 	M (6)
Class IV Heart Failure		
149.	<ul style="list-style-type: none"> Patient with a VAD 	M (6)
Section 4: ICD Generator Replacement at ERI		
No Clinically Relevant Ventricular Arrhythmias on ICD Since Implant		
152.	<ul style="list-style-type: none"> Patient received primary prevention ICD when LVEF was $\leq 35\%$ LVEF now 36-49% 	M (6)
153.	<ul style="list-style-type: none"> Patient received primary prevention ICD when LVEF was $\leq 35\%$ LVEF now $\geq 50\%$ (normalized) 	M (5)
No Clinically Relevant Ventricular Arrhythmias on ICD Since Implant (Now Has Prognosis <1 Year)		
154.	<ul style="list-style-type: none"> Patient received primary prevention ICD Pacemaker dependent Replace with ICD 	M (4)
Clinically Relevant Ventricular Arrhythmias on ICD Since Implant		
159.	<ul style="list-style-type: none"> Patient received primary prevention ICD Now has prognosis <1 year 	M (5)
Primary Prevention at Initial Implant: Replacement of CRT-ICD for ERI		
164.	<ul style="list-style-type: none"> Patient received a CRT-ICD when LVEF was $\leq 35\%$ LVEF now 36-49% Replace with CRT-Pacemaker 	M (5)
165.	<ul style="list-style-type: none"> Patient received a CRT-ICD when LVEF was $\leq 35\%$ LVEF now $\geq 50\%$ (normalized) Replace with CRT-Pacemaker 	M (6)
Section 5: Dual Chamber ICD (As Opposed to Single Chamber ICD for Patients Who Meet Criteria for ICD Implantation)		
Conduction System Abnormalities		
AV Conduction Disease Who Meets Criteria for ICD (Narrow QRS <120 msec)		
173.	<ul style="list-style-type: none"> Mobitz Type I AV block Asymptomatic CRT not indicated 	M (6)
174.	<ul style="list-style-type: none"> First degree AV block (PR <300 msec) Asymptomatic 	M (5)
175.	<ul style="list-style-type: none"> First degree AV block (PR ≥ 300 msec) Asymptomatic 	M (6)
Conduction System Abnormalities		
Bundle Branch Block		

176.	<ul style="list-style-type: none"> • Sinus rhythm with normal PR interval • LBBB • CRT not indicated 	M (5)
177.	<ul style="list-style-type: none"> • Sinus rhythm with first degree AV block • LBBB • CRT not indicated 	M (6)
178.	<ul style="list-style-type: none"> • Sinus rhythm with normal PR interval • Bifascicular block (RBBB/LAFB or RBBB/LPFB) • CRT not indicated 	M (5)
179.	<ul style="list-style-type: none"> • Sinus rhythm with first degree AV block • Bifascicular block (RBBB/LAFB or RBBB /LPFB) • CRT not indicated 	M (6)
Conduction System Abnormalities Acute MI or Ischemic Event		
181.	<ul style="list-style-type: none"> • Transient AV block thought to be secondary to ischemia • Status post successful revascularization • Narrow QRS (<120 msec) 	M (5)
182.	<ul style="list-style-type: none"> • Transient AV block thought to be secondary to ischemia • Not amenable to revascularization • Narrow QRS (<120 msec) 	M (6)
Conduction System Abnormalities Cardiac Valve Surgery		
183.	<ul style="list-style-type: none"> • Transient AV block • Narrow QRS (<120 msec) 	M (5)
No Conduction Abnormalities Meets Criteria for ICD (Narrow QRS <120 msec)		
185.	<ul style="list-style-type: none"> • Sinus rhythm with normal PR interval • Asymptomatic 	M (4)
Tachyarrhythmias		
Atrial Arrhythmias or “Supraventricular Tachycardia (SVT)” and “No Standard Pacing Indications”		
187.	<ul style="list-style-type: none"> • Underlying structural heart disease (e.g., ischemic or nonischemic CM) • No known paroxysmal atrial arrhythmias or SVT 	M (5)
188.	<ul style="list-style-type: none"> • Structurally normal heart • No known paroxysmal atrial arrhythmias or SVT 	M (4)
Genetic Disorders		
193.	<ul style="list-style-type: none"> • Hypertrophic cardiomyopathy • Narrow QRS (<120 msec) • No standard bradycardia pacing indications 	M (6)
194.	<ul style="list-style-type: none"> • Hypertrophic cardiomyopathy • Wide QRS (\geq120 msec) • No standard bradycardia pacing indications 	M (6)

Section 6: CRT – No Prior Implant		
Ischemic Cardiomyopathy LVEF ≤30%		
196.	<ul style="list-style-type: none"> • QRS 120-149 msec • LBBB • Sinus rhythm • NYHA Class I 	M (5)
198.	<ul style="list-style-type: none"> • QRS 120-149 msec • Non-LBBB • Sinus rhythm • NYHA Class III-amb IV 	M (6)
199.	<ul style="list-style-type: none"> • QRS ≥150 msec • Non-LBBB • Sinus rhythm • NYHA Class I 	M (4)
199.	<ul style="list-style-type: none"> • QRS ≥150 msec • Non-LBBB • Sinus rhythm • NYHA Class II 	M (6)
Ischemic Cardiomyopathy LVEF 31-35%		
201.	<ul style="list-style-type: none"> • QRS 120-149 msec • LBBB • Sinus rhythm • NYHA Class I 	M (5)
202.	<ul style="list-style-type: none"> • QRS ≥150 msec • LBBB • Sinus rhythm • NYHA Class I 	M (6)
203.	<ul style="list-style-type: none"> • QRS 120-149 msec • Non-LBBB • Sinus rhythm • NYHA Class III-amb IV 	M (6)
204.	<ul style="list-style-type: none"> • QRS ≥150 msec • Non-LBBB • Sinus rhythm • NYHA Class I 	M (4)
204.	<ul style="list-style-type: none"> • QRS ≥150 msec • Non-LBBB • Sinus rhythm • NYHA Class II 	M (6)
Nonischemic Cardiomyopathy LVEF ≤30%		
206.	<ul style="list-style-type: none"> • QRS 120-149 msec • LBBB • Sinus rhythm • NYHA Class I 	M (4)

207.	<ul style="list-style-type: none"> • QRS \geq150 msec • LBBB • Sinus rhythm • NYHA Class I 	M (6)
208.	<ul style="list-style-type: none"> • QRS 120-149 msec • Non-LBBB • Sinus rhythm • NYHA Class III-amb IV 	M (6)
209.	<ul style="list-style-type: none"> • QRS \geq150 msec • Non-LBBB • Sinus rhythm • NYHA Class I 	M (5)
209.	<ul style="list-style-type: none"> • QRS \geq150 msec • Non-LBBB • Sinus rhythm • NYHA Class II 	M (6)
Nonischemic Cardiomyopathy LVEF 31-35%		
211.	<ul style="list-style-type: none"> • QRS 120-149 msec • LBBB • Sinus rhythm • NYHA Class I 	M (5)
212.	<ul style="list-style-type: none"> • QRS \geq150 msec • LBBB • Sinus rhythm • NYHA Class I 	M (6)
213.	<ul style="list-style-type: none"> • QRS 120-149 msec • Non-LBBB • Sinus rhythm • NYHA Class III-amb IV 	M (6)
214.	<ul style="list-style-type: none"> • QRS \geq150 msec • Non-LBBB • Sinus rhythm • NYHA Class I 	M (5)
214.	<ul style="list-style-type: none"> • QRS \geq150 msec • Non-LBBB • Sinus rhythm • NYHA Class II 	M (6)
LVEF >35% of Any Etiology (ICD Indicated)		
216.	<ul style="list-style-type: none"> • QRS 120-149 msec • LBBB • Sinus rhythm • NYHA Class III-amb IV 	M (4)
217.	<ul style="list-style-type: none"> • QRS \geq150 msec • LBBB • Sinus rhythm • NYHA Class I-II 	M (4)

217.	<ul style="list-style-type: none"> • QRS \geq150 msec • LBBB • Sinus rhythm • NYHA Class III-amb IV 	M (5)
219.	<ul style="list-style-type: none"> • QRS \geq150 msec • Non-LBBB • Sinus rhythm • NYHA Class III-amb IV 	M (4)
LVEF \leq35% of Any Etiology		
NYHA Class IV On Intravenous Inotropic Support		
220.	<ul style="list-style-type: none"> • QRS 120-149 msec • LBBB 	M (6)
221.	<ul style="list-style-type: none"> • QRS \geq150 msec • LBBB 	M (6)
222.	<ul style="list-style-type: none"> • QRS 120-149 msec • Non-LBBB 	M (4)
223.	<ul style="list-style-type: none"> • QRS \geq150 msec • Non-LBBB 	M (5)
Pre-existing or Anticipated RV Pacing With a Clinical Indication for ICD or Pacemaker Implantation		
Intrinsic Narrow QRS, LVEF \leq35%		
224.	<ul style="list-style-type: none"> • RV pacing anticipated \leq40% • NYHA Class I-II 	M (4)
224.	<ul style="list-style-type: none"> • RV pacing anticipated \leq40% • NYHA Class III-amb IV 	M (5)
Intrinsic Narrow QRS, LVEF $>$35%		
226.	<ul style="list-style-type: none"> • RV pacing anticipated \leq40% • NYHA Class III-amb IV 	M (4)
227.	<ul style="list-style-type: none"> • RV pacing anticipated $>$40% • NYHA Class I-II 	M (5)
227.	<ul style="list-style-type: none"> • RV pacing anticipated $>$40% • NYHA Class III-amb IV 	M (6)
Refractory Class III/IV CHF $<$3 Months Post Revascularization and/or \leq40 Days Post		
No Other Indication for Ventricular Pacing LVEF \leq35%		
230.	<ul style="list-style-type: none"> • QRS 120-149 msec • Non-LBBB 	M (5)
No Other Indication for Ventricular Pacing LVEF 36-50%		
233.	<ul style="list-style-type: none"> • QRS \geq150 msec • LBBB 	M (4)

Table 3. Rarely Appropriate Indications (Median Score 1-3)

Indication		Appropriate Use Score (1-9)
Section 1: Secondary Prevention		
CAD: VF or Hemodynamically Unstable VT Associated With Acute (<48 hours) MI (Newly Diagnosed, No Prior Assessment of LVEF)		
Total Revascularization Completed After Cardiac Arrest		
1.	<ul style="list-style-type: none"> Single episode VF or polymorphic VT during acute (<48 hours) MI LVEF ≥50% 	R (2)
1.	<ul style="list-style-type: none"> Single episode VF or polymorphic VT during acute (<48 hours) MI LVEF 36-49% 	R (3)
2.	<ul style="list-style-type: none"> Recurrent VF or polymorphic VT during acute (<48 hours) MI LVEF ≥50% 	R (3)
2.	<ul style="list-style-type: none"> Recurrent VF or polymorphic VT during acute (<48 hours) MI LVEF 36-49% 	R (3)
No Revascularization Indicated (i.e., No Significant CAD)		
4.	<ul style="list-style-type: none"> Single episode VF or polymorphic VT during acute (<48 hours) MI LVEF ≥50% 	R (2)
4.	<ul style="list-style-type: none"> Single episode VF or polymorphic VT during acute (<48 hours) MI LVEF 36-49% 	R (3)
5.	<ul style="list-style-type: none"> Recurrent VF or polymorphic VT during acute (<48 hours) MI LVEF ≥50% 	R (2)
5.	<ul style="list-style-type: none"> Recurrent VF or polymorphic VT during acute (<48 hours) MI LVEF 36-49% 	R (3)
No CAD: VF or Hemodynamically Unstable VT		
16.	<ul style="list-style-type: none"> VT/VF associated with cocaine abuse LVEF ≥50% 	R (3)
No Structural Heart Disease (LVEF ≥50%) or Known Genetic Causes of Sustained VT/VF		
Pharmacologically Induced Sustained VT/VF		
30.	<ul style="list-style-type: none"> Non-torsades de pointes VT/VF in the setting of antiarrhythmic drug use 	R (3)
31.	<ul style="list-style-type: none"> Drug induced torsades de pointes 	R (2)
Other Causes		
35.	<ul style="list-style-type: none"> WPW syndrome with VT/VF Pathway successfully ablated Structurally normal heart 	R (2)
Syncope in Patients Without Structural Heart Disease		
Unexplained Syncope With No Structural Heart Disease or Genetically Transmitted Ventricular Arrhythmias		
36.	<ul style="list-style-type: none"> Normal ECG and structurally normal heart Family history of sudden death 	R (3)

37.	<ul style="list-style-type: none"> • Normal ECG and structurally normal heart • No known family history of sudden death 	R (1)
Unexplained Syncope in a Patient With RV or LV Outflow Tract Tachycardia (Idiopathic VT) With Normal LV and RV Function and Anatomy		
38.	<ul style="list-style-type: none"> • Documented sustained monomorphic VT (LBBB/inferior axis) at the time of syncope • Ablation not yet attempted 	R (2)
39.	<ul style="list-style-type: none"> • Documented history of sustained monomorphic VT (LBBB/inferior axis) but not recorded at the time of syncope • Ablation not yet attempted 	R (2)
40.	<ul style="list-style-type: none"> • Documented sustained monomorphic VT (LBBB/inferior axis) at the time of syncope • Ablation successful 	R (2)
Syncope in Patients With Coronary Artery Disease		
Unexplained Syncope With Coronary Heart Disease and No Acute MI LVEF ≥50%		
48.	<ul style="list-style-type: none"> • Electrophysiology study and noninvasive investigations failed to define a cause of syncope • No prior MI • Nonobstructive CAD; revascularization not indicated 	R (2)
49.	<ul style="list-style-type: none"> • Electrophysiology study and noninvasive investigations failed to define a cause of syncope • No prior MI • Obstructive CAD; not amenable to revascularization 	R (3)
Syncope in Patients With Nonischemic Structural Heart Disease		
Unexplained Syncope in a Patient With Left Ventricular Hypertrophy Without Criteria for Hypertrophic Cardiomyopathy		
56.	<ul style="list-style-type: none"> • Left ventricular hypertrophy/hypertensive heart disease • LVEF ≥50% 	R (3)
Section 2: Primary Prevention		
Post Acute Myocardial Infarction (≤40 Days) LVEF ≤30%		
Plan for Revascularization (Not Yet Performed)		
72.	<ul style="list-style-type: none"> • No NSVT 	R (2)
Revascularized After Acute MI		
73.	<ul style="list-style-type: none"> • No NSVT 	R (2)
74.	<ul style="list-style-type: none"> • Asymptomatic NSVT (>4 days post MI) • No EPS performed 	R (3)
77.	<ul style="list-style-type: none"> • Asymptomatic NSVT (>4 days post MI) • EPS without inducible VT (EPS performed after revascularization, within 30 days after MI) 	R (3)
Not Revascularized		
Obstructive CAD With Coronary Anatomy Not Amenable to Revascularization		
79.	<ul style="list-style-type: none"> • No NSVT 	R (2)
Post Acute Myocardial Infarction (≤40 Days) LVEF 31-40%		
Revascularized for Acute MI		
85.	<ul style="list-style-type: none"> • No NSVT 	R (2)

86.	<ul style="list-style-type: none"> Asymptomatic NSVT (>4 days post MI) No EPS performed 	R (3)
89.	<ul style="list-style-type: none"> Asymptomatic NSVT (>4 days post MI) EPS without inducible VT (EPS performed after revascularization, within 30 days of MI) 	R (3)
90.	<ul style="list-style-type: none"> Asymptomatic NSVT (>4 days post MI) EPS without inducible VT (EPS performed after revascularization, between 30 and 40 days after MI) 	R (3)
Nonischemic Cardiomyopathy		
Treatment Since Diagnosis <3 Months Newly Diagnosed Cardiomyopathy With Narrow QRS		
108.	<ul style="list-style-type: none"> LVEF ≤30% NYHA Class I 	R (3)
109.	<ul style="list-style-type: none"> LVEF 31-35% NYHA Class I 	R (3)
109.	<ul style="list-style-type: none"> LVEF 31-35% NYHA Class II-III 	R (3)
Specific Etiologies		
118.	<ul style="list-style-type: none"> Acute lymphocytic myocarditis Newly diagnosed (<3 months ago) LVEF ≤35% 	R (3)
118.	<ul style="list-style-type: none"> Acute lymphocytic myocarditis Newly diagnosed (<3 months ago) LVEF >35% 	R (3)
Genetic Conditions (Excludes Syncope and Sustained VT, Covered in Section 1)		
Incidentally Discovered Brugada by ECG (Type I ECG Pattern) In the Absence of Symptoms or Family History of Sudden Cardiac Death		
128.	<ul style="list-style-type: none"> No EPS 	R (3)
130.	<ul style="list-style-type: none"> No inducible VT or VF at EPS 	R (3)
Section 3: Comorbidities		
Special Conditions/Comorbidities in Patients for Primary Prevention (Meeting Indications of ICD Implant Related to HF Diagnosis With LVEF ≤30% on Guideline-Directed Medical Therapy >3 Months)		
Life Expectancy		
134.	<ul style="list-style-type: none"> Life expectancy <1 year from cardiac or noncardiac conditions 	R (1)
Elderly		
137.	<ul style="list-style-type: none"> ≥90 years old NHYA Class I 	R (3)
Cognitive Impairment		
139.	<ul style="list-style-type: none"> Not able to understand or provide informed consent No health care proxy can be identified 	R (3)
Advanced Psychiatric Impairment		

140.	<ul style="list-style-type: none"> Significant psychiatric illnesses that may be aggravated by device implantation or that may preclude regular follow-up 	R (1)
Other Comorbidities		
144.	<ul style="list-style-type: none"> IV drug abuse (ongoing) 	R (2)
145.	<ul style="list-style-type: none"> Unresolved infection associated with risk for hematogenous seeding 	R (2)
146.	<ul style="list-style-type: none"> Non-compliance with medical therapy and follow-up 	R (3)
Class IV Heart Failure		
148.	<ul style="list-style-type: none"> Not candidate for cardiac transplantation, CRT, or VAD Refractory symptoms on oral therapy 	R (2)
150.	<ul style="list-style-type: none"> Not a candidate for transplant or VAD Does not meet CRT criteria Planned outpatient continuous intravenous inotropic therapy for palliation 	R (2)
Section 4: ICD Generator Replacement at ERI		
Primary Prevention ICD at Initial Implant		
No Clinically Relevant Ventricular Arrhythmias on ICD Since Implant (Now Has Prognosis <1 Year)		
155.	<ul style="list-style-type: none"> Patient received primary prevention ICD Not pacemaker dependent 	R (2)
Primary Prevention at Initial Implant: Replacement of CRT-ICD for ERI		
163.	<ul style="list-style-type: none"> Patient received a CRT-ICD when LVEF was $\leq 35\%$ LVEF now unchanged (despite clinical improvement) Replace with CRT-Pacemaker 	R (3)
Secondary Prevention at Initial Implant: Replacement of CRT-ICD for ERI		
167.	<ul style="list-style-type: none"> Patient received a CRT-ICD when LVEF was $\leq 35\%$ LVEF now 36-49% Replace with CRT-Pacemaker 	R (3)
168.	<ul style="list-style-type: none"> Patient received a CRT-ICD when LVEF was $\leq 35\%$ LVEF now $\geq 50\%$ (normalized) Replace with CRT-Pacemaker 	R (3)
Section 5: Dual Chamber ICD (As Opposed to Single Chamber ICD for Patients Who Meet Criteria for ICD Implantation)		
Tachyarrhythmias		
Atrial Arrhythmias or "Supraventricular Tachycardia (SVT)" and "No Standard Pacing Indications"		
189.	<ul style="list-style-type: none"> Long-standing persistent or permanent atrial fibrillation or atrial flutter No plans for cardioversion or rhythm control 	R (1)
Section 6: CRT – No Prior Implant		
Ischemic Cardiomyopathy LVEF $\leq 30\%$		
195.	<ul style="list-style-type: none"> QRS <120 msec Sinus rhythm NYHA Class I 	R (1)

195.	<ul style="list-style-type: none"> • QRS <120 msec • Sinus rhythm • NYHA Class II 	R (1)
195.	<ul style="list-style-type: none"> • QRS <120 msec • Sinus rhythm • NYHA Class III-amb IV 	R (1)
198.	<ul style="list-style-type: none"> • QRS 120-149 msec • Non-LBBB • Sinus rhythm • NYHA Class I 	R (3)
198.	<ul style="list-style-type: none"> • QRS 120-149 msec • Non-LBBB • Sinus rhythm • NYHA Class II 	R (3)
Ischemic Cardiomyopathy LVEF 31-35%		
200.	<ul style="list-style-type: none"> • QRS <120 msec • Sinus rhythm • NYHA Class I 	R (1)
200.	<ul style="list-style-type: none"> • QRS <120 msec • Sinus rhythm • NYHA Class II 	R (1)
200.	<ul style="list-style-type: none"> • QRS <120 msec • Sinus rhythm • NYHA Class III-amb IV 	R (1)
203.	<ul style="list-style-type: none"> • QRS 120-149 msec • Non-LBBB • Sinus rhythm • NYHA Class I 	R (3)
203.	<ul style="list-style-type: none"> • QRS 120-149 msec • Non-LBBB • Sinus rhythm • NYHA Class II 	R (3)
Nonischemic Cardiomyopathy LVEF ≤30%		
205.	<ul style="list-style-type: none"> • QRS <120 msec • Sinus rhythm • NYHA Class I 	R (1)
205.	<ul style="list-style-type: none"> • QRS <120 msec • Sinus rhythm • NYHA Class II 	R (1)
205.	<ul style="list-style-type: none"> • QRS <120 msec • Sinus rhythm • NYHA Class III-amb IV 	R (1)

208.	<ul style="list-style-type: none"> • QRS 120-149 msec • Non-LBBB • Sinus rhythm • NYHA Class I 	R (3)
208.	<ul style="list-style-type: none"> • QRS 120-149 msec • Non-LBBB • Sinus rhythm • NYHA Class II 	R (3)
Nonischemic Cardiomyopathy LVEF 31-35%		
210.	<ul style="list-style-type: none"> • QRS <120 msec • Sinus rhythm • NYHA Class I 	R (1)
210.	<ul style="list-style-type: none"> • QRS <120 msec • Sinus rhythm • NYHA Class II 	R (1)
210.	<ul style="list-style-type: none"> • QRS <120 msec • Sinus rhythm • NYHA Class III-amb IV 	R (1)
213.	<ul style="list-style-type: none"> • QRS 120-149 msec • Non-LBBB • Sinus rhythm • NYHA Class I 	R (3)
213.	<ul style="list-style-type: none"> • QRS 120-149 msec • Non-LBBB • Sinus rhythm • NYHA Class II 	R (3)
LVEF >35% of Any Etiology (ICD Indicated)		
215.	<ul style="list-style-type: none"> • QRS <120 msec • Sinus rhythm • NYHA Class I-II 	R (1)
215.	<ul style="list-style-type: none"> • QRS <120 msec • Sinus rhythm • NYHA Class III-amb IV 	R (1)
216.	<ul style="list-style-type: none"> • QRS 120-149 msec • LBBB • Sinus rhythm • NYHA Class I-II 	R (3)
218.	<ul style="list-style-type: none"> • QRS 120-149 msec • Non-LBBB • Sinus rhythm • NYHA Class I-II 	R (2)
218.	<ul style="list-style-type: none"> • QRS 120-149 msec • Non-LBBB • Sinus rhythm • NYHA Class III-amb IV 	R (3)

219.	<ul style="list-style-type: none"> • QRS \geq150 msec • Non-LBBB • Sinus rhythm • NYHA Class I-II 	R (3)
Pre-existing or Anticipated RV Pacing With a Clinical Indication for ICD or Pacemaker Implantation		
Intrinsic Narrow QRS, LVEF >35%		
226.	<ul style="list-style-type: none"> • RV pacing anticipated \leq40% • NYHA Class I-II 	R (2)
Refractory Class III/IV CHF <3 Months Post Revascularization and/or \leq40 Days Post MI		
No Other Indication for Ventricular Pacing LVEF 36-50%		
232.	<ul style="list-style-type: none"> • QRS 120-149 msec • LBBB 	R (3)
234.	<ul style="list-style-type: none"> • QRS 120-149 msec • Non-LBBB 	R (3)
235.	<ul style="list-style-type: none"> • QRS \geq150 msec • Non-LBBB 	R (3)