eviCore healthcare Clinical Decision Support Tool Diagnostic Strategies: This tool addresses common symptoms and symptom complexes. Imaging requests for patients with atypical symptoms or clinical presentations that are not specifically addressed will require physician review. Consultation with the referring physician, specialist and/or patient’s Primary Care Physician (PCP) may provide additional insight.
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## ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tr>
<td>ACE inhibitor</td>
<td>angiotensin-converting enzyme inhibitor</td>
</tr>
<tr>
<td>AMI</td>
<td>acute myocardial infarction</td>
</tr>
<tr>
<td>ARVC</td>
<td>arrhythmogenic right ventricular cardiomyopathy</td>
</tr>
<tr>
<td>CC</td>
<td>complications/comorbid conditions</td>
</tr>
<tr>
<td>CHF</td>
<td>congestive heart failure</td>
</tr>
<tr>
<td>CM</td>
<td>cardiomyopathy</td>
</tr>
<tr>
<td>CRT</td>
<td>cardiac resynchronization therapy</td>
</tr>
<tr>
<td>EP</td>
<td>electrophysiology</td>
</tr>
<tr>
<td>ICD</td>
<td>implantable cardioverter defibrillator</td>
</tr>
<tr>
<td>LV</td>
<td>left ventricular</td>
</tr>
<tr>
<td>LVEF</td>
<td>left ventricular ejection fraction</td>
</tr>
<tr>
<td>MCC</td>
<td>major complications/comorbid conditions</td>
</tr>
<tr>
<td>MI</td>
<td>myocardial infarction</td>
</tr>
<tr>
<td>NCCM</td>
<td>non-compaction cardiomyopathy</td>
</tr>
<tr>
<td>NYHA</td>
<td>New York Heart Association functional classification</td>
</tr>
<tr>
<td>VF</td>
<td>ventricular fibrillation</td>
</tr>
<tr>
<td>VT</td>
<td>ventricular tachycardia</td>
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## GLOSSARY

<table>
<thead>
<tr>
<th>Class</th>
<th>NYHA Heart Failure Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>No symptoms and no limitation in ordinary physical activity, e.g. shortness of breath when walking, climbing stairs etc.</td>
</tr>
<tr>
<td>II</td>
<td>Mild symptoms (mild shortness of breath and/or angina) and slight limitation during ordinary activity.</td>
</tr>
<tr>
<td>III</td>
<td>Marked limitation in activity due to symptoms, even during less-than-ordinary activity, e.g. walking short distances (20–100 m). Comfortable only at rest.</td>
</tr>
<tr>
<td>IV</td>
<td>Severe limitations. Experiences symptoms even while at rest. Mostly bedbound patients</td>
</tr>
</tbody>
</table>

**Abnormal blood pressure response to exercise:** Flat response/failure to augment; rise then fall during exercise; vasoactive cardiovascular drugs may result in an abnormal blood pressure response to exercise

**Non-Sustained Ventricular Tachycardia (NSVT):** Three or more consecutive ventricular beats at a rate of greater than 120 beats/min with a duration of less than 30 seconds

**Incessant VT:** Frequent recurrences of ongoing hemodynamically stable VT

**Long QT Syndrome (LQTS):** A congenital disorder characterized by a prolongation of the QT interval on ECG and a propensity to ventricular tachyarrhythmias, which may lead to syncope, cardiac arrest, or sudden death. The QT interval on the ECG, measured from the beginning of the QRS complex to the end of the T wave, represents the duration of activation and recovery of the ventricular myocardium. QT intervals corrected for heart rate (QTc) longer than 0.44 seconds are generally considered abnormal, though a normal QTc can be more prolonged in females (up to 0.46 sec). The Bazett formula is the formula most commonly used to calculate the QTc, as follows: QTc = AT/square root of the R-R interval (in seconds).

**Optimal Medical Therapy:** Three months of heart failure medications in maximally titrated doses as tolerated. These include beta blockers, ACE inhibitors or ARBs, and diuretics.

**Structural Heart Disease:** A structural or functional abnormality of the heart, or of the blood vessels supplying the heart, that impairs its normal functioning.

**Non-Compaction Cardiomyopathy:** A rare congenital cardiomyopathy that affects children and adults. It results from the failure of myocardial development during embryogenesis. It is also called spongiform cardiomyopathy. Symptoms are often a result of a poor pumping performance by the heart. The disease can be associated with other problems with the heart and the body.
Preface-1—Guideline Development

The eviCore evidence-based, proprietary clinical guidelines evaluate a range of advanced imaging and procedures, including CT, MRI, PET, and Radiation Oncology, Sleep Studies and Cardiac and Spine interventions.

eviCore healthcare reserves the right to change and update the guidelines. The guidelines undergo a formal review annually. eviCore’s guidelines are based upon major national and international association and society guidelines and criteria, peer-reviewed literature, major treatises and, input from health plans, practicing academic and community-based physicians.

These Guidelines are not intended to supersede or replace sound medical judgment, but instead, should facilitate the identification of the most appropriate imaging procedure given the patient’s clinical condition. These guidelines are written to cover medical conditions as experienced by the majority of patients. However, these guidelines may not be applicable in certain clinical circumstances, and physician judgment can override the guidelines.

Clinical decisions, including treatment decisions, are the responsibility of the patient and his/her provider. Clinicians are expected to use independent medical judgment which takes into account the clinical circumstances to determine patient management decisions.

eviCore supports the Choosing Wisely initiative (www.choosingwisely.org) by the American Board of Internal Medicine (ABIM) Foundation and many national physician organizations, to reduce the overuse of diagnostic tests that are low value, no value, or whose risks are greater than the benefits.

eviCore’s guidelines are based upon expert consensus and analysis reported by the following specialty societies, publications, studies and trials:

- The American College of Cardiology (ACC)
- The American Heart Association (AHA)
- The Heart Rhythm Society (HRS)
- The Multicenter Automatic Defibrillator Implantation Trial (MADIT/MADIT-2)
- The Multicenter Unsustained Tachycardia Trial (MUSTT)
- The Defibrillator in Acute Myocardial Infarction Trial (DINAMIT)
- The Resynchronization/defibrillation for Ambulatory Heart Failure Trial (RAFT)
- The Sudden Cardiac Death in Heart Failure Trial (SCD-HeFT)
The Resynchronization Reverses Remodeling in Systolic Left Ventricular Dysfunction trial (REVERSE)
Immediate Risk Stratification Improves Survival trial (IRIS)
The Comparison of Medical Therapy, Pacing, and Defibrillation in Heart Failure trial (COMPANION)
The Antiarrhythmics Versus Implantable Defibrillators trial (AVID)
The Canadian Implantable Defibrillator Study (CIDS)
The Cardiac Arrest Study Hamburg (CASH)

PREFACE-2–Benefits, Coverage Policies, and Eligibility Issues

Benefits, coverage policies, and eligibility issues pertaining to each Health Plan may take precedence over eviCore’s guidelines. Providers are urged to obtain written instructions and requirements directly from each payor.

Medicare Coverage Policies

For Medicare and Medicare Advantage enrollees, the coverage policies of CMS (Centers for Medicare and Medicaid Services) may take precedence over eviCore’s guidelines. Payors may choose to adopt other evidence-based guidelines (such as eviCore’s guidelines) rather than using Local Coverage Determinations and other Medicare coverage policy.

Investigational and Experimental Studies

Certain imaging studies described in these guidelines are considered investigational by various payers, and their coverage policies may take precedence over eviCore’s guidelines.

Clinical and Research Trials

Similar to investigational and experimental studies, clinical trial imaging requests will be considered to determine whether they meet Health Plan coverage and eviCore’s evidence-based guidelines.

State and federal legislations may need to be considered in the review of advanced imaging requests.

PREFACE-3–Clinical Information

✓ The philosophy behind eviCore guidelines entails using an evidence-based approach to determine the most appropriate procedure for each individual, at the most appropriate time in the diagnostic and treatment cycle.
✓ Procedures should be requested after initial consultation and physician treatment planning, and following full counseling of the individual.
✓ Current clinical information, which may include history, physical examination, symptoms, laboratory results, and imaging reports, are necessary for determining the medical necessity of implantable cardioverter defibrillator (ICD) devices and cardiac resynchronization therapy (CRT-D).

✓ The information provided to eviCore should have clinical relevance to the request.

✓ If the information provided makes no reference to the potential indication for the request, then the medical necessity for the procedure(s) cannot be supported.

✓ These clinical guidelines are not intended to supersede or replace sound medical judgment, but instead, should facilitate the identification of the most appropriate procedure given the individual’s clinical condition.

✓ These guidelines are written to cover medical conditions as experienced by the majority of individuals. However, these guidelines may not be applicable in certain clinical circumstances, and physician judgment can override the guidelines.

✓ Clinical decisions, including treatment decisions, are the responsibility of the patient and his/her provider. Clinicians are expected to use independent medical judgment which takes into account the clinical circumstances to determine patient management decisions.

**Preface-6 References**

References are embedded within the body of the guidelines.

**Preface-5 Copyright Information**

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**Procedure Codes (CPT®)**

The CPT® code set *33202-33249* includes the various Pacemaker and Defibrillator procedures including the insertion, replacement and removal of the leads. Some of the codes apply to both the pacemaker and the defibrillator. Codes are included for informational purposes only and any given code’s inclusion on this list does not necessarily indicate prior authorization is required. Pre-authorization requirements vary by health plan.

<table>
<thead>
<tr>
<th>CPT®</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>33206</td>
<td>Insertion of new or replacement of permanent pacemaker with transvenous electrode(s); atrial</td>
</tr>
<tr>
<td>33207</td>
<td>Insertion of new or replacement of permanent pacemaker with transvenous electrode(s); ventricular</td>
</tr>
<tr>
<td>33208</td>
<td>Insertion of new or replacement of permanent pacemaker with transvenous electrode(s); atrial and ventricular</td>
</tr>
<tr>
<td>33212</td>
<td>Insertion of pacemaker pulse generator only; single existing single lead</td>
</tr>
<tr>
<td>33213</td>
<td>Insertion of pacemaker pulse generator only; with existing dual leads</td>
</tr>
<tr>
<td>33214</td>
<td>Upgrade of implanted pacemaker system, conversion of single chamber system to dual chamber system (includes removal of previously placed pulse generator, testing of existing lead, insertion of new lead, insertion of new pulse generator)</td>
</tr>
<tr>
<td>33227</td>
<td>Removal of permanent pacemaker pulse generator with replacement of pacemaker pulse generator; single lead system</td>
</tr>
<tr>
<td>33228</td>
<td>Removal of permanent pacemaker pulse generator with replacement of pacemaker pulse generator; dual lead system</td>
</tr>
<tr>
<td>33215</td>
<td>Repositioning of previously implanted transvenous pacemaker or pacing cardioverter-defibrillator (right atrial or right ventricular) electrode</td>
</tr>
<tr>
<td>33216</td>
<td>Insertion of a single transvenous electrode; permanent pacemaker or cardioverter-defibrillator</td>
</tr>
<tr>
<td>33217</td>
<td>Insertion of 2 transvenous electrodes, permanent pacemaker or cardioverter-defibrillator</td>
</tr>
<tr>
<td>33218</td>
<td>Repair of single transvenous electrode, permanent pacemaker or pacing cardioverter-defibrillator</td>
</tr>
<tr>
<td>33220</td>
<td>Repair of 2 transvenous electrodes for permanent pacemaker or pacing cardioverter-defibrillator</td>
</tr>
<tr>
<td>33221</td>
<td>Insertion of pacemaker pulse generator only; with existing multiple leads</td>
</tr>
<tr>
<td>33222</td>
<td>Revision or relocation of skin pocket for pacemaker</td>
</tr>
<tr>
<td>33223</td>
<td>Revision of skin pocket for cardioverter-defibrillator</td>
</tr>
<tr>
<td>33224</td>
<td>Insertion of pacing electrode, cardiac venous system, for left ventricular pacing, with attachment to previously placed pacemaker or pacing cardioverter-defibrillator pulse generator</td>
</tr>
</tbody>
</table>

*List continued next page . . .*
Procedure Codes (CPT®)  
*Continued from previous page*

The CPT® code set 33202-33249 includes the various Pacemaker and Defibrillator procedures including the insertion, replacement and removal of the leads. Some of the codes apply to both the pacemaker and the defibrillator. Codes are included for informational purposes only and any given code’s inclusion on this list does not necessarily indicate prior authorization is required. Pre-authorization requirements vary by health plan.

<table>
<thead>
<tr>
<th>CPT®</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>33225</td>
<td>Insertion of pacing electrode, cardiac venous system, for left ventricular pacing, at time of insertion of pacing cardioverter-defibrillator pulse generator (including upgrade to dual chamber system and pocket revision)</td>
</tr>
<tr>
<td>33226</td>
<td>Repositioning of previously implanted cardiac venous system (left ventricular) electrode (including removal, insertion and/or replacement of existing generator)</td>
</tr>
<tr>
<td>33229</td>
<td>Removal of permanent pacemaker pulse generator with replacement of pacemaker pulse generator; multiple lead system</td>
</tr>
<tr>
<td>33230</td>
<td>Insertion of pacing cardioverter-defibrillator pulse generator only; with existing dual leads</td>
</tr>
<tr>
<td>33231</td>
<td>Insertion of pacing cardioverter-defibrillator pulse generator only; with existing multiple leads</td>
</tr>
<tr>
<td>33233</td>
<td>Removal of permanent pacemaker pulse generator only</td>
</tr>
<tr>
<td>33236</td>
<td>Removal of permanent epicardial pacemaker and electrodes by thoracotomy; single lead system, atrial or ventricular</td>
</tr>
<tr>
<td>33237</td>
<td>Removal of permanent epicardial pacemaker and electrodes by thoracotomy; dual lead system</td>
</tr>
<tr>
<td>33238</td>
<td>Removal of permanent transvenous electrode(s) by thoracotomy</td>
</tr>
<tr>
<td>33240</td>
<td>Insertion of pacing cardioverter-defibrillator pulse generator only; with existing single leads</td>
</tr>
<tr>
<td>33241</td>
<td>Removal of pacing cardioverter-defibrillator pulse generator only</td>
</tr>
<tr>
<td>33243</td>
<td>Removal of single or dual chamber pacing cardioverter-defibrillator electrode(s); by thoracotomy</td>
</tr>
<tr>
<td>33244</td>
<td>Removal of single or dual chamber pacing cardioverter-defibrillator electrode(s); by transvenous extraction</td>
</tr>
<tr>
<td>33249</td>
<td>Insertion or replacement of permanent pacing cardioverter-defibrillator system with transvenous lead(s), single or dual chamber</td>
</tr>
<tr>
<td>33262</td>
<td>Removal of pacing cardioverter-defibrillator pulse generator with replacement of pacing cardioverter-defibrillator pulse generator; single lead system</td>
</tr>
<tr>
<td>33263</td>
<td>Removal of pacing cardioverter-defibrillator pulse generator with replacement of pacing cardioverter-defibrillator pulse generator; dual lead system</td>
</tr>
<tr>
<td>33264</td>
<td>Removal of pacing cardioverter-defibrillator pulse generator with replacement of pacing cardioverter-defibrillator pulse generator; multiple lead system</td>
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</table>
ICD-9-CM Procedure Codes

<table>
<thead>
<tr>
<th>ICD-9-CM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>37.7</td>
<td>Insertion, revision, replacement, and removal of leads; insertion of temporary pacemaker system; or revision of cardiac device pocket</td>
</tr>
<tr>
<td>37.70</td>
<td>Initial insertion of lead [electrode]. not otherwise specified</td>
</tr>
<tr>
<td>37.71</td>
<td>Initial insertion of lead [electrode] into ventricle</td>
</tr>
<tr>
<td>37.72</td>
<td>Initial insertion of transvenous leads [electrodes] into atrium and ventricle</td>
</tr>
<tr>
<td>37.73</td>
<td>Initial insertion of transvenous lead [electrode] into atrium</td>
</tr>
<tr>
<td>37.74</td>
<td>Insertion or replacement of epicardial lead [electrode] into epicardium</td>
</tr>
<tr>
<td>37.75</td>
<td>Revision of lead [electrode]</td>
</tr>
<tr>
<td>37.76</td>
<td>Replacement of transvenous atrial and/or ventricular lead(s) [electrodes]</td>
</tr>
<tr>
<td>37.77</td>
<td>Removal of leads(s) [electrodes] without replacement</td>
</tr>
<tr>
<td>37.78</td>
<td>Insertion of temporary transvenous pacemaker system</td>
</tr>
<tr>
<td>37.79</td>
<td>Revision or relocation of cardiac device pocket</td>
</tr>
<tr>
<td>37.8</td>
<td>Insertion, replacement, removal, and revision of pacemaker device</td>
</tr>
<tr>
<td>37.80</td>
<td>Insertion of permanent pacemaker, initial or replacement, type of device not specified</td>
</tr>
<tr>
<td>37.81</td>
<td>Initial insertion of single chamber device, not specified as rate responsive</td>
</tr>
<tr>
<td>37.82</td>
<td>Initial insertion of single chamber device, rate responsive</td>
</tr>
<tr>
<td>37.83</td>
<td>Initial insertion of dual chamber device</td>
</tr>
<tr>
<td>37.85</td>
<td>Replacement of any type pacemaker device with single chamber device, not specified as rate responsive</td>
</tr>
<tr>
<td>37.86</td>
<td>Replacement of any type pacemaker device with single chamber device, rate responsive</td>
</tr>
<tr>
<td>37.87</td>
<td>Replacement of any type pacemaker device with dual chamber device</td>
</tr>
<tr>
<td>37.89</td>
<td>Revision or removal of pacemaker device</td>
</tr>
</tbody>
</table>

FY 2014 MS-DRG Codes

<table>
<thead>
<tr>
<th>DRG</th>
<th>ICD &amp; CRT System Implants</th>
</tr>
</thead>
<tbody>
<tr>
<td>222</td>
<td>Cardiac defib implant w cardiac cath w AMI/HF/shock w MCC</td>
</tr>
<tr>
<td>223</td>
<td>Cardiac defib implant w cardiac cath w AMI/HF/shock w/o MCC</td>
</tr>
<tr>
<td>224</td>
<td>Cardiac defib implant w cardiac cath w/o AMI/HF/shock w MCC</td>
</tr>
<tr>
<td>225</td>
<td>Cardiac defib implant w cardiac cath w/o AMI/HF/shock w/o MCC</td>
</tr>
<tr>
<td>226</td>
<td>Cardiac defibrillator implant w/o cardiac cath w MCC</td>
</tr>
<tr>
<td>227</td>
<td>Cardiac defibrillator implant w/o cardiac cath w/o MCC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DRG</th>
<th>ICD Replacements</th>
</tr>
</thead>
<tbody>
<tr>
<td>245</td>
<td>AICD generator procedures</td>
</tr>
<tr>
<td>253</td>
<td>ICD lead procedures</td>
</tr>
</tbody>
</table>
CRID-2.1 Survivors of Cardiac Arrest

ICD implantation is indicated in individuals who are survivors of cardiac arrest due to ventricular tachycardia (VT) or ventricular fibrillation (VF) after evaluation has excluded any completely reversible causes.

References:
- *Am J Cardiol* 1997;79:661-663
- *Am J Cardiol* 2000;101:1297-1302
- *Circulation* 2000;102:748-754

CRID-2.2 Structural Heart Disease with Sustained VT

ICD implantation is indicated in individuals with structural heart disease (such as prior myocardial infarction (MI), congenital heart disease, and/or ventricular dysfunction) and spontaneous, sustained VT (greater than 30 seconds), whether hemodynamically stable or unstable.

References:
- *Am J Cardiol* 1997;79:661-663
- *Am J Cardiol* 2000;101:1297-1302
- *Circulation* 2000;102:748-754

CRID-2.3 Syncope of Undetermined Origin and Positive EP Study

ICD implantation is indicated in individuals with syncope of undetermined origin who have clinically relevant, hemodynamically significant sustained VT or VF induced at electrophysiology (EP) study.

Reference:
- *Circulation* 2008;117:e349-408

CRID-2.4 Unexplained Syncope

ICD implantation is indicated in individuals with unexplained syncope, significant left ventricular (LV) dysfunction (LV ejection fraction less than 50%), and structural heart disease such as prior myocardial infarction (MI), congenital heart disease, and/or ventricular dysfunction.
Reference:
- *Circulation* 2008;117:e349-408

**CRID-2.5 Ischemic Cardiomyopathy**

ICD implantation is indicated in individuals with the following:
- LV dysfunction due to prior myocardial infarction (MI), **and**
- LV ejection fraction less than or equal to 35%, **and**
- At least 40 days post-MI, **and**
- Are NYHA functional Class II or III, **and**
- Are on optimal medical therapy, defined as 3 months of maximally titrated doses as tolerated of an ACE inhibitor, beta-blocker, and diuretic

**or**
- LV dysfunction due to prior MI, **and**
- LV ejection fraction less than or equal to 30%, **and**
- At least 40 days post-MI, **and**
- Are NYHA functional Class I

**or**
- Have non-sustained VT due to prior MI, **and**
- LV ejection fraction less than or equal to 40%, **and**
- Have inducible VF or sustained VT at EP study performed at least 96 hours after revascularization or MI

**References:**

**CRID-2.6 Nonischemic Dilated Cardiomyopathy (DCM)**

ICD implantation is indicated in individuals with nonischemic dilated cardiomyopathy who have LV ejection fraction less than or equal to 35%, NYHA Class II or III CHF and who are on optimal medical therapy. Trials assessing ICD therapy in primary prophylaxis of DCM have not generally included asymptomatic, NYHA functional Class I patients.

**Reference:**
- *Circulation* 2008;117:e349-408
o Optimal medical therapy is defined as 3 months of maximally titrated doses as tolerated of an ACE inhibitor, beta-blocker, and diuretic.

---

**CRID-3~Reasonable Indications for ICD Implantation**

**CRID-3.1 General Considerations**

For the “reasonable” or “considered” indications listed in this CRID-3 guideline, consensus opinion is less clear about the use of ICD implantation in these settings. Limited evidence suggests that ICD placement may be reasonable or may be considered; this category includes VF or hypotensive VT events where pharmaceutical or ablative techniques are indicated but the results of treatment are too unpredictable to withhold ICD implantation.

**CRID-3.2 Sustained Ventricular Tachycardia with Normal LV Function**

ICD implantation is reasonable for individuals with sustained VT and normal or near-normal ventricular function.

**Reference:**
- *Circulation* 2008;117:e349-408

**CRID-3.3 Cardiomyopathy**

**Cardiomyopathy due to Hypertrophic Cardiomyopathy:** ICD implantation is reasonable for individuals with hypertrophic cardiomyopathy who have one or more risk factors for sudden cardiac death.

Risk factors for sudden cardiac death include the following:
- Unheralded syncope
- Family history of sudden death
- Septal wall thickness of greater than or equal to 30 mm
- Abnormal blood pressure response to exercise
- Nonsustained VT (< 30 seconds)

**Cardiomyopathy due to Arrhythmogenic Right Ventricular Cardiomyopathy (ARVC):** ICD implantation is reasonable for individuals with ARVC who have one or more risk factors for sudden cardiac death.
Risk factors for sudden cardiac death include the following:
- Unheralded syncope
- Family history of sudden death
- Nonsustained VT (< 30 seconds)
- Clinical signs of RV failure

**Reference:**
- *Circulation* 2008;117:e349-408

**CRID-3.4 Long QT Syndrome**
ICD implantation is reasonable in Long-QT Syndrome in the following settings:
- Syncope and/or VT while receiving beta-blockers or if beta-blockers are contraindicated.

or
- Asymptomatic with other risk factors for sudden cardiac death
  - Risk factors for sudden cardiac death include the following:
    - QTc greater than 500 msec, or
    - LQT 2 or 3
    - Family history of sudden death

**Reference:**
- *Circulation* 2008;117:e349-408

**CRID-3.5 Brugada’s Syndrome**
ICD implantation is reasonable for individuals with Brugada Syndrome who have had syncope or who have documented or inducible VT or VF.

**Reference:**
- *Circulation* 2008;117:e349-408

**CRID-3.6 Catecholaminergic Polymorphic Ventricular Tachycardia**
ICD implantation is reasonable for individuals with catecholaminergic polymorphic VT who have syncope and/or documented sustained VT while receiving beta-blockers.

**Reference:**
- *Circulation* 2008;117:e349-408

**CRID-3.7 Other Indications**
ICD implantation is reasonable for individuals with cardiac sarcoidosis, giant cell myocarditis, or Chagas disease, regardless of LV ejection fraction measurement.
LV non compaction
- ICD implantation should be considered for the primary prevention of sudden cardiac death due to malignant ventricular arrhythmias in individuals with non-compaction cardiomyopathy and impaired LV function (LV ejection fraction less than 50%).
  - ICD implantation is also indicated for normal LV function (LVEF greater than 50%), primary prevention cases with positive family history of sudden cardiac death. This exception is due to the presence of sarcomeric gene mutations reported in non-compaction cardiomyopathy.

References:
- Circulation 2008;117: e349-408

CRID-3.8 Familial Cardiomyopathy
ICD implantation may be considered in affected individuals with a familial cardiomyopathy associated with sudden death.

Reference:
- Circulation 2008;117:e349-408
CRID-4.1 Ischemic Cardiomyopathy
ICD implantation is NOT indicated in individuals who have had a myocardial infarction within the past 40 days or who have had coronary revascularization within the past 90 days UNLESS the following applies:
   o A separate indication for permanent pacemaker implantation exists (thus preventing a likely repeat procedure for an upgraded device in the near future)

CRID-4.2 NYHA Class IV CHF
ICD implantation is NOT indicated for individuals with NYHA functional class IV symptoms UNLESS one of the following applies:
   o It is a CRT-D device meeting the indications for CRT-D implantation listed in ICD-5.1 Dilated Cardiomyopathy with NYHA Class III or IV Congestive Heart Failure (CHF), or
   o The individual is awaiting heart transplantation, or
   o Left ventricular assist device (LVAD) is being used as destination therapy

CRID-4.3 Limited Life Expectancy
ICD implantation is NOT indicated for individuals who do not have a reasonable expectation of survival with an acceptable functional status for at least one year, even if they meet ICD implantation criteria listed in:
   o CRID-2 Definite Indications for ICD Implantation or
   o CRID-3 Reasonable Indications for ICD Implantation.

CRID-4.4 Incessant VT or VF
ICD implantation is NOT indicated for individuals with incessant VT or VF
   o Incessant VT or VF is defined as hemodynamically stable VT or VF continuing for hours.

CRID-4.5 Psychiatric Conditions
ICD implantation is NOT indicated in individuals with significant psychiatric illnesses that may be aggravated by device implantation or that may preclude systematic follow-up.
CRID-4.6 Reversible Cause of VT/VF
ICD implantation is **NOT** indicated when VF or VT is due to a reversible cause
  o Sudden death can occur secondary to reversible derangements such as severe electrolyte disturbance or acute, reperfused myocardial infarction with preserved ejection fraction.

CRID-4.7 Ablation Candidate, No Structural Heart Disease
ICD implantation is **NOT** indicated if the individual has no structural heart disease and is a candidate for ablation. Surgical or catheter ablation can be curative in this setting.

For CRID-4.1 through 4.7, see references in CRID-2
CRID-5~Indications for Cardiac Resynchronization Therapy (CRT)-D Implantation

CRID-5.1 Dilated Cardiomyopathy with NYHA Class III or IV Congestive Heart Failure (CHF)

CRT-D implantation is indicated in individuals with ischemic or nonischemic dilated cardiomyopathy who have **ALL** of the following:

- Non-right bundle branch block with QRS greater than or equal to 120 msec, **and**
- LV ejection fraction less than or equal to 35%, **and**
- Are NYHA functional Class III or IV on stable optimal medical therapy
  
  - Optimal medical therapy is defined as 3 months of maximally titrated doses as tolerated of an ACE inhibitor, beta-blocker, and diuretic.

**Reference:**

CRID-5.2 Dilated Cardiomyopathy with NYHA Class II Congestive Heart Failure (CHF)

CRT-D implantation is indicated in individuals with ischemic or nonischemic dilated cardiomyopathy who have **ALL** of the following:

- Left bundle branch block with QRS greater than or equal to 130 msec, **and**
- LV ejection fraction less than or equal to 30%, **and**
- Are NYHA functional Class II on stable optimal medical therapy
  
  - Optimal medical therapy is defined as 3 months of maximally titrated doses as tolerated of an ACE inhibitor, beta-blocker, and diuretic.

**References:**
- *Circulation* 2011;123:1061-1072
- *Am Heart J* 2006;151:288-294
- *BCBSA TEC CRT July 2011;26(1):1-28*
CRID-6.1 Ischemic Cardiomyopathy
CRT-D implantation is NOT indicated in individuals who have had a myocardial infarction within the past 40 days or who have had coronary revascularization within the past 90 days UNLESS the following applies:
  o A separate indication for permanent pacemaker implantation exists (thus preventing a likely repeat procedure for an upgraded device in the near future)

CRID 6.2 Reversible Causes of Cardiomyopathy
CRT-D implantation is not indicated in the setting of a reversible CM such as: toxic, metabolic or tachycardia induced cardiomyopathy.
  o Once the reversible aberration is corrected, clinical reassessment is indicated.

For CRID-6.1 and 6.2, see references in CRID-5
CRID-7~Definite Indications for Permanent Pacemaker Implantation

CRID-7.1 Symptomatic Bradycardia
Permanent pacemaker implantation is indicated for symptomatic bradycardia, including frequent sinus pauses that produce symptoms and any degree of AV block producing symptoms.

References:
- *Am Heart J* 1982;103:338-42

Permanent pacemaker implantation is indicated for symptomatic bradycardia that results from required drug therapy for medical conditions (for example, beta blocker therapy in patients with prior myocardial infarction).

References:
- *Circulation* 2008;117:e350-408

CRID-7.2 Symptomatic Chronotropic Incompetence
Permanent pacemaker implantation is indicated for symptomatic chronotropic incompetence defined as limitations due to the inability to achieve 80% of maximum predicted heart rate (220-age).

Reference:

CRID-7.3 Indications for Asymptomatic Patients
Permanent pacemaker implantation is indicated for asymptomatic patients with third degree AV block.

References:
- *Circulation* 2008;117:e350-408
- *Am J Cardiol* 1997;80:1309-13
- *Am J Cardiol* 1976;38:205-8
Permanent pacemaker implantation is indicated for asymptomatic patients with advanced second degree AV block (Mobitz type II) and intermittent third degree AV block

**References:**
- *Circulation* 2008;117:e350-408

Permanent pacemaker implantation is indicated for asymptomatic patients with second degree AV block and documented periods of asystole greater than or equal to 3.0 seconds.

**References:**
- *Circulation* 1979;60:465-72
- *PACE* 1983;6:548-51

Permanent pacemaker implantation is indicated for second degree AV block in awake, symptom-free patients with atrial fibrillation and a pause of 5 seconds or longer.

**Reference:**
- *Circulation* 2008;117:e350-408

Permanent pacemaker implantation is indicated for alternating bundle branch block in asymptomatic patients.

**Reference:**
- *Circulation* 2008;117:e350-408

Permanent pacemaker implantation is indicated for asymptomatic patients with second degree AV block at any anatomic level associated with neuromuscular diseases known to involve the heart

**References:**
- *Am J Cardiol* 1984;54:1074-81
- *Am Heart J* 1987;113:1482-8
- *Am Heart J* 1963;66:164-75
- *Am J Cardiol* 1979;44:1396-400
CRID-7.4 Prior to Planned Catheter Ablation
Permanent pacemaker implantation is indicated prior to a planned catheter ablation of the AV junction intended for a rate control strategy for management of atrial fibrillation.

Reference:
- Circulation 1989;80:1527-35

CRID-7.5 Persistent Second Degree AV Block
Permanent pacemaker implantation is indicated for persistent second degree AV block in the His-Purkinje system with alternating bundle branch block or third degree AV block within or below the His-Purlinje system after myocardial infarction.

References:
- Am J Cardiol 1976;38:205-8
- Am J Cardiol 1991;67:225-30
- Am J Cardiol 1972;29:344-50
- Am J Cardiol 1986;57:1213-9

CRID-7.6 Syncope
Permanent pacemaker implantation is indicated for syncope caused by spontaneously occurring carotid sinus stimulation and carotid sinus pressure that induces ventricular asystole of more than 3 seconds.

Reference:
- Circulation 2008;117:e350-408
CRID-8~Reasonable Indications for Permanent Pacemaker Implantation

CRID-8.1 General Considerations
For the “reasonable” or “considered” indications listed in this CRID-8 guideline, consensus opinion is less clear about permanent pacing in these settings, with evidence suggesting that device placement may be reasonable or may be considered.

CRID-8.2 Sinus Node Dysfunction
Permanent pacemaker implantation is reasonable for individuals with sinus node dysfunction with a resting heart rate of less than 40 bpm when periodic symptomatic bradycardia is suspected.

References:
- *Am Heart J* 1982;103:338-42

CRID-8.3 Syncope
Permanent pacemaker implantation may be reasonable or may be considered for individuals with syncope in the following settings:

- Syncope of unexplained origin when clinically significant abnormalities of sinus node function are discovered or provoked in electrophysiological studies

  References:
  - *PACE* 1994;17:349-65
  - *Circulation* 1978;58:689-99

- Syncope without clear, provocative events and with a hypersensitive cardioinhibitory response of 3 seconds or longer

  References:
  - *Circulation* 2008;117:e350-408

- Significantly symptomatic neurocardiogenic syncope associated with Bradycardia documented spontaneously or at the time of tilt table testing

  Reference:
CRID-8.4 Asymptomatic Second Degree AV Block
Permanent pacemaker implantation is reasonable for individuals with asymptomatic second degree AV block at intra- or infra- His levels found at electrophysiological study.

References:
- Circulation 1979;60:465-72
- Circulation 1972;45:282-94

CRID-8.5 First or Second AV Block
Permanent pacemaker implantation is reasonable for individuals with first or second degree AV block with symptoms similar to those of pacemaker syndrome.

References:
- Circulation 1981;63:1043-9
- PACE 1996;19:747-51
- PACE 1996;19:261-4

CRID-8.6 Symptomatic Recurrent SVT
Permanent pacemaker implantation is reasonable for individuals with symptomatic recurrent SVT that is reproducibly terminated by pacing when catheter ablation and/or drugs fail to control the arrhythmia or produce intolerable side effects.

References:
- Am J Cardiol 1987;60:1311-6
- J Am Coll Cardiol 1985;6:206-14
- Am J Cardiol 1986;58:70-4

CRID-8.7 Relative Bradycardia – Postoperative Cardiac Transplant
Permanent pacemaker implantation may be considered for individuals when relative bradycardia is prolonged or recurrent, which limits rehabilitation or discharge after postoperative recovery from cardiac transplantation.

References:
- J Am Coll Cardiol 1994;24:1334-41
- J Heart Lung Trans 1991;10:931-6
- PACE 1981;7:1296-300

CRID-8.8 Incidental Finding at Electrophysiology (EP) Study
Permanent pacemaker implantation may be reasonable for an incidental finding at electrophysiology study of a markedly prolonged HV interval (greater than or equal to
100 milliseconds) or non-physiological intra- or infra- Hisian block in asymptomatic patients.

References:
- Am Heart J 1983;106:693-7
- Circulation 1977;56:240-4
- Circulation 1979;60:1455-64
- Am Heart J 1979;97:19-26

CRID-8.9 Neuromuscular Diseases Known to Involve the Heart
Permanent pacemaker implantation may be considered for progressive neuromuscular diseases known to involve the heart* with any degree of AV block (including first degree AV block) or any fascicular block, with or without symptoms, because there may be unpredictable progression of AV conduction disease.

*Progressive neuromuscular diseases known to involve the heart include myotonic muscular dystrophy, Kearns-Sayre syndrome, Erb dystrophy (limb-girdle muscular dystrophy), and peroneal muscular atrophy.

References:
- Am J Cardiol 1984;54:1074-81
- Am Heart J 1987;113:1482-8
- Am Heart J 1963;66:164-75
- Am J Cardiol 1979;44:1396-400
- Circulation 1981;63:214-9
Permanent pacemaker implantation is not indicated in any of the following settings:

- Sinus node dysfunction in asymptomatic patients
- Sinus node dysfunction in patients for whom the symptoms, suggestive of bradycardia, have been clearly documented to occur in the absence of bradycardia
- Fascicular block without AV block or symptoms concerning for AV block
- Incidentally noted hypersensitive cardioinhibitory response to carotid sinus stimulation without symptoms or with vague symptoms

**Reference:**
- *Circulation* 2008;117:e350-408

- Asymptomatic first degree AV block

**References:**

- Asymptomatic type I second degree AV block at the supra-His (AV node) level or that which is not known to be intra- or infra-Hisian

**References:**
- *Circulation* 1974;49:638-46

- Permanent ventricular pacing not indicated for asymptomatic transient AV block in the absence of intraventricular conduction defects or in isolated single fascicular block.

**References:**
- *Circulation* 2008;117:e350-408
- *Circulation* 1979;60:1455-64

- Permanent pacing not indicated for situational vasovagal syncope in which avoidance behavior is effective.

**References:**
- *Circulation* 2008;117:e350-408
- *JAMA* 2003;289:2224-9
CARDIAC RHYTHM IMPLANTABLE DEVICE (CRID)

GUIDECLASS REFERENCES

CRID-2.1 Survivors of Cardiac Arrest Due to VT or VF


CRID-2.2 Structural Heart Disease with Sustained VT VF


CRID-2.3 Syncope of Undetermined Origin and Positive Electrophysiology Study


CRID-2.4 Unexplained Syncope


CRID-2.5 Ischemic Cardiomyopathy


**CRID-2.6 Nonischemic Dilated Cardiomyopathy (DCM)**


**CRID-3.2 Sustained Ventricular Tachycardia (VT) with Normal LV Function**


**CRID-3.3 Cardiomyopathy due to Hypertrophic Cardiomyopathy or Arrhythmogenic Right Ventricular Cardiomyopathy (ARVC)**


**CRID-3.4 Long QT Syndrome**

CRID-3.5 Brugada’s Syndrome

CRID-3.6 Catecholaminergic Polymorphic Ventricular Tachycardia (VT)

CRID-3.7 Other Indications

CRID-3.8 Familial Cardiomyopathy

CRID-4 ~ ICD IMPLANTATION—NON-INDICATIONS
See References listed in CRID-2

CRID-5.1 Dilated Cardiomyopathy with NYHA Class III or IV Congestive Heart Failure (CHF)

CRID-5.2 Dilated Cardiomyopathy-NYHA Class II Congestive Heart Failure (CHF)

CRID-6~CARDIAC RESYNCHRONIZATION THERAPY (CRT)-D
IMPLANTATION—NON-INDICATIONS: See References listed in CRID-5
CRID-7.1 Symptomatic Bradycardia


CRID-7.2 Symptomatic Chronotropic Incompetence


CRID-7.3 Indications for Asymptomatic Patients


**CRID-7.4 Prior to Planned Catheter Ablation**

CRID-7.5 Persistent Second Degree AV Block


CRID-7.6 Syncope


CRID-8.2 Sinus Node Dysfunction


CRID-8.3 Syncope


**CRID-8.4 Asymptomatic Second Degree AV Block**


**CRID-8.5 First or Second AV Block**


**CRID-8.6 Symptomatic Recurrent SVT**


CRID-8.7 Relative Bradycardia – Postoperative Cardiac Transplant

CRID-8.8 Incidental Finding at Electrophysiology (EP) Study
- Altschuler H, Fisher JD, Furman S. Significance of isolated H-V interval prolongation in symptomatic patients without documented heart block. Am Heart J 1979;97:19-26

CRID-8.9 Neuromuscular Diseases Known to Involve the Heart


**CRID-9~PERMANENT PACEMAKER IMPLANTATION-Non-Indications**