ACC/AHA/NASPE Guideline for Implantation of Cardiac Pacemakers and Antiarrhythmia Devices

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

ACC/AHA/NASPE Guideline
for Implantation of Cardiac Pacemakers and Antiarrhythmia Devices

- Task Force on Practice Guidelines (Committee on Pacemaker Implantation)
- 1984 – original pacemaker guidelines published
- 1991 – guidelines revised and implantable cardioverter defibrillators (ICDs) added
- 1998 – guidelines revised
- 2002 – guidelines revised

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

ACC/AHA/NASPE Guideline
for Implantation of Cardiac Pacemakers and Antiarrhythmia Devices

- Document approved by
  - ACC Foundation Board of trustees in Sept. 2002
  - AHA Science Advisory and Coordinating Committee in August 2002
  - NASPE in August 2002
- Summary is published in Circulation (Oct. 15, 2002) and Journal of the American College of Cardiology (Nov. 6, 2002)
- Full text of the guidelines is posted on ACC, AHA, NASPE web sites

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

ACC/AHA Task Force on Practice Guidelines

- Role: Develop and revise important cardiovascular practice guidelines
- Includes:
  - Experts from ACC and AHA
  - Representatives from: NASPE, ACP, STS
  - University-affiliated and practicing physicians
- Process: A formal literature review and evaluation of evidence
- Procedures and treatments are classified by usefulness and efficacy

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

ACC/AHA/NASPE 2002 Guideline Revision: Guiding Principles

- Changes reflect new clinical evidence, results from randomized clinical trials and clinical consensus.
- Healthcare, logistic, and financial implications of new evidence were considered in classifying indications.
- Made prior wording more precise when needed.
- Recommendations apply to "most" patients, but the treating physician may modify based on an individual patient's situation.
- Recommendations presume absence of inciting causes that may be eliminated without detriment to the patient.
- Efforts were made to maintain consistency with other related guidelines.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

ACC/AHA Classification of Indications

- Class I:
  - Conditions for which there is evidence and/or general agreement that a given procedure or treatment is beneficial, useful, and effective.
- Class II:
  - Conditions for which there is *conflicting* evidence and/or a *divergence of opinion* about the usefulness/efficacy of a procedure or treatment.
  - Class IIa:
    - Weight of evidence/opinion is in favor of usefulness/efficacy.
  - Class IIb:
    - Usefulness/efficacy is less well established by evidence/opinion.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

ACC/AHA Classification of Indications

- Class III:
  - Conditions for which there is evidence and/or general agreement that a procedure/treatment is not useful/effective and in some cases may be harmful.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

ACC/AHA Classification of Clinical Evidence

Level A	Data derived from multiple *randomized* clinical trials involving a large number of individuals.
Level B	Data derived from a limited number of trials involving comparatively small numbers of patients or from well-designed data analysis of *nonrandomized* studies or *observational* data registries.
Level C	Consensus of expert opinion was the primary source of recommendation.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

2002 New or Revised Recommendations

Section I: Permanent Pacing

(changes from 1998 version highlighted in yellow text)

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Section I-A:
Pacing for Acquired Atrioventricular Block in Adults

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class I Indications:
Pacing for Acquired AV Block

1. Third-degree and advanced second degree AV block at any anatomic level with:
   a) Bradycardia and symptoms (including heart failure) presumed due to AV block,
   b) Arrhythmias and other medical conditions requiring drugs that result in symptomatic bradycardia,
   c) Documented asystole ≥3.0 sec. or escape rate <40 bpm in awake, symptom-free patients.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class I Indications:
Pacing for Acquired AV Block

1. Third-degree and advanced second degree AV block at any anatomic level with (continued):
   d) Post AV junction ablation,
   e) Postoperative AV block not expected to resolve after cardiac surgery,
   f) Neuromuscular diseases with AV block, with or without symptoms.
2. Second-degree AV block regardless of type or site of block, with associated symptomatic bradycardia.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class IIa Indications:
Pacing for Acquired AV Block

1. Asymptomatic third-degree AV block at any anatomic site with average, awake ventricular rate ≥40 bpm, especially if cardiomegaly or LV dysfunction is present.

2. Asymptomatic type II second-degree AV block with a narrow QRS.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class IIa Indications:
Pacing for Acquired AV Block

3. Asymptomatic type I second-degree AV block at intra- or infra-His levels found at EP study.

4. First or second degree AV block with symptoms similar to "pacemaker syndrome“.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class IIb Indications:
Pacing for Acquired AV Block

1. Marked first-degree AV block (>0.30 sec.) in patients with LV dysfunction and CHF in whom a shorter AV interval results in hemodynamic improvement, presumably by left atrial filling pressure.

2. Neuromuscular diseases with any degree of AV block (including first degree AV block), with or without symptoms.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class III Indications:
Pacing for Acquired AV Block

1. Asymptomatic first-degree AV block.

2. Asymptomatic type I second-degree AV block at the supra-His level.

3. AV block expected to resolve and unlikely to recur (e.g., drug toxicity, Lyme disease, etc), or during hypoxia in sleep apnea syndrome in absence of symptoms.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Section I-B:
Pacing for Chronic Bifascicular and Trifascicular Block

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class I Indications:

Pacing in Chronic Bifasicular and Trifasicular Block

1. Intermittent third-degree AV block.

2. Type II second-degree AV block.

3. Alternating bundle-branch block.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class IIa Indications:

Pacing in Chronic Bifasicular and Trifasicular Block

1. Syncope not demonstrated to be due to AV block when other likely causes have been excluded, specifically ventricular tachycardia.

2. Incidental finding at EP study of markedly prolonged HV interval (≥ 100 ms) in asymptomatic patients.

3. Incidental finding at EP study of pacing-induced infra-His block that is not physiological.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class IIb Indications:

Pacing in Chronic Bifasicular and Trifasicular Block

1. Neuromuscular diseases…with any degree of fascicular block with or without symptoms, because there may be unpredictable progression of AV conduction disease.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class III Indications:
Pacing in Chronic Bifasicular and Trifasicular Block

1. Fascicular block without AV block or symptoms.

2. Fascicular block with first-degree AV block without symptoms.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Section I-C:
Pacing for Atrioventricular Block Associated with Acute Myocardial Infarction

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class I Indications:
Pacing After Acute MI

1. Persistent second-degree AV block in the His-Purkinje system with bilateral BBB or third-degree AV block within or below the His-Purkinje system.

2. Transient, advanced (second- or third-degree) infranodal AV block and associated BBB. If the site of the block is uncertain, an EP study may be necessary.

3. Persistent and symptomatic second- or third-degree AV block.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class IIa and IIb Indications:
Pacing After Acute MI

Class IIa: None

Class IIb:

1. Persistent second- or third-degree AV block at the AV node level.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class III Indications: Pacing After Acute MI

1. Transient AV block in absence of intraventricular conduction defects.

2. Transient AV block in presence of isolated left anterior fascicular block (LAFB).

3. Acquired LAFB in absence of AV block.

4. Persistent first-degree AV block in presence of BBB that is old or age indeterminate.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Section I-D:
Pacing In Sinus Node Dysfunction

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class I Indications:
Pacing in Sinus Node Dysfunction

1. SN dysfunction with documented symptomatic bradycardia, including frequent sinus pauses that produce symptoms.
   - May be a consequence of essential long-term drug therapy for which there is no alternative.

1. Symptomatic chronotropic incompetence.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class IIa Indications:
Pacing in Sinus Node Dysfunction

1. SN dysfunction with HR <40 bpm, developing either spontaneously or as a result of necessary drug therapy, when a clear association between significant symptoms consistent with bradycardia and the actual presence of bradycardia has not been documented.

2. Syncope of unexplained origin when major abnormalities of sinus node function are discovered or provoked in EP studies.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class IIb Indications:
Pacing in Sinus Node Dysfunction

1. In minimally symptomatic patients, chronic heart rates <40 bpm, while awake.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class III Indications:
Pacing in Sinus Node Dysfunction

1. SN dysfunction in asymptomatic patients including those in whom substantial bradycardia (HR <40 bpm) is a result of long-term drug treatment.

2. SN dysfunction in patients in whom symptoms suggestive of bradycardia are clearly documented not to be associated with a slow HR.

3. SN dysfunction with symptomatic bradycardia due to nonessential drug therapy.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Section I-E:
Prevention and Termination of Tachyarrhythmias by Pacing

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class I and IIa Indications:
Prevention and Termination of Tachyarrhythmias by Pacing
(Pacemakers that Automatically Detect and Pace to Terminate Tachycardias)

Class I: None

Class IIa:

1. Symptomatic recurrent SVT that is reproducibly terminated by pacing in the unlikely event that catheter ablation and/or drugs fail to control the arrhythmia or produce intolerable side effects.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class IIb Indications:
Prevention and Termination of Tachyarrhythmias by Pacing
(Pacemakers that Automatically Detect and Pace to Terminate Tachycardias)

1. Recurrent SVT or atrial flutter that is reproducibly terminated by pacing as an alternative to drug therapy or ablation.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class III Indications:
Prevention and Termination of Tachyarrhythmias by Pacing
(Pacemakers that Automatically Detect and Pace to Terminate Tachycardias)

1. Tachycardias that are frequently accelerated or converted to fibrillation by pacing.

2. Presence of accessory pathways having capacity for rapid anterograde conduction whether or not the pathways participate in the mechanism of the tachycardia.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class I and IIa Indications:
Prevention and Termination of Tachyarrhythmias by Pacing
(Pacing Recommendations to Prevent Tachycardia)

Class I:

1. Sustained, pause-dependent VT, with or without prolonged QT, in which efficacy of pacing is thoroughly documented.

Class IIa:

1. High-risk patients with congenital long QT syndrome.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class IIb Indications:
Prevention and Termination of Tachyarrhythmias by Pacing
(Pacing Recommendations to Prevent Tachycardia)

1. AV re-entrant or AV node re-entrant SVT not responsive to medical or ablation therapy.

2. Prevention of symptomatic, drug-refractory, recurrent AF in patients with coexisting sinus node dysfunction.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class III Indications:
Prevention and Termination of Tachyarrhythmias by Pacing
(Pacing Recommendations to Prevent Tachycardia)

1. Frequent or complex ventricular ectopic activity without sustained VT in absence of long QT syndrome.

2. Torsade de Pointes VT due to reversible causes.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Section I-F:
Pacing in Hypersensitive Carotid Sinus and Neurocardiogenic Syncope

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class I Indications:

Pacing in Hypersensitive Carotid Sinus and Neurocardiogenic Syncope

1. Recurrent syncope caused by carotid sinus stimulation; minimal carotid sinus pressure induces ventricular asystole >3 sec duration in absence of any medication that depresses the SN or AV conduction.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class IIa Indications:

Pacing in Hypersensitive Carotid Sinus and Neurocardiogenic Syncope

1. Recurrent syncope without clear, provocative events and with a hypersensitive cardioinhibitory response.

2. Significantly symptomatic and recurrent neurocardiogenic syncope associated with bradycardia documented spontaneously or at the time of tilt-table testing.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class IIb and III Indications:

Pacing in Hypersensitive Carotid Sinus and Neurocardiogenic Syncope

Class IIb: None

Class III:

1. Hyperactive cardioinhibitory response to CS stimulation in absence of symptoms or in the presence of vague symptoms such as dizziness, lightheadedness, or both.
2. Recurrent syncope, lightheadedness or dizziness in absence of hyperactive cardioinhibitory response.
3. Situational vasovagal syncope in which avoidance behavior is effective.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Section I-G:
Pacing in Children, Adolescents, and Patients with Congenital Heart Disease

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class I Indications:

Pacing in Children, Adolescents, and Patients with Congenital Heart Disease

1. Advanced second- or third-degree AV block associated with symptomatic bradycardia, ventricular dysfunction or low cardiac output.

2. SN dysfunction with correlation of symptoms during age-inappropriate bradycardia.

3. Postoperative advanced second- or third-degree AV block not expected to resolve, or persists >7 days after cardiac surgery.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class I Indications:

Pacing in Children, Adolescents, and Patients with Congenital Heart Disease

4. Congenital third-degree AV block with a wide QRS escape rhythm, complex ventricular ectopy, or ventricular dysfunction.

5. Congenital third-degree AV block in the infant with a ventricular rate <50-55 bpm or with congenital heart disease and a ventricular rate <70 bpm.

6. Sustained pause-dependent VT, with or without prolonged QT, in which the efficacy of pacing is thoroughly documented.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class IIa Indications:

Pacing in Children, Adolescents, and Patients with Congenital Heart Disease

1. Brady-tachy syndrome with the need for chronic antiarrhythmic treatment other than digitalis.

2. Congenital third-degree AV block, beyond the first year of life, with an average HR <50 bpm, or abrupt pauses in the ventricular rate which are 2x or 3x the basic cycle length or associated with symptoms due to chronotropic incompetence.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class IIa Indications:

Pacing in Children, Adolescents, and Patients with Congenital Heart Disease

3. Long QT syndrome with 2:1 AV or third-degree AV block.

4. Asymptomatic sinus bradycardia in child with complex congenital heart disease where the resting HR is <40 bpm or >3 sec. pauses occur in the ventricular rate.

1. Patients with congenital heart disease and impaired hemodynamics due to sinus bradycardia or loss of AV synchrony.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class IIb Indications:

Pacing in Children, Adolescents, and Patients with Congenital Heart Disease

1. Transient postoperative third-degree AV block that reverts to sinus rhythm with residual bifascicular block.
2. Congenital third-degree AV block in asymptomatic infant, child, adolescent or young adult with an acceptable rate, narrow QRS complex, and normal ventricular function.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class IIb Indications:

Pacing in Children, Adolescents, and Patients with Congenital Heart Disease

3. Asymptomatic sinus bradycardia in adolescents with congenital heart disease with resting HR <40 bpm or >3 second pauses in the ventricular rate.

4. Neuromuscular diseases with any degree of AV block (including first-degree AV block), with or without symptoms, because there may be unpredictable progression of AV conduction disease.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class III Indications:

Pacing in Children, Adolescents, and Patients with Congenital Heart Disease

1. Transient postoperative AV block with return of normal AV conduction.
2. Asymptomatic postoperative bifascicular block with or without first-degree AV block.
3. Asymptomatic type I second-degree AV block.
4. Asymptomatic sinus bradycardia in adolescent where the longest RR interval is <3 sec and minimum HR is >40 bpm.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Section I-H:
Pacing in Specific Conditions

Hypertrophic obstructive cardiomyopathy

Idiopathic dilated cardiomyopathy

Cardiac transplantation

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class I, IIa, and IIb Indications:
Pacing for Hypertrophic Obstructive Cardiomyopathy

Class I:

1. Class I indications for sinus node dysfunction or AV block as previously described.

Class IIa: None

Class IIb:

1. Medically refractory, symptomatic hypertrophic cardiomyopathy with significant resting or provoked LV outflow obstruction.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class III Indications:

Pacing for Hypertrophic Obstructive Cardiomyopathy

1. Patients who are asymptomatic or medically controlled.

2. Symptomatic patients without evidence of LV outflow obstruction.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class I and II Indications:

Pacing for Idiopathic Dilated Cardiomyopathy

Class I

1. Class I indications for SN dysfunction or AV block as previously described.

Class IIa:

1. Biventricular pacing in medically refractory, symptomatic NYHA Class III/IV patients with idiopathic dilated or ischemic cardiomyopathy, prolonged QRS interval (≥130 msec), LV end-diastolic diameter ≥55mm, and LVEF ≤35%.

Class IIb: None

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class III Indications:

Pacing for Idiopathic Dilated Cardiomyopathy

1. Asymptomatic dilated cardiomyopathy.

2. Symptomatic dilated cardiomyopathy when patients are rendered asymptomatic by drug therapy.

3. Symptomatic ischemic cardiomyopathy when the ischemia is amenable to intervention.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class I-III Indications:

Pacing After Cardiac Transplantation

Class I:

1. Symptomatic bradyarrhythmias/chronotropic incompetence not expected to resolve and other Class I indications for permanent pacing.

Class IIa: None

Class IIb:

1. Symptomatic bradyarrhythmias/chronotropic incompetence that, although transient, may persist for months and require intervention.

Class III:

1. Postoperative asymptomatic bradyarrhythmias.

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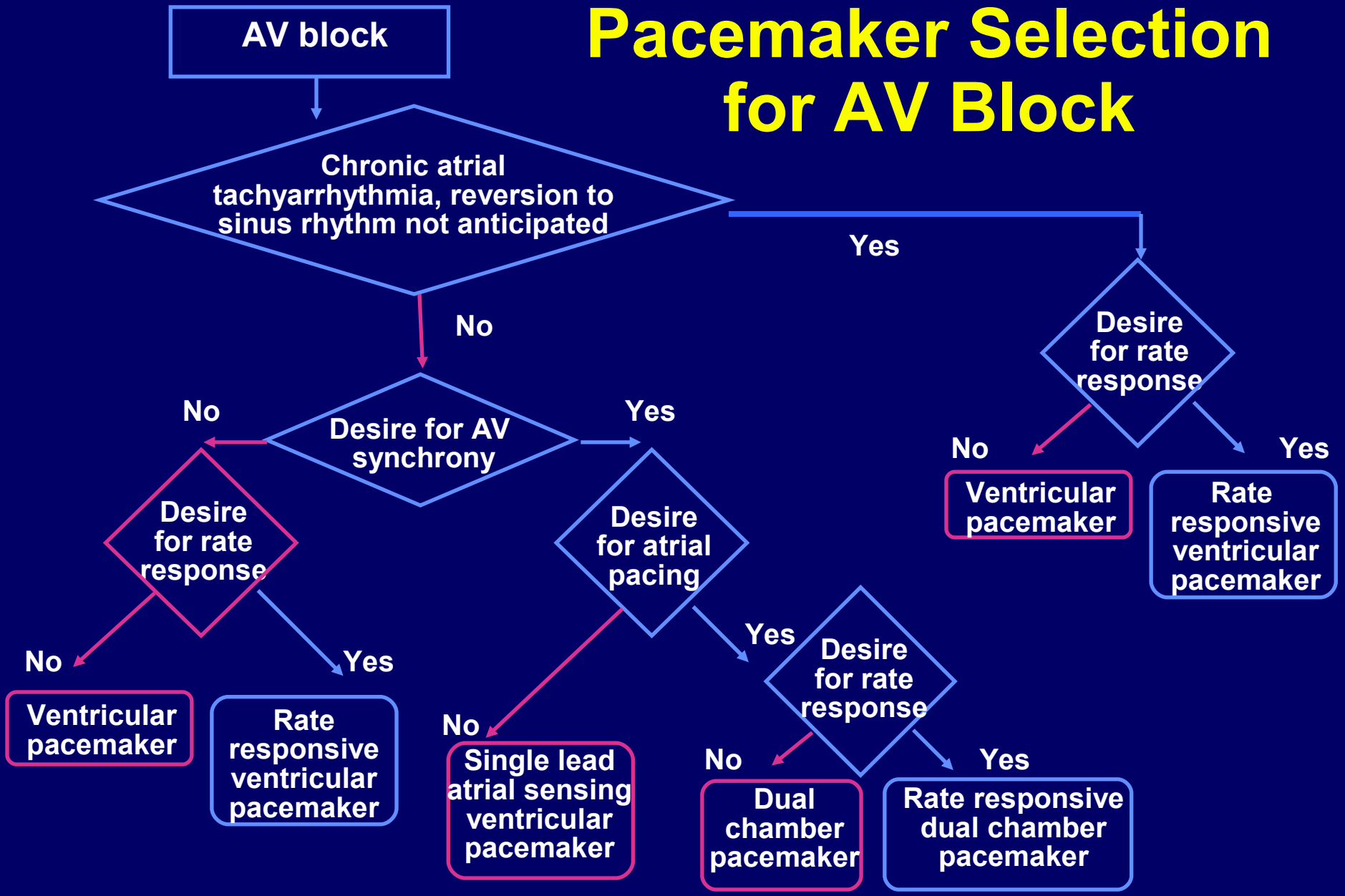
Pacemaker Selection for AV Block



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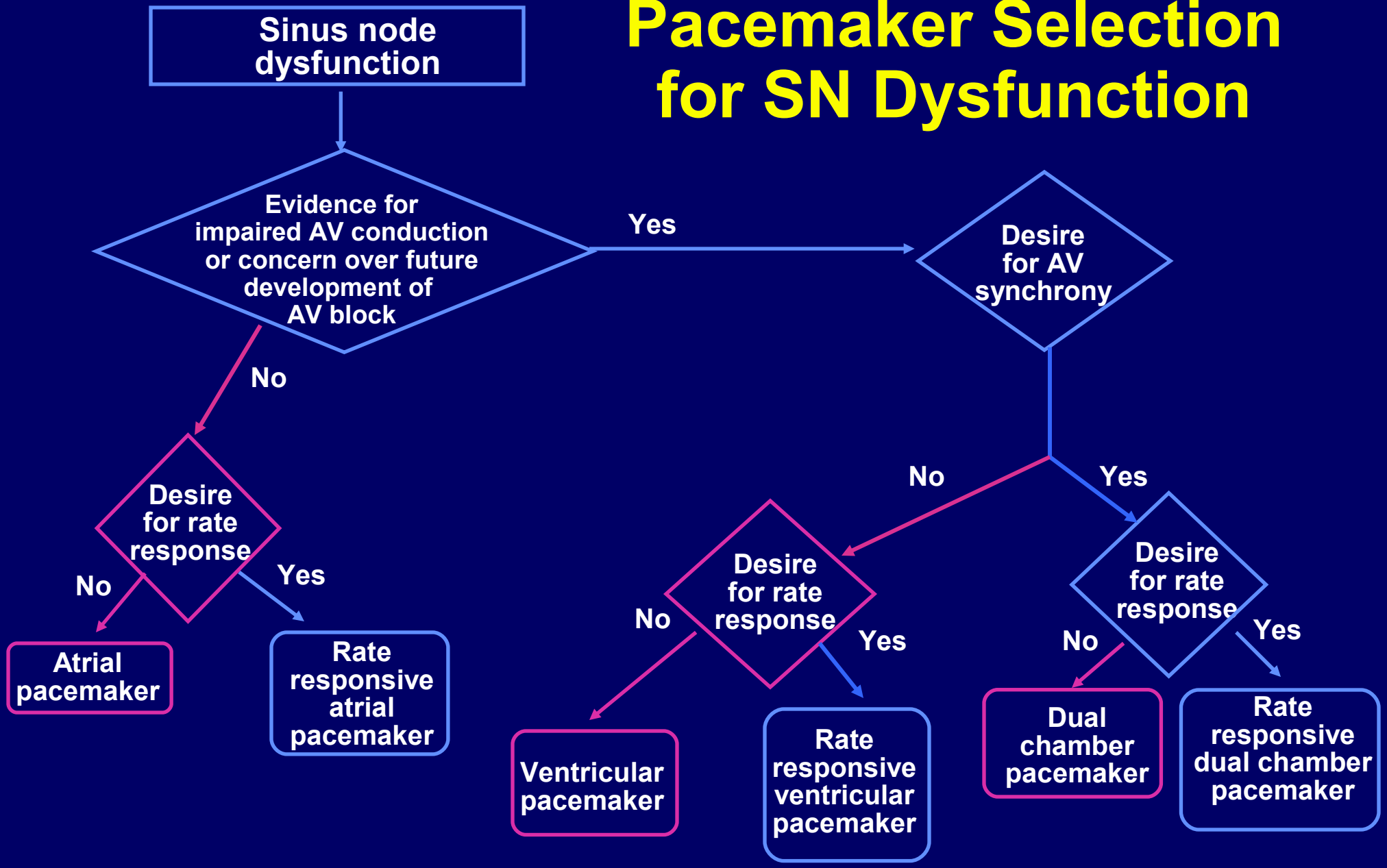
Pacemaker Selection for SN Dysfunction



Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Section II:
Indications For Implantable Cardioverter Defibrillator Therapy

Recommendations for ICD Therapy

(changes from 1998 version highlighted in yellow text)

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class I Indications
for ICD Therapy

1. Cardiac arrest due to VF or VT not due to a transient or reversible cause.

2. Spontaneous sustained VT in association with structural heart disease.

3. Syncope of undetermined origin with clinically relevant, hemodynamically significant sustained VT or VF induced at EP study when drug therapy is ineffective, not tolerated, or not preferred.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf

Class I Indications
for ICD Therapy

4. Nonsustained VT in patients with coronary disease, prior MI, LV dysfunction, and inducible VF or sustained VT at EP study that is not suppressible by a Class I antiarrhythmic drug.

5. Spontaneous sustained VT in patients without structural heart disease not amenable to other treatments.

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Class IIa Indications
for ICD Therapy

1. Patients with left ventricular ejection fraction of less than or equal to 30% at least 1 month post myocardial infarction and 3 months post coronary artery revascularization surgery.

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Class IIb Indications for ICD Therapy

1. Cardiac arrest presumed to be due to VF when EP testing is precluded by other medical conditions.

- Severe symptoms (e.g. syncope) attributable to sustained ventricular tachyarrhythmias while awaiting cardiac transplantation.

- Familial or inherited conditions with a high risk for life-threatening ventricular tachyarrhythmias such as long QT syndrome or hypertrophic cardiomyopathy.

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Class IIb Indications for ICD Therapy

4. Nonsustained VT with coronary artery disease, prior MI, and LV dysfunction, and inducible sustained VT or VF at EP study.

5. Recurrent syncope of undetermined etiology in the presence of ventricular dysfunction and inducible ventricular arrhythmias at EP study, when other causes of syncope have been excluded.

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Class IIb Indications for ICD Therapy

6. Syncope of unexplained origin or family history of unexplained sudden cardiac death in association with typical or atypical right bundle-branch block and ST-segment elevation (Brugada syndrome).

7. Syncope in patients with advanced structural heart disease in whom thorough invasive and noninvasive investigations have failed to define a cause.

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Class III Indications
for ICD Therapy

1. Syncope of undetermined cause in a patient without inducible ventricular tachyarrhythmias and without structural heart disease.
2. Incessant VT or VF.
3. VF or VT resulting from arrhythmias amenable to surgical or catheter ablation; for example atrial arrhythmias associated with Wolfe-Parkinson-White syndrome, right ventricular outflow tract VT, idiopathic left ventricular tachycardia, or fascicular VT.

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Class III Indications
for ICD Therapy

4. Ventricular tachyarrhythmias due to a transient or reversible disorder (e.g. AMI, electrolyte imbalance, drugs, or trauma) when correction of the disorder is considered feasible and likely to substantially reduce the risk of recurrent arrhythmia.
5. Significant psychiatric illnesses that may be aggravated by device implantation or may preclude systematic follow-up.
6. Terminal illnesses with projected life expectancy less than 6 months.

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Class III Indications for ICD Therapy

7. Patients with coronary artery disease with LV dysfunction and prolonged QRS duration in the absence of spontaneous or inducible sustained or nonsustained VT who are undergoing coronary bypass surgery.
8. NYHA Class IV drug-refractory congestive heart failure in patients who are not candidates for cardiac transplantation.

Gregoratos G. et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2002. Available at www.acc.org/clinical/guidelines/pacemaker/pacemaker.pdf