2017 Guideline for Management of Patients With Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death

GUIDELINES MADE SIMPLE
A Selection of Tables and Figures
The purpose of the guideline is to provide a contemporary guideline for the management of adults who have ventricular arrhythmias (VA) or who are at risk for sudden cardiac death (SCD), including diseases and syndromes associated with a risk of SCD from VA. The 2017 guideline supersedes three guidelines; the entire ACC/AHA/ESC 2006 Guidelines for Management of Patients With Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death, and selected sections of the ACC/AHA/HRS 2008 Guidelines for Device-Based Therapy of Cardiac Rhythm Abnormalities and selected sections of the 2011 ACCF/AHA Guideline for the Diagnosis and Treatment of Hypertrophic Cardiomyopathy.

The following resource contains selected Figures and Tables from the 2017 AHA/ACC/HRS Guideline for Management of Patients With Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death. The resource is only an excerpt from the Guideline and the full publication should be reviewed for more figures and tables as well as important context.

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Management of Sustained Monomorphic VT

- **Sustained Monomorphic VT**
  - **Stable**
    - 12-lead ECG, history & physical
    - Consider disease specific VTs
    - Structural heart disease
      - **Yes**
      - Typical ECG morphology for idiopathic VA
      - Verapamil sensitive VT*: verapamil or Outflow tract VT: beta blocker for acute termination of VT (*Class IIa*)
    - **No**
      - Therapy guided by underlying heart disease
      - Therapy to prevent recurrence preferred
  - **Unstable**
    - Direct current cardioversion & ACLS

- **Cardioversion (*Class I*)**
  - IV procainamide (*Class IIa*)
  - IV amiodarone or sotalol (*Class IIb*)
  - VT termination
    - **Yes**
    - Therapy to prevent recurrence preferred
    - Catheter ablation (*Class I*)
    - Verapamil or beta blocker (*Class IIa*)
  - **No**
    - Sedation/anesthesia, reassess antiarrhythmic therapeutic options, repeat cardioversion

*Known history of verapamil sensitive or classical electrocardiographic presentation.

Figure 2
Secondary Prevention of Sudden Cardiac Death in Patients with Ischemic Heart Disease

Secondary prevention in pts with IHD

SCD survivor* or sustained spontaneous monomorphic VT*

Ischemia warranting revascularization

Yes No

Revascularize & reassess SCD risk (Class I)

ICD candidate†

Yes No

ICD (Class I) GDMT (Class I)

Cardiac syncope†

LVEF ≤35%

Yes No

ICD (Class I) EP study (Class IIa)

Inducible VA

Yes No

Extended monitoring

*Exclude reversible causes.
†History consistent with an arrhythmic etiology for syncope.
‡ICD candidacy as determined by functional status, life expectancy, or patient preference.

Figure 3
Primary Prevention of Sudden Cardiac Death in Patients with Ischemic Heart Disease

Primary prevention in pts with IHD, LVEF ≤40%

- MI <40 d and/or revascularization <90 d
  - Yes* → ICD (Class I)
  - No → EP study

- EP study (especially in the presence of NSVT)
  - Yes → ICD (Class I)
  - No → GDMT (Class I)

- WCD (Class IIb)
  - Reassess LVEF >40 d after MI and/or >90 d after revascularization

- NYHA class I, LVEF ≤30%
  - Yes → ICD (Class I)*

- NYHA class II or III, LVEF ≤35%
  - Yes → ICD (Class I)
  - No → GDMT

- LVEF ≤40%, NSVT, inducible sustained VT on EP study
  - Yes → ICD (Class I)
  - No → GDMT

- NYHA class IV candidate for advanced HF therapy†
  - Yes → ICD should not be implanted (Class III: No Benefit)
  - No

*Scenarios exist for early ICD placement in select circumstances such as patients with a pacing indication or syncope.
†Advanced HF therapy includes CRT, cardiac transplant, and LVAD.

Figure 4
Treatment of Recurrent Ventricular Arrhythmias in Patients with Ischemic Heart Disease or Nonischemic Cardiomyopathy

ICD with VT/VF recurrent arrhythmia*

Polymorphic VT/VF
Consider reversible causes

Sustained monomorphic VT
Catheter ablation as first-line therapy (Class IIb)
Amiodarone or sotalol (Class I)

Drug, electrolyte induced ischemia No reversible causes

Arrhythmia not controlled

Treat for QT prolongation, discontinue offending medication, correct electrolytes (Class I)
Revascularize (Class I)
Amiodarone (Class I)
Beta blockers or lidocaine (Class IIa)

Nicardipine (Class I)

Identifiable PVC triggers

Yes No
Catheter ablation (Class I) Autonomic modulation (Class IIb)

IHD with frequent VT or VT storm

Yes No
Catheter ablation (Class I) Catheter ablation (Class IIa)

NICM

*Management should start with ensuring that the ICD is programmed appropriately and that potential precipitating causes, including heart failure exacerbation, are addressed. For information regarding optimal ICD programming, refer to the 2015 HRS/EHRA/APHRS/SOLAECE expert consensus statement (*Wilkoff BL, Fauchier L, Stiles MK, et al. 2015 HRS/EHRA/APHRS/SOLAECE expert consensus statement on optimal implantable cardioverter-defibrillator programming and testing. J Arrhythm. 2016;32:1-28).
Secondary and Primary Prevention of Sudden Cardiac Death in Patients with a Nonischemic Cardiomyopathy

Patients with NICM

SCA survivor/sustained VT (spontaneous/inducible)

- Yes
  - ICD (Class I)
  - Amiodarone (Class IIb)

- No
  - Symptoms concerning for VA

- Yes
  - ICD candidate*
  - Arrhythmogenic syncope suspected

- No
  - Etiology uncertain

- Yes
  - ICD (Class I)
  - EP study (Class IIa)

- No, due to newly diagnosed HF (<3 mo GDMT) or not on optimal GDMT

- No, due to newly diagnosed HF (<3 mo GDMT) and 2° risk factors

NICM due to LMNA mutation and 2° risk factors

- Yes
  - ICD candidate*

- Yes
  - ICD candidate*

- Yes
  - ICD (Class IIa)

*ICD candidacy as determined by functional status, life expectancy or patient preference.

Figure 6
## Major Clinical Features Associated with Increased Risk of Sudden Cardiac Death in Patients with Hypertrophic Cardiomyopathy

<table>
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<th>Potential Risk Modifiers‡</th>
<th>High-risk Subsets§‡</th>
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<td>Survival from a cardiac arrest due to VT or VF</td>
<td>&lt;30 y</td>
<td>LV aneurysm</td>
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<td>Spontaneous sustained VT causing syncope or hemodynamic compromise</td>
<td>Delayed hyperenhancement on cardiac MRI</td>
<td>LVEF &lt;50%</td>
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<td>Family history of SCD associated with HCM</td>
<td>LVOT obstruction</td>
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<tr>
<td>LV wall thickness ≥30 mm</td>
<td>Syncope &gt;5 y ago</td>
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<tr>
<td>Unexplained syncope within 6 mo</td>
<td>NSVT ≥3 beats</td>
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<tr>
<td>Abnormal blood pressure response during exercise†</td>
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*There is general agreement in the literature that these factors independently convey an increased risk for SCD in patients with HCM.

† Decrease in blood pressure of 20 mm Hg or failure to increase systolic blood pressure >20 mm Hg during exertion.

‡ There is a lack of agreement in the literature that these modifiers independently convey an increase risk of SCD in patients with HCM; however, a risk modifier when combined with a risk factor often identifies a patient with HCM at increased risk for SCD beyond the risk conveyed by the risk factor alone.

§ A small subset of patients with an LVEF <50% (end-stage disease) or an LV aneurysm warrant consideration for ICD implantation.

Table 8
Prevention of Sudden Cardiac Death in Patients with Hypertrophic Cardiomyopathy

Patients with HCM

SCD survivor; sustained VT

Yes

ICD candidate*

No

Family Hx SCD; LVWT >30 mm; syncope <6 mo

No

NSVT; abnormal BP response to exercise

Yes

ICD (Class IIa)

No

SCD risk modifier† present

Yes

ICD (Class IIa)

No

ICD (Class IIb)

ICD (Class III: No Benefit)

* ICD candidacy as determined by functional status, life expectancy, or patient preference.
† Risk modifiers: Age <30 y, late gadolinium enhancement on cardiac MRI, LVOT obstruction, LV aneurysm, syncope >5 y.

Figure 7
Prevention of Sudden Cardiac Death in Patients with Long QT Syndrome

ICD candidate*

ICD (Class I)

Recurrent ICD shocks for VT

Treatment intensification: additional medications, left cardiac sympathetic denervation (Class I)

LQTS

QTc <470 ms

Beta blocker (Class I)

QTc ≥470 ms and/or symptomatic

Beta blocker (Class I)

Persistent symptoms and/or other high-risk features†

Treatment intensification: additional medications, left cardiac sympathetic denervation and/or an ICD (Class I)

Asymptomatic and QTc >500 ms

Treatment intensification: additional medications, left cardiac sympathetic denervation and/or an ICD (Class IIb)

QT prolonging drugs/hypokalemia/hypomagnesemia (Class III: Harm)

*ICD candidacy as determined by functional status, life expectancy, or patient preference.
†High-risk patients with LQTS include those with QTc >500 ms, genotypes LQT2 and LQT3, females with genotype LQT2, <40 years of age, onset of symptoms at <10 years of age, and patients with recurrent syncope.

Figure 9
Prevention of Sudden Cardiac Death in Patients with Brugada Syndrome

Documented or suspected Brugada syndrome

**Genotyping (Class IIb)**

Positive

Genetic counselling for mutation specific genotyping of 1° relatives (Class I)

Spontaneous Type I Brugada ECG

**Suspected Brugada syndrome without Type I ECG**

**Lifestyle changes:**
1. Avoid Brugada aggravating drugs
2. Treat fever
3. Avoid excessive alcohol
4. Avoid cocaine

Pharmacologic challenge (Class IIa)

Cardiac arrest, recent unexplained syncope

**Yes**

ICD candidate*

**No**

Observe without therapy

**EP study for risk stratification (Class IIb)**

Quinidine or catheter ablation (Class I)

Quinidine or catheter ablation (Class I)

Recurrent VT, VF storm

*ICD candidacy as determined by functional status, life expectancy, or patient preference.

Figure 14
Prevention of Sudden Cardiac Death in Patients with Adult Congenital Heart Disease

ACHD with documented or suspected life-threatening VA

Evaluation and treatment (if appropriate) for residual anatomic or coronary abnormalities (Class I)

Initial presentation: resuscitated cardiac arrest

ACHD with high-risk features* and frequent VA†

ICD (Class I)

Recurrent sustained VT

Catheter ablation (Class IIa)

EP study (Class IIa)

Sustained VT

Beta blocker (Class IIa)

Unexplained syncope and at least moderate ventricular dysfunction or marked hypertrophy

ICD (Class IIa)

if positive

Figure 16

*High-risk features: prior palliative systemic to pulmonary shunts, unexplained syncope, frequent PVC, atrial tachycardia, QRS duration ≥180 ms, decreased LVEF or diastolic dysfunction, dilated right ventricle, severe pulmonary regurgitation or stenosis, or elevated levels of BNP.

†Frequent VA refers to frequent PVCs and/or nonsustained VT.