Heart Rhythm Congress
ICC, Birmingham: October 8th 2018

STARS Take Fainting to Heart: Syncope and POTs Update

ESC & ACC, AHA, HRS
What are the Differences and are they Important?

John Camm
Professor of Clinical Cardiology, St. George’s Hospital Medical School, London
Declaration of Competing Interests

Chairman

Steering Committees
Multiple trials involving antiarrhythmic agents, heart failure drugs and novel anticoagulants

DSMBs
Multiple trials of devices and drugs

Events Committees
One trial of novel oral anticoagulants and multiple trials of miscellaneous agents with CV adverse effects

Editorial Role
Editor-in-Chief, European Heart Journal: Case Reports and Clinical Cardiology; Editor, European Textbook of Cardiology, European Heart Journal, Electrophysiology of the Heart, and Evidence Based Cardiology

Consultant/Advisor/Speaker
Incarda, Menarini, Milestone, Sanofi, Servier, Bayer, Boehringer Ingelheim, Bristol-Myers Squibb, Daiichi Sankyo, Pfizer, Boston Scientific, Abbott, Biotronik, Medtronic, GlaxoSmithKline, Anidium, Cardiac Insight, Johnson and Johnson, Novartis, Radius, Richmond Pharmacology
# ESC: Classes of Recommendations

<table>
<thead>
<tr>
<th>Classes of recommendations</th>
<th>Definition</th>
<th>Suggested wording to use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective.</td>
<td>Is recommended/is indicated.</td>
</tr>
<tr>
<td>Class II</td>
<td>Conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the given treatment or procedure.</td>
<td></td>
</tr>
<tr>
<td><strong>Class IIa</strong></td>
<td><em>Weight of evidence/opinion is in favour of usefulness/efficacy.</em></td>
<td>Should be considered.</td>
</tr>
<tr>
<td><strong>Class IIb</strong></td>
<td><em>Usefulness/efficacy is less well established by evidence/opinion.</em></td>
<td>May be considered.</td>
</tr>
<tr>
<td>Class III</td>
<td>Evidence or general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful.</td>
<td>Is not recommended.</td>
</tr>
</tbody>
</table>

2018 ESC Guidelines on Syncope – Michele Brignole & Angel Moya
EHJ Doi:10.1093/eurheartj/ehy037
AHA: Classes of Recommendations

**CLASS (STRENGTH) OF RECOMMENDATION**

**CLASS I (STRONG)**
- Benefit >>> Risk
  - Suggested phrases for writing recommendations:
    - Is recommended
    - Is indicated/useful/effective/beneficial
    - Should be performed/administered/other
    - Comparative-Effectiveness Phrases:
      - Treatment/strategy A is recommended/indicated in preference to treatment B
      - Treatment A should be chosen over treatment B

**CLASS IIa (MODERATE)**
- Benefit >> Risk
  - Suggested phrases for writing recommendations:
    - Is reasonable
    - Can be useful/effective/beneficial
    - Comparative-Effectiveness Phrases:
      - Treatment/strategy A is probably recommended/indicated in preference to treatment B
      - It is reasonable to choose treatment A over treatment B

**CLASS IIb (WEAK)**
- Benefit ≥ Risk
  - Suggested phrases for writing recommendations:
    - May/might be reasonable
    - May/might be considered
    - Usefulness/effectiveness is unknown/unclear/uncertain or not well established

**CLASS III: No Benefit (MODERATE)**
- Benefit = Risk
  - Suggested phrases for writing recommendations:
    - Is not recommended
    - Is not indicated/useful/effective/beneficial
    - Should not be performed/administered/other

**CLASS III: Harm (STRONG)**
- Risk > Benefit
  - Suggested phrases for writing recommendations:
    - Potentially harmful
    - Causes harm
    - Associated with excess morbidity/mortality
    - Should not be performed/administered/other

**LEVEL (QUALITY) OF EVIDENCE†‡**

**LEVEL A**
- High-quality evidence‡ from more than 1 RCT
- Meta-analyses of high-quality RCTs
- One or more RCTs corroborated by high-quality registry studies

**LEVEL B-R**
- Moderate-quality evidence‡ from 1 or more RCTs
- Meta-analyses of moderate-quality RCTs

**LEVEL B-NR**
- Moderate-quality evidence‡ from 1 or more well-designed, well-executed nonrandomized studies, observational studies, or registry studies
- Meta-analyses of such studies

**LEVEL C-LD**
- Randomized or nonrandomized observational or registry studies with limitations of design or execution
- Meta-analyses of such studies
- Physiological or mechanistic studies in human subjects

**LEVEL C-EO**
- Consensus of expert opinion based on clinical experience

COR and LOE are determined independently (any COR may be paired with any LOE). A recommendation with LOE C does not imply that the recommendation is weak. Many important clinical questions addressed in guidelines do not lend themselves to clinical trials. Although RCTs are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

- The outcome or result of the intervention should be specified (an improved clinical outcome or increased diagnostic accuracy or incremental prognostic information).
- For comparative-effectiveness recommendations (COR I and IIa; LOE A and B only), studies that support the use of comparator verbs should involve direct comparisons of the treatments or strategies being evaluated.
- The method of assessing quality is evolving, including the application of standardized, widely used, and preferably validated evidence grading tools; and for systematic reviews, the incorporation of an Evidence Review Committee.

COR indicates Class of Recommendation; EO, expert opinion; LD, limited data; LOE, Level of Evidence; NR, nonrandomized; R, randomized; and RCT, randomized controlled trial.
Definition

- **Syncope** is a TLOC, *due to transient global cerebral hypoperfusion*, characterized by rapid onset, short duration and spontaneous complete recovery.

- **Syncope**: A symptom that presents with an abrupt, transient, complete loss of consciousness, associated with inability to maintain postural tone, with rapid and spontaneous recovery. The presumed mechanism is cerebral hypoperfusion. There should not be clinical features of other nonsyncope causes of loss of consciousness, such as seizure, antecedent head trauma, or apparent loss of consciousness (i.e., pseudosyncope)
Presentation of Patient with Probable TLOC

TLOC present? (history)

No TLOC

Act as needed

Syncope

Initial syncope evaluation
(H&P exam, ECG, supine and standing BP)

TLOC - non syncopal

• Epileptic seizure
• Psychogenic TLOC
• TLOC, rare cause

Treat appropriately

Certain or highly likely diagnosis

Start treatment

Uncertain diagnosis

Risk stratification

High-risk of short-term serious events
Early evaluation & treatment

Low-risk but recurrent syncopes
Ancillary tests followed by treatment

Low-risk, single or rare recurrences
Explanation, no further evaluation
## Risk Stratification at the Initial Evaluation

<table>
<thead>
<tr>
<th>Low-risk</th>
<th>High-risk (red flag)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Syncopal event</strong></td>
<td><strong>Major</strong></td>
</tr>
<tr>
<td>1. Associated with prodrome typical of reflex syncope (e.g. light-headedness, feeling of warmth, sweating, nausea, vomiting)</td>
<td>1. New onset of chest discomfort, breathlessness, abdominal pain, or headache</td>
</tr>
<tr>
<td>2. After sudden unexpected unpleasant sight, sound, smell, or pain</td>
<td>2. Syncope during exertion or when supine.</td>
</tr>
<tr>
<td>3. After prolonged standing or crowded, hot places</td>
<td>3. Sudden onset palpitation immediately followed by syncope</td>
</tr>
<tr>
<td>4. During a meal or postprandial</td>
<td><strong>Minor</strong> (high risk only if associated with structural heart disease or abnormal ECG):</td>
</tr>
<tr>
<td>5. Triggered by cough, defaecation, or micturition</td>
<td>1. No warning symptoms or short (&lt;10 s) prodrome</td>
</tr>
<tr>
<td>6. With head rotation or pressure on carotid sinus (e.g. tumour, shaving, tight collars)</td>
<td>2. Family history of SCD at young age</td>
</tr>
<tr>
<td>7. Standing from supine/sitting position</td>
<td>3. Syncope in the sitting position</td>
</tr>
</tbody>
</table>
SYSTEMATIC REVIEW

Pacing as a treatment for reflex-mediated (vasovagal, situational, or carotid sinus hypersensitivity) syncope: A systematic review for the 2017 ACC/AHA/HRS guideline for the evaluation and management of patients with syncope. A report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society

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2017 ACC/AHA/HRS guideline for the evaluation and management of patients with syncope: A report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society

Endorsed by:

Heart Rhythm Congress
AHA: Initial Evaluation

- Transient loss of consciousness*
  - Suspected syncope
    - Evaluation as clinically indicated
    - Initial evaluation: history, physical examination, and ECG (Class I)
      - Cause of syncope certain
        - Treatment
      - Cause of syncope uncertain
        - Risk assessment
          - Further evaluation
## Syncope Risk Scores

### TABLE 5  Examples of Syncope Risk Scores

<table>
<thead>
<tr>
<th>Study/Reference</th>
<th>Year</th>
<th>Sample N</th>
<th>Events N (%)</th>
<th>Outcome Definition</th>
<th>ED Events</th>
<th>Predictors</th>
<th>NPV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Martin (65)</td>
<td>1997</td>
<td>252</td>
<td>104 (41%)</td>
<td>1-y death/arrhythmia</td>
<td>Yes</td>
<td>Abnormal ECG‡; &gt;45 y of age; VA; HF</td>
<td>93</td>
</tr>
<tr>
<td>Sarasin (54)</td>
<td>2003</td>
<td>175</td>
<td>30 (17%)</td>
<td>Inpatient arrhythmia</td>
<td>Yes</td>
<td>Abnormal ECG‡; &gt;65 y of age; HF</td>
<td>98</td>
</tr>
<tr>
<td>OESIL (47)</td>
<td>2003</td>
<td>270</td>
<td>31 (11%)</td>
<td>1-y death</td>
<td>N/A</td>
<td>Abnormal ECG‡; &gt;65 y of age; no prodrome; cardiac history</td>
<td>100</td>
</tr>
<tr>
<td>SFSR (52)</td>
<td>2004</td>
<td>684</td>
<td>79 (12%)</td>
<td>7-d serious events§</td>
<td>Yes</td>
<td>Abnormal ECG‡; dyspnea; hematocrit; systolic BP &lt;90 mm Hg; HF</td>
<td>99</td>
</tr>
<tr>
<td>Boston Syncope Rule (50)</td>
<td>2007</td>
<td>293</td>
<td>68 (23%)</td>
<td>30-d serious events</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Del Rosso (49)</td>
<td>2008</td>
<td>260</td>
<td>44 (17%)</td>
<td>Cardiac etiology</td>
<td>N/A</td>
<td>Abnormal ECG‡/cardiac history; palpitations; exertional; supine; precipitant (a low-risk factor); autonomic prodrome (low-risk factors)</td>
<td>99</td>
</tr>
<tr>
<td>STePS (48)</td>
<td>2008</td>
<td>676</td>
<td>41 (6%)</td>
<td>10-d serious events¶</td>
<td>Yes</td>
<td>Abnormal ECG‡; trauma; no prodrome; male sex</td>
<td>—</td>
</tr>
<tr>
<td>Syncope Risk Score (55)</td>
<td>2009</td>
<td>2,584</td>
<td>173 (7%)</td>
<td>30-d serious events#</td>
<td>No</td>
<td>Abnormal ECG‡; &gt;90 y of age; male sex; positive troponin; history of arrhythmia; systolic BP &gt;160 mm Hg; near-syncope (a low-risk factor)</td>
<td>97</td>
</tr>
<tr>
<td>ROSE (53)</td>
<td>2010</td>
<td>550</td>
<td>40 (7%)</td>
<td>30-d serious events#</td>
<td>Yes</td>
<td>Abnormal ECG‡; B-natriuretic peptide; hemoglobin; O₂Sat; fecal occult blood</td>
<td>98</td>
</tr>
</tbody>
</table>
AHA: Initial Evaluation
# AHA: ECG Monitoring

## Recommendations for Cardiac Monitoring

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>RECOMMENDATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>C-EO</td>
<td>The choice of a specific cardiac monitor should be determined on the basis of the frequency and nature of syncope events.</td>
</tr>
</tbody>
</table>
| IIa | B-NR | To evaluate selected ambulatory patients with syncope of suspected arrhythmic etiology, the following external cardiac monitoring approaches can be useful:  
1. Holter monitor (95,99)  
2. Transtelephonic monitor (96,100,101)  
3. External loop recorder (96,100-102)  
4. Patch recorder (103-105)  
5. Mobile cardiac outpatient telemetry (106,107). |
| IIa | B-R  | To evaluate selected ambulatory patients with syncope of suspected arrhythmic etiology, an implantable cardiac monitor can be useful (95,96,99,107-121). |
ESC: ECG Monitoring

T-LOC suspected syncope

Certain diagnosis/mechanism

Treat appropriately

Uncertain diagnosis/mechanism

Syncope

High risk, arrhythmia likely

Low risk, arrhythmia likely & recurrent episodes

Low risk, reflex likely & need for specific therapy

Low risk & rare episodes

T-LOC non-syncopal

Unconfirmed epilepsy

Unexplained falls

Not indicated

In-hospital monitoring (Class I)
If negative

ILR (Class I)

ELR (Class IIa)

ILR (Class IIb)

Holter (Class IIa)
<table>
<thead>
<tr>
<th>Class</th>
<th>Benefit</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>III: No Benefit</td>
<td>B-NR</td>
<td>EPS is not recommended for syncope evaluation in patients with a normal ECG and normal cardiac structure and function, unless an arrhythmic etiology is suspected (134-136).</td>
</tr>
<tr>
<td>III: No Benefit</td>
<td>B-NR</td>
<td>Routine cardiac imaging is not useful in the evaluation of patients with syncope unless cardiac etiology is suspected on the basis of an initial evaluation, including history, physical examination, or ECG (89,92).</td>
</tr>
<tr>
<td>III: No Benefit</td>
<td>B-R</td>
<td>Tilt-table testing is not recommended to predict a response to medical treatments for VVS (152,153).</td>
</tr>
<tr>
<td>III: No Benefit</td>
<td>B-NR</td>
<td>ICD implantation is not recommended in patients with Brugada ECG pattern and reflex-mediated syncope in the absence of other risk factors (205,206).</td>
</tr>
<tr>
<td>III: Harm</td>
<td>B-NR</td>
<td>EPS should not be performed in patients with early repolarization pattern and history of syncope in the absence of other indications (234).</td>
</tr>
<tr>
<td>III: No Benefit</td>
<td>B-R</td>
<td>Beta blockers are not beneficial in pediatric patients with VVS (371,374).</td>
</tr>
</tbody>
</table>
Neurological Evaluation and Tests

5. EEG, ultrasound of neck arteries, and computed tomography or magnetic resonance imaging of the brain are not indicated in patients with syncope.

<table>
<thead>
<tr>
<th>Level</th>
<th>Benefit</th>
<th>Code</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>III: No Benefit</td>
<td>B-NR</td>
<td>Magnetic resonance imaging and computed tomography of the head are not recommended in the routine evaluation of patients with syncope in the absence of focal neurological findings or head injury that support further evaluation (161,162).</td>
<td></td>
</tr>
<tr>
<td>III: No Benefit</td>
<td>B-NR</td>
<td>Carotid artery imaging is not recommended in the routine evaluation of patients with syncope in the absence of focal neurological findings that support further evaluation (92,161-164).</td>
<td></td>
</tr>
<tr>
<td>III: No Benefit</td>
<td>B-NR</td>
<td>Routine recording of an electroencephalogram is not recommended in the evaluation of patients with syncope in the absence of specific neurological features suggestive of a seizure (18,92,163-167).</td>
<td></td>
</tr>
</tbody>
</table>
Pacing for Vasovagal/CSH Syncope

Recurrent Syncope

The evidence does not support the routine use of pacing for reflex-mediated syncope beyond patients with recurrent syncope and asystole documented by implantable loop recorder, such as those meeting the entry criteria for the ISSUE-3 trial.
Treatment of Reflex syncope

### Pharmacological therapy

**Beta-adrenergic blocking drugs are not indicated.**

**Cardiac pacing is not indicated in the absence of a documented cardioinhibitory reflex.**

#### Extrinsic (functional) (Class IIa)

- **CI- CSS** (Class IIa)
- **Asystolic tilt** (Class IIb)

#### Reflex syncope

- **Undocumented syncope (Class III)**
  - Pacing not indicated

- **Pacing indicated**
  - Adenosine-sensitive syncope (Class IIb)

  - Vagally-mediated or
  - Adenosine-sensitive

**Spontaneous asystolic pauses/s**

**Test-induced asystolic pauses/s**

---

The use of adenosine triphosphate in the evaluation of syncope in older patients continues to evolve. In a small, single-blind trial of older patients (mean age 75 years) randomized to active pacing or back-up pacing with documented adenosine triphosphate–sensitive sinoatrial or AV block, there was a 75% risk reduction in syncope recurrence with dual-chamber pacing.
ESC: Reflex Syncope

Reflex syncope

Education, life-style measures (Class I)

Severe/recurrent form

Low BP phenotype

Prodromes

Yes

No or very short

Hypotensive drugs

Dominant cardioinhibition

Younger

• Fludrocortisone (Class IIb)
• Midodrine (Class IIb)

Counter-pressure manoeuvre (Class IIa)

Tilt training (Class IIb)

ILR-guided management in selected cases (Class I); See section 4.2.4

Stop/reduce hypotensive drugs (Class IIa)

Older

Cardiac pacing (Class IIa/IIb) See Figure 10
Recommendations for Reflex Syncope

Recommendation for Pacemakers in VVS

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>RECOMMENDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>IIb</td>
<td>B-R</td>
<td>Recommendations for Carotid Sinus Syndrome</td>
</tr>
</tbody>
</table>

**Recommendations for Carotid Sinus Syndrome**

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>RECOMMENDATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IIA</td>
<td>B-R</td>
<td>Permanent cardiac pacing is reasonable in patients with carotid sinus syndrome that is cardioinhibitory or mixed (267-275).</td>
</tr>
<tr>
<td>IIb</td>
<td>B-R</td>
<td>It may be reasonable to implant a dual-chamber pacemaker in patients with carotid sinus syndrome who require permanent pacing (276-279).</td>
</tr>
</tbody>
</table>
ESC: Vasovagal Syncope

Syncope due to orthostatic hypotension

- Education, life-style measures (Class I)
- Adequate hydration and salt intakes (Class I)

Stop/reduce vasoactive drugs (Class IIa)

if symptoms persist

- Counter-pressure manoeuvres (Class IIa)
- Compression garments (Class IIa)
- Head-up tilt sleeping (Class IIa)
- Midodrine (Class IIa)
- Fludrocortisone (Class IIa)
AHA: Vasovagal Syncope

VVS

Education on diagnosis and prognosis (Class I)

Options

Counter-pressure maneuvers (Class IIa)
Salt and fluid intake (Class IIb)

VVS recurs

Options

Midodrine (Class IIa)
Fludrocortisone (Class IIb)
Beta blocker (in patients ≥42 y) (Class IIb)
Orthostatic training (Class IIb)
Selected serotonin reuptake inhibitors (Class IIb)
Dual-chamber pacemaker therapy (Class IIb)
Droxidopa improves symptoms of neurogenic OH due to Parkinson disease.

Octreotide reduces splanchnic blood flow by which prevents postprandial hypotension.

AHA: Orthostatic Hypotension
4. MANAGEMENT OF CARDIOVASCULAR CONDITIONS

See Online Data Supplements 17 to 24 for data supporting Section 4.

4.1. Arrhythmic Conditions: Recommendations

4.1.1. Bradycardia: Recommendation

**Recommendation for Bradycardia**

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>RECOMMENDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C-E0</td>
<td>In patients with syncope associated with bradycardia, GDMT is recommended (169).</td>
</tr>
</tbody>
</table>

4.1.2. Supraventricular Tachycardia: Recommendations

**Recommendations for Supraventricular Tachycardia**

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>RECOMMENDATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C-E0</td>
<td>In patients with syncope and supraventricular tachycardia, GDMT is recommended (170).</td>
</tr>
<tr>
<td>1</td>
<td>C-E0</td>
<td>In patients with atrial fibrillation, GDMT is recommended (171).</td>
</tr>
</tbody>
</table>

4.1.3. Ventricular Arrhythmia: Recommendation

**Recommendation for Ventricular Arrhythmia (VA)**

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>RECOMMENDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C-E0</td>
<td>In patients with syncope and VA, GDMT is recommended (169,172-174).</td>
</tr>
</tbody>
</table>

4.2. Structural Conditions: Recommendation

4.2.1. Ischemic and Nonischemic Cardiomyopathy: Recommendations

**Recommendation for Ischemic and Nonischemic Cardiomyopathy**

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>RECOMMENDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C-E0</td>
<td>In patients with syncope associated with ischemic and nonischemic cardiomyopathy, GDMT is recommended (169,172).</td>
</tr>
</tbody>
</table>

4.2.2. Valvular Heart Disease: Recommendation

**Recommendation for Valvular Heart Disease**

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>RECOMMENDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C-E0</td>
<td>In patients with syncope associated with valvular heart disease, GDMT is recommended (175).</td>
</tr>
</tbody>
</table>
# ESC: Ventricular Arrhythmias

## Implantable cardioverter defibrillator indications in patients with unexplained syncope and long QT syndrome

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Class&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Level&lt;sup&gt;c&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICD implantation in addition to beta-blockers should be considered in LQTS patients who experience unexplained syncope while receiving an adequate dose of beta-blockers.&lt;sup&gt;46&lt;/sup&gt;</td>
<td>IIA</td>
<td>B</td>
</tr>
<tr>
<td>Left cardiac sympathetic denervation should be considered in patients with symptomatic LQTS when: (1) beta-blockers are not effective, not tolerated, or are contraindicated; (2) ICD therapy is contraindicated or refused; or (3) when patients on beta-blockers with an ICD experience multiple shocks.&lt;sup&gt;46&lt;/sup&gt;</td>
<td>IIA</td>
<td>C</td>
</tr>
<tr>
<td>Instead of an ICD, an ILR should be considered in patients with recurrent episodes of unexplained syncope&lt;sup&gt;a&lt;/sup&gt; who are at low risk of SCD based on a multiparametric analysis that takes into account the other known risk factors for SCD.</td>
<td>IIA</td>
<td>C</td>
</tr>
</tbody>
</table>

## Implantable cardioverter defibrillator indications in patients with unexplained syncope and Brugada syndrome

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Class&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Level&lt;sup&gt;c&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICD implantation should be considered in patients with a spontaneous diagnostic type 1 ECG pattern and a history of unexplained syncope.&lt;sup&gt;a&lt;/sup&gt;</td>
<td>IIA</td>
<td>C</td>
</tr>
<tr>
<td>Instead of an ICD, an ILR should be considered in patients with recurrent episodes of unexplained syncope&lt;sup&gt;a&lt;/sup&gt; who are at low risk of SCD, based on a multiparametric analysis that takes into account the other known risk factors for SCD.</td>
<td>IIA</td>
<td>C</td>
</tr>
</tbody>
</table>

ECG = electrocardiogram; ICD = implantable cardioverter defibrillator; ILR = implantable loop recorder; SCD = sudden cardiac death.

<sup>a</sup>Unexplained (or uncertain) syncope is defined as any syncope that does not meet the class I diagnostic criteria defined in section 4. In the presence of clinical features described in this section, unexplained syncope is considered a risk factor for ventricular tachyarrhythmias.

<sup>b</sup>Class of recommendation.

<sup>c</sup>Level of evidence.
ARVC

### Recommendations for Arrhythmogenic Right Ventricular Cardiomyopathy (ARVC)

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>RECOMMENDATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>B-NR</td>
<td>Implantable cardioverter-defibrillator (ICD) implantation is recommended in patients with ARVC who present with syncope and have a documented sustained VA (177-181).</td>
</tr>
<tr>
<td>IIa</td>
<td>B-NR</td>
<td>ICD implantation is reasonable in patients with ARVC who present with syncope of suspected arrhythmic etiology (177,178,180-182).</td>
</tr>
</tbody>
</table>

### Arrhythmogenic right ventricular cardiomyopathy

3. ICD implantation may be considered in patients with ARVC and a history of unexplained syncope.  
   - IIb  
   - C

4. Instead of an ICD, an ILR should be considered in patients with recurrent episodes of unexplained syncope with systolic impairment but without a current indication for ICD.  
   - IIa  
   - C
Long QT Syndrome

Recommendations for Long-QT Syndrome (LQTS)

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>RECOMMENDATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>B-NR</td>
<td>Beta-blocker therapy, in the absence of contraindications, is indicated as a first-line therapy in patients with LQTS and suspected arrhythmic syncope (207-209).</td>
</tr>
<tr>
<td>IIa</td>
<td>B-NR</td>
<td>ICD implantation is reasonable in patients with LQTS and suspected arrhythmic syncope who are on beta-blocker therapy or are intolerant to beta-blocker therapy (208,210-214).</td>
</tr>
<tr>
<td>IIa</td>
<td>C-LD</td>
<td>Left cardiac sympathetic denervation is reasonable in patients with LQTS and recurrent syncope of suspected arrhythmic mechanism who are intolerant to beta-blocker therapy or for whom beta-blocker therapy has failed (215-217).</td>
</tr>
</tbody>
</table>

Long QT syndrome

1. ICD implantation in addition to beta-blockers should be considered in LQTS patients who experience unexplained syncopea while receiving an adequate dose of beta-blockers.  
   IIa     B

2. Left cardiac sympathetic denervation should be considered in patients with symptomatic LQTS when:
   (a) beta-blockers are not effective, not tolerated, or are contraindicated;
   (b) ICD therapy is contraindicated or refused; or
   (c) when patients on beta-blockers with an ICD experience multiple shocks.  
   IIa     C

3. Instead of an ICD, an ILR may be considered in patients with recurrent episodes of unexplained syncope with systolic impairment but without a current indication for ICD.  
   IIa     C
### Syncope and Driving

#### Recommendation for Driving and Syncope

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>RECOMMENDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>IIA</td>
<td>C-EO</td>
<td>It can be beneficial for healthcare providers managing patients with syncope to know the driving laws and restrictions in their regions and discuss implications with the patient.</td>
</tr>
</tbody>
</table>
# Advice for Driving in Patients with Syncope

<table>
<thead>
<tr>
<th>Disorder causing syncope</th>
<th>Group 1 (private drivers)</th>
<th>Group 2 (professional drivers)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cardiac arrhythmias</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Untreated arrhythmias</td>
<td>Unfit to drive</td>
<td>Unfit to drive</td>
</tr>
<tr>
<td>Cardiac arrhythmia, life-threatening, medical treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reflex syncope</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single/mild</td>
<td>No restrictions unless it occurred during driving.</td>
<td>No restriction unless it occurred during driving or without prodromes.</td>
</tr>
<tr>
<td>Recurrent and severe</td>
<td>After successful treatment is established.</td>
<td>After successful treatment is established. Particular caution if it occurred during driving or without prodromes.</td>
</tr>
<tr>
<td>Unexplained syncope</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No restrictions unless absence of prodrome, occurrence during driving, or presence of severe structural heart disease. If yes, after diagnosis and appropriate therapy is established.</td>
<td>After diagnosis and appropriate therapy is established.</td>
</tr>
</tbody>
</table>
## ESC: Video Recording

### Recommendations

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Class</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Home video recordings of spontaneous events should be considered. Physicians should encourage patients and their relatives to obtain home video recordings of spontaneous events.</td>
<td>IIA</td>
<td>C</td>
</tr>
<tr>
<td>2. Adding video recording to tilt testing may be considered in order to increase reliability of clinical observation of induced events.</td>
<td>IIB</td>
<td>C</td>
</tr>
</tbody>
</table>

### Recommendation for History and Physical Examination

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>B-NR</td>
<td>A detailed history and physical examination should be performed in patients with syncope.</td>
</tr>
</tbody>
</table>
Help with the Guidelines

Available on www.escardio.org/Guidelines