

Table 1. ACC/AHA/HRS 2017 GL on syncope

Term	Definition/Comments
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).
Loss of consciousness	A cognitive state in which one lacks awareness of oneself and one's situation, with an inability to respond to stimuli.
Transient loss of consciousness	Self-limited loss of consciousness (30) can be divided into syncope and nonsyncope conditions. Nonsyncope conditions include but are not limited to seizures, hypoglycemia, metabolic conditions, drug or alcohol intoxication, and concussion due to head trauma. The underlying mechanism of syncope is presumed to be cerebral hypoperfusion, whereas nonsyncope conditions are attributed to different mechanisms.
Presyncope (near-syncope)	The symptoms before syncope. These symptoms could include extreme lightheadedness; visual sensations, such as “tunnel vision” or “graying out”; and variable degrees of altered consciousness without complete loss of consciousness. Presyncope could progress to syncope, or it could abort without syncope.
Unexplained syncope (syncope of undetermined etiology)	Syncope for which a cause is undetermined after an initial evaluation that is deemed appropriate by the experienced healthcare provider. The initial evaluation includes but is not limited to a thorough history, physical examination, and ECG.
Orthostatic intolerance	A syndrome consisting of a constellation of symptoms that include frequent, recurrent, or persistent lightheadedness, palpitations, tremulousness, generalized weakness, blurred vision, exercise intolerance, and fatigue upon standing. These symptoms can occur with or without orthostatic tachycardia, OH, or syncope. Individuals with orthostatic intolerance have ≥ 1 of these symptoms associated with reduced ability to maintain upright posture.
Orthostatic tachycardia	A sustained increase in heart rate of ≥ 30 bpm within 10 min of moving from a recumbent to a quiet (nonexertional) standing position (or ≥ 40 bpm in individuals 12–19 y of age)
Orthostatic hypotension (OH)	A drop in systolic BP of ≥ 20 mm Hg or diastolic BP of ≥ 10 mm Hg with assumption of an upright posture.

Initial (immediate) OH

A transient BP decrease within 15 s after standing, with presyncope or syncope.

Classic OH

A sustained reduction of systolic BP of ≥ 20 mm Hg or diastolic BP of ≥ 10 mm Hg within 3 min of assuming upright posture.

Delayed OH

A sustained reduction of systolic BP of ≥ 20 mm Hg (or 30 mm Hg in patients with supine hypertension) or diastolic BP of ≥ 10 mm Hg that takes >3 min of upright posture to develop. The fall in BP is usually gradual until reaching the threshold.

Neurogenic OH

A subtype of OH that is due to dysfunction of the autonomic nervous system and not solely due to environmental triggers (e.g., dehydration or drugs). Neurogenic OH is due to lesions involving the central or peripheral autonomic nerves.

**Cardiac
(cardiovascular)
syncope**

Syncope caused by bradycardia, tachycardia, or hypotension due to low cardiac index, blood flow obstruction, vasodilatation, or acute vascular dissection.

Noncardiac syncope

Syncope due to noncardiac causes which include reflex syncope, OH, volume depletion, dehydration, and blood loss.

**Reflex (neurally
mediated) syncope**

Syncope due to a reflex that causes vasodilation, bradycardia, or both.

Table 2. 2018 ESC GL on syncope.

Classification of syncope

Reflex (neurally mediated) syncope Vasovagal: - orthostatic VVS: standing, less common sitting - emotional: fear, pain (somatic or visceral), instrumentation, blood phobia Situational: - micturition - gastrointestinal stimulation (swallow, defaecation) - cough, sneeze - post-exercise - others (e.g. laughing, brass instrument playing) Carotid sinus syndrome Non-classical forms (without prodromes and/or without apparent triggers and/or atypical presentation)
Syncope due to OH <i>Note that hypotension may be exacerbated by venous pooling during exercise (exercise-induced), after meals (postprandial hypotension), and after prolonged bed rest (deconditioning).</i> Drug-induced OH (most common cause of OH): - e.g. vasodilators, diuretics, phenothiazine, antidepressants Volume depletion: - haemorrhage, diarrhoea, vomiting, etc. Primary autonomic failure (neurogenic OH): - pure autonomic failure, multiple system atrophy, Parkinson's disease, dementia with Lewy bodies Secondary autonomic failure (neurogenic OH): - diabetes, amyloidosis, spinal cord injuries, auto-immune autonomic neuropathy, paraneoplastic autonomic neuropathy, kidney failure
Cardiac syncope Arrhythmia as primary cause: Bradycardia: - sinus node dysfunction (including bradycardia/tachycardia syndrome) - atrioventricular conduction system disease Tachycardia: - supraventricular - ventricular Structural cardiac: aortic stenosis, acute myocardial infarction/ischaemia, hypertrophic cardiomyopathy, cardiac masses (atrial myxoma, tumours, etc.), pericardial disease/tamponade, congenital anomalies of coronary arteries, prosthetic valve dysfunction Cardiopulmonary and great vessels: pulmonary embolus, acute aortic dissection, pulmonary hypertension
Remarks • All forms of syncope, but mostly reflex syncope and OH, are more likely to occur or are more severe when various factors are present: medication causing low BP (due to vasodilatation or hypovolaemia), alcohol use, volume depletion (haemorrhage, low fluid intake, diarrhoea, vomiting), pulmonary diseases causing reduction in brain oxygen supply, environmental factors (thermal stress). • There are two main pathophysiological mechanisms in reflex syncope. "Vasodepression" refers to conditions in which insufficient sympathetic vasoconstriction results in hypotension.^{1,2} "Cardioinhibition" is used when bradycardia or asystole predominates, reflecting a shift towards parasympathetic predominance. The haemodynamic pattern, i.e. cardioinhibitory, vasodepressive, or both, is independent of the trigger evoking reflex syncope. For example, micturition syncope and orthostatic VVS may equally well present as cardioinhibitory or as vasodepressor syncope • The non-classical form of reflex syncope involves a heterogeneous group of patients. The term is used to describe reflex syncope that occurs with uncertain or apparently absent triggers and/or atypical presentation. The diagnosis of reflex syncope is probable when other causes of syncope are excluded (absence of structural heart disease) and/or symptoms are reproduced in the tilt test.³ At present, this group also contains syncope associated with low adenosine plasma levels^{4,5} • The cardiovascular causes of orthostatic intolerance include classical OH, initial OH, delayed OH, POTS, and VVS, which in this context can be called orthostatic VVS.^{6,7} Syndromes of orthostatic intolerance that may cause syncope are presented in <i>Web Practical Instruction section 2</i>.

BP = blood pressure; OH = orthostatic hypotension; POTS = postural orthostatic tachycardia syndrome; VVS = vasovagal syncope.

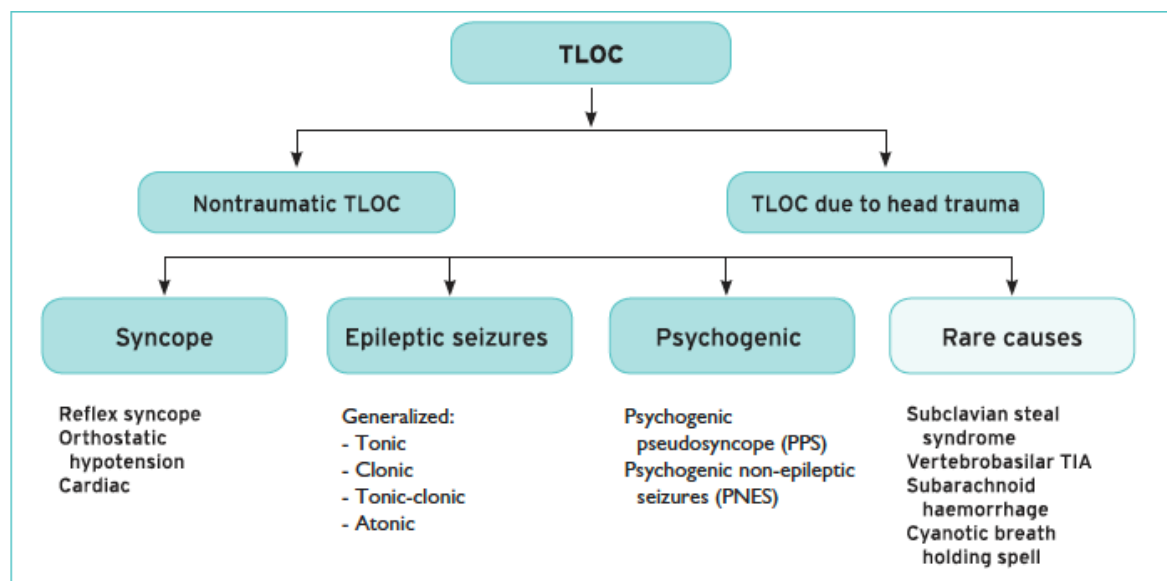


Figure 1. ESC 2018 GL on syncope. Syncope in the context of transient loss of consciousness.

Non-traumatic transient loss of consciousness is classified into one of four groupings: syncope, epileptic seizures, psychogenic transient loss of consciousness, and a miscellaneous group of rare causes. This order represents their rate of occurrence. Combinations occur; e.g. non-traumatic transient loss of consciousness causes can cause falls with concussion, in which case transient loss of consciousness is both traumatic and non-traumatic.

TIA = transient ischaemic attack; TLOC = transient loss of consciousness.

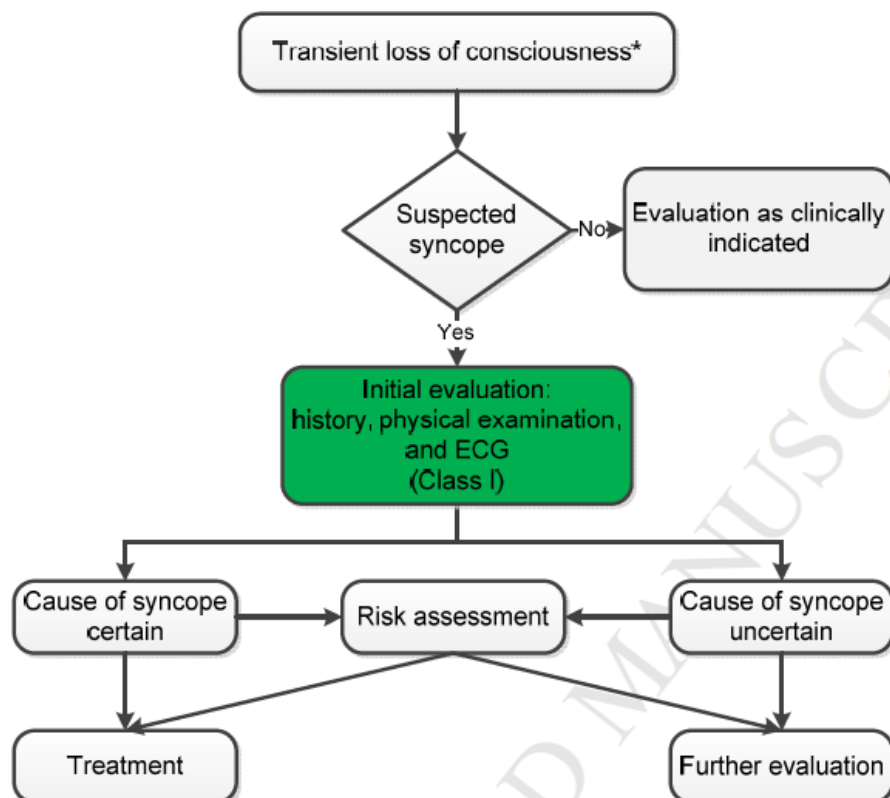


Figure 2. ACC/AHA/HRS 2017 GL on Syncope. Syncope Initial Evaluation

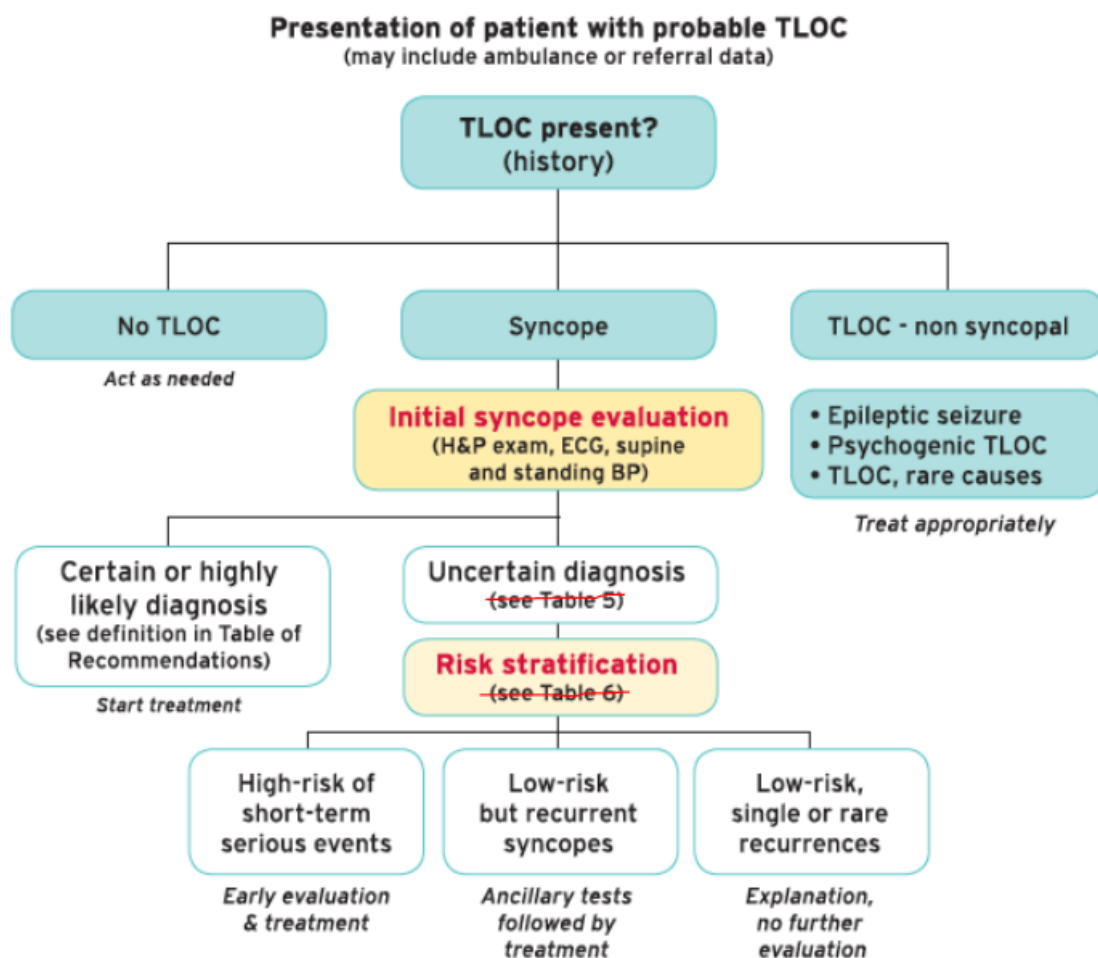


Figure 3. ESC 2018 GL on syncope. Flow diagram for the initial evaluation and risk stratification of patients with syncope.

BP = blood pressure; ECG = electrocardiogram; H&P exam= history and physical examination; TLOC = transient loss of consciousness.

Table 3. 2018 ESC GL on syncope. Conditions that may be incorrectly diagnosed as syncope

Condition	Characteristic features that distinguish from syncope
Generalized seizures	See section 8, Table 10.
Complex partial seizures, absence epilepsy	No falls, yet unresponsive and later amnesia
PPS or “pseudocoma”	Duration of apparent LOC lasting many minutes to hours; high frequency, up to several times a day
Falls without TLOC	No unresponsiveness or amnesia
Catatlexy	Falls with flaccid paralysis and non-responsive, yet no later amnesia
Intracerebral or sub-arachnoid haemorrhage	Consciousness may be progressively reduced rather than immediately lost. Accompanying severe headache, other neurological signs
Vertebrobasilar TIA	Always focal neurological signs and symptoms, usually without LOC; if consciousness is lost this usually lasts longer than in TLOC.
Carotid TIA	Consciousness is for all practical purposes not lost in carotid TIAs, but there are pronounced focal neurological signs and symptoms
Subclavian steal syndrome	Associated with focal neurological signs
Metabolic disorders including hypoglycaemia, hypoxia, hyperventilation with hypocapnia	Duration much longer than in TLOC; consciousness may be impaired instead of lost
Intoxication	Duration much longer than in TLOC; consciousness may be impaired instead of lost
Cardiac arrest	LOC yet no spontaneous recovery
Coma	Duration much longer than TLOC

LOC = loss of consciousness; PPS = psychogenic pseudosyncope; TIA = transient ischaemic attack; TLOC = transient loss of consciousness.

TABLE 4. 2018 ESC GL on syncope. Clinical features that can suggest a diagnosis on initial evaluation

Reflex syncope ● Long history of recurrent syncope, in particular occurring before the age of 40 years ● After unpleasant sight, sound, smell, or pain ● Prolonged standing ● During meal ● Being in crowded and/or hot places ● Autonomic activation before syncope: pallor, sweating, and/or nausea/vomiting ● With head rotation or pressure on carotid sinus (as in tumours, shaving, tight collars) ● Absence of heart disease
Syncope due to OH ● While or after standing ● Prolonged standing ● Standing after exertion ● Post-prandial hypotension ● Temporal relationship with start or changes of dosage of vasodepressive drugs or diuretics leading to hypotension ● Presence of autonomic neuropathy or parkinsonism
Cardiac syncope ● During exertion or when supine ● Sudden onset palpitation immediately followed by syncope ● Family history of unexplained sudden death at young age ● Presence of structural heart disease or coronary artery disease ● ECG findings suggesting arrhythmic syncope: - Bifascicular block (defined as either left or right BBB combined with left anterior or left posterior fascicular block) - Other intraventricular conduction abnormalities (QRS duration ≥ 0.12 s) - Mobitz I second-degree AV block and 1° degree AV block with markedly prolonged PR interval - Asymptomatic mild inappropriate sinus bradycardia (40–50 b.p.m.) or slow atrial fibrillation (40–50 b.p.m.) in the absence of negatively chronotropic medications - Non-sustained VT - Pre-excited QRS complexes - Long or short QT intervals - Early repolarization - ST-segment elevation with type 1 morphology in leads V1-V3 (Brugada pattern) - Negative T waves in right precordial leads, epsilon waves suggestive of ARVC - Left ventricular hypertrophy suggesting hypertrophic cardiomyopathy

ARVC = arrhythmogenic right ventricular cardiomyopathy; AV = atrioventricular; BBB = bundle branch block; b.p.m. = beats per minute; ECG = electrocardiogram; OH = orthostatic hypotension; VT = ventricular tachycardia.

Table 5. ACC/AHA/HRS 2017 GL on syncope.

Historical Characteristics Associated With Increased Probability of Cardiac and Noncardiac Causes of Syncope

More Often Associated With Cardiac Causes of Syncope
• Older age (>60 y)
• Male sex
• Presence of known ischemic heart disease, structural heart disease, previous arrhythmias, or reduced ventricular function
• Brief prodrome, such as palpitations, or sudden loss of consciousness without prodrome
• Syncope during exertion
• Syncope in the supine position
• Low number of syncope episodes (1 or 2)
• Abnormal cardiac examination
• Family history of inheritable conditions or premature SCD (<50 y of age)
• Presence of known congenital heart disease
More Often Associated With Noncardiac Causes of Syncope
• Younger age
• No known cardiac disease
• Syncope only in the standing position
• Positional change from supine or sitting to standing
• Presence of prodrome: nausea, vomiting, feeling warmth
• Presence of specific triggers: dehydration, pain, distressful stimulus, medical environment
• Situational triggers: cough, laugh, micturition, defecation, deglutition
• Frequent recurrence and prolonged history of syncope with similar characteristics

SCD indicates sudden cardiac death.

Table 6. 2018 ESC GL on syncope. Diagnostic criteria with initial evaluation**Reflex syncope and OH**

VVS is highly probable if syncope is precipitated by pain, fear, or standing, and is associated with typical progressive prodrome (pallor, sweating, and/or nausea). I-C

Situational reflex syncope is highly probable if syncope occurs during or immediately after specific triggers, listed in Table 1. I-C

Syncope due to OH is confirmed when syncope occurs while standing and there is concomitant significant OH. I-C

In the absence of the above criteria, reflex syncope and OH are likely when the features that suggest reflex syncope or OH are present and the features that suggest cardiac syncope are absent (see Table 4). IIa-C

Cardiac syncope

Arrhythmic syncope is highly probable when the ECG shows: I-C

- Persistent sinus bradycardia <40 b.p.m. or sinus pauses >3 s in awake state and in absence of physical training;
- Mobitz II second- and third-degree AV block;
- Alternating left and right BBB;
- VT or rapid paroxysmal SVT;
- Non-sustained episodes of polymorphic VT and long or short QT interval; or
- Pacemaker or ICD malfunction with cardiac pauses.

Cardiac ischaemia-related syncope is confirmed when syncope presents with evidence of acute myocardial ischaemia with or without myocardial infarction. I-C

Syncope due to structural cardiopulmonary disorders is highly probable when syncope presents in patients with prolapsing atrial myxoma, left atrial ball thrombus, severe aortic stenosis, pulmonary embolus, or acute aortic dissection. I-C

Additional advice and clinical perspectives

The initial syncope evaluation, as described in this document, can define the cause of syncope in most patients. Strict adherence to the above definitions of VVS and situational reflex syncope, and of syncope due to OH, can be considered certain or highly likely irrespective of the presence of any other abnormal finding. In young subjects with unexplained syncope and no history of cardiac disease, no family history of sudden death, no supine syncope or syncope during sleep or exercise, no unusual triggers, and a normal ECG, the chance of cardiac syncope is very low. SCD rates in subjects <35 years amount to 1 – 3/100 000.

AV = atrioventricular; BBB = bundle branch block; b.p.m. = beats per minute; ECG = electrocardiogram; ICD = implantable cardioverter defibrillator; OH = orthostatic hypotension; SCD = sudden cardiac death; SVT = supraventricular tachycardia; VT = ventricular tachycardia; VVS = vasovagal syncope.

Table 7. 2018 ESC GL on syncope. Differentiating syncope from epileptic seizures

Clinical feature	Syncope	Epileptic seizures
Useful features		
Presence of trigger	Very often	Rare
Nature of trigger	Differs between types: pain, standing, emotions for VVS; specific trigger for situational syncope; standing for OH	Flashing lights is best known; also range of rare triggers
Prodromes	Often presyncope (autonomic activation in reflex syncope, light-headedness in OH, palpitations in cardiac syncope)	Epileptic aura: repetitive, specific for each patient. Includes <i>déjà vu</i> . Rising sensation in the abdomen (epigastric aura) and/or an unusual unpleasant smell
Detailed characteristics of myoclonus	• <10, irregular in amplitude, asynchronous, asymmetrical • Starts after the onset of LOC	• 20–100, synchronous, symmetrical, hemilateral • The onset mostly coincides with LOC • Clear long-lasting automatisms as chewing or lip smacking at the mouth
Tongue bite	Rare, tip of tongue	Side of tongue (rarely bilateral)
Duration of restoration of consciousness	10–30 seconds	May be many minutes
Confusion after attack	No understanding of situation for <10 seconds in most syncope, full alertness and awareness afterwards	Memory deficit, i.e. repeated questions without imprinting for many minutes
Features of limited utility		
Incontinence	Not uncommon	Common
Presence of myoclonus (see below for nature of myoclonus)	Very often	~60%, dependent on accuracy of observation
Eyes open during LOC	Frequent	Nearly always
Fatigue and sleep afterwards	Common, particularly in children	Very common
Blue face	Rare	Fairly often
LOC = loss of consciousness; OH = orthostatic hypotension; VVS = vasovagal syncope.		

Table 8. ACC/AHA/HRS 2017 GL on syncope**Recommendations for Risk Assessment**

Evaluation of the cause and assessment for the short- and long-term morbidity and mortality risk of syncope are recommended	I-B-NR
Use of risk stratification scores may be reasonable in the management of patients with syncope	IIB-B-NR

Short- and Long-Term Risk Factors**Short-Term Risk Factors (≤ 30 d)****Long-Term Risk Factors (>30 d)*****History: Outpatient Clinic or ED Evaluation***

Male sex	Male sex
Older age (>60 y)	Older age
No prodrome	Absence of nausea/vomiting preceding syncopal event
Palpitations preceding loss of consciousness	VA
Exertional syncope	Cancer
Structural heart disease	Structural heart disease
HF	HF
Cerebrovascular disease	Cerebrovascular disease
Family history of SCD	Diabetes mellitus
Trauma	High CHADS-2 score

Physical Examination or Laboratory Investigation

Evidence of bleeding	Abnormal ECG
Persistent abnormal vital signs	Lower GFR
Abnormal ECG	
Positive troponin	

CHADS-2 indicates congestive heart failure, hypertension, age ≥ 75 years, diabetes mellitus, and stroke or transient ischemic attack; ECG, electrocardiogram; ED, emergency department; GFR, glomerular filtration rate; HF, heart failure; SCD, sudden cardiac death; and VA, ventricular arrhythmias.

Table 9. Canadian Syncope Risk Score

- Vasovagal predisposition (Triggered by being in a warm crowded place, prolonged standing, fear, emotion or pain): -1
- History of heart disease : +1
- Any ED systolic blood pressure (BP) 180mmHg : +2
- Troponin elevated (>99thpercentile normal population) +2
- Abnormal QRS Axis (<-30 or >100) : +1
- QRS duration >130 milliseconds : +1
- Corrected QT interval >480milliseconds: +2
- Diagnosis in the ED : Vasovagal syncope : -2
- Diagnosis in the ED : Cardiac syncope : +2

The point score is found as the sum of the mentioned risk factors:

Score>=4: high estimated risk of adverse effects (13-20%)

Score>=6: very high estimated risk of adverse effects (29-84%)

Thiruganasambandamoorthy V, et al. Development of the Canadian Syncope Risk Score to predict serious adverse events after emergency department assessment of syncope. *CMAJ*. 2016;188:E289-E298

Table 10. 2018 ESC GL on syncope. High-risk features (that suggest a serious condition) and low-risk features (that suggest a benign condition) in patients with syncope at initial evaluation in the emergency department

SYNCOPE EVENT	
Low-risk	
• Associated with prodrome typical of reflex syncope (e.g. light-headedness, feeling of warmth, sweating, nausea, vomiting)^{36,49} • After sudden unexpected unpleasant sight, sound, smell, or pain^{36,49,50} • After prolonged standing or crowded, hot places³⁶ • During a meal or postprandial⁵¹ • Triggered by cough, defaecation, or micturition⁵² • With head rotation or pressure on carotid sinus (e.g. tumour, shaving, tight collars)⁵³ • Standing from supine/sitting position⁵⁴	
High-risk	
Major	
• New onset of chest discomfort, breathlessness, abdominal pain, or headache^{26, 44, 55} • Syncope during exertion or when supine³⁶ • Sudden onset palpitation immediately followed by syncope³⁶	
Minor (high-risk only if associated with structural heart disease or abnormal ECG):	
• No warning symptoms or short (<10 s) prodrome^{36, 38, 49, 56} • Family history of SCD at young age⁵⁷ • Syncope in the sitting position⁵⁴	
PAST MEDICAL HISTORY	
Low-risk	
• Long history (years) of recurrent syncope with low-risk features with the same characteristics of the current episode⁵⁸ • Absence of structural heart disease^{27, 58}	
High-risk	
Major	
• Severe structural or coronary artery disease (heart failure, low LVEF or previous myocardial infarction)^{26, 27, 35, 55, 59}	
PHYSICAL EXAMINATION	
Low-risk	
• Normal examination	

PHYSICAL EXAMINATION	
High-risk	
Major	
• Unexplained systolic BP in the ED <90 mmHg^{26, 55} • Suggestion of gastrointestinal bleed on rectal examination⁴⁴ • Persistent bradycardia (<40 b.p.m.) in awake state and in absence of physical training • Undiagnosed systolic murmur⁶⁰	
ECG^a	
Low-risk	
• Normal ECG^{26, 35, 36, 55}	
High-risk	
Major	Minor (high-risk only if history consistent with arrhythmic syncope)
• ECG changes consistent with acute ischaemia • Mobitz II second- and third-degree AV block • Slow AF (<40 b.p.m.) • Persistent sinus bradycardia (<40 b.p.m.), or repetitive sinoatrial block or sinus pauses >3 seconds in awake state and in absence of physical training • Bundle branch block, intraventricular conduction disturbance, ventricular hypertrophy, or Q waves consistent with ischaemic heart disease or cardiomyopathy^{44, 56} • Sustained and non-sustained VT • Dysfunction of an implantable cardiac device (pacemaker or ICD) • Type 1 Brugada pattern • ST-segment elevation with type 1 morphology in leads V1-V3 (Brugada pattern) • QTc >460 ms in repeated 12-lead ECGs indicating LQTS⁴⁶	• Mobitz I second-degree AV block and 1°degree AV block with markedly prolonged PR interval • Asymptomatic inappropriate mild sinus bradycardia (40–50 b.p.m.), or slow AF (40–50 b.p.m.)⁵⁶ • Paroxysmal SVT or atrial fibrillation⁵⁰ • Pre-excited QRS complex • Short QTc interval (≤340 ms)⁴⁶ • Atypical Brugada patterns⁴⁶ • Negative T waves in right precordial leads, epsilon waves suggestive of ARVC⁴⁶

AF = atrial fibrillation; ARVC = arrhythmogenic right ventricular cardiomyopathy; AV = atrioventricular; BP = blood pressure; b.p.m. = beats per minute; ECG = electrocardiogram; ED = emergency department; ICD = implantable cardioverter defibrillator; LQTS = long QT syndrome; LVEF = left ventricular ejection fraction; SCD = sudden cardiac death; SVT = supraventricular tachycardia; VT = ventricular tachycardia.

a Some ECG criteria are per se diagnostic of the cause of the syncope (see recommendations: Diagnostic criteria); in such circumstances appropriate therapy is indicated without further investigations. We strongly suggest the use of standardized criteria to identify ECG abnormalities with the aim of precise diagnosis of ECG-defined cardiac syndromes in ED practice.

Table 11. ACC/AHA/HRS 2017 GL on syncope . Disposition after initial evaluation

Hospital evaluation and treatment for patients presenting with syncope who have a serious medical condition potentially relevant to the cause of syncope identified during initial evaluation	I-B-NR
Manage patients with presumptive reflex-mediated syncope in the outpatient setting in the absence of serious medical conditions	IIa-C-LD
In intermediate-risk patients with an unclear cause of syncope, use of a structured emergency department observation protocol for in reducing hospital admission	IIa-B-R
Manage selected patients with suspected cardiac syncope in the outpatient setting in the absence of serious medical conditions	IIb-C-LD

Table 12. 2018 ESC GL on syncope. High-risk syncope patients: criteria favouring a stay in an emergency department observation unit and/or fast-tracking to a syncope unit vs. requiring admission to hospital

Favour initial management in ED observation unit and/or fast-track to syncope unit	Favour admission to hospital
High-risk features AND: ● Stable, known structural heart disease ● Severe chronic disease ● Syncope during exertion ● Syncope while supine or sitting ● Syncope without prodrome ● Palpitations at the time of syncope ● Inadequate sinus bradycardia or sinoatrial block ● Suspected device malfunction or inappropriate intervention ● Pre-excited QRS complex ● SVT or paroxysmal atrial fibrillation ● ECG suggesting an inheritable arrhythmogenic disorders ● ECG suggesting ARVC	High-risk features AND: ● Any potentially severe coexisting disease that requires admission ● Injury caused by syncope ● Need of further urgent evaluation and treatment if it cannot be achieved in another way (i.e. observation unit), e.g. ECG monitoring, echocardiography, stress test, electrophysiological study, angiography, device malfunction, etc. ● Need for treatment of syncope

ARVC = arrhythmogenic right ventricular cardiomyopathy; ECG = electrocardiogram; ED = emergency department; SVT = supraventricular tachycardia.

Table 13. 2018 ESC GL on syncope. Management of syncope in the emergency department

Patients with low-risk features, likely to have reflex or situational syncope, or syncope due to OH, are discharged from the ED.	I-B
Patients with high-risk features receive an early intensive and prompt evaluation in a syncope unit or in an ED observation unit (if available), or are hospitalized.	I-B
Patients who have neither high- nor low-risk features are observed in the ED or in a syncope unit instead of being hospitalized.	I-B
Risk stratification scores may be considered for risk stratification in the ED.	IIB-B

Additional advice and clinical perspectives

- In the ED, presyncope should be managed with the same accuracy as syncope as it carries the same prognosis.
- Diagnostic radiology and laboratory tests such as chest X-ray, brain computed tomography, routine blood haematology, biochemistry, and D-dimer and cardiac markers have a low diagnostic yield, impact on risk stratification of patients with syncope, and should not routinely be used unless specifically suggested by clinical evaluation.
- Around 10% of patients with syncope in the ED will suffer from a serious outcome within 7–30 days of their visit, with just under half occurring after their stay in the ED. It is crucial to identify these high-risk patients to ensure early, rapid, and intensive investigation.
- As syncope units are both effective and efficient, this early, rapid, and intensive investigation can be performed on an outpatient basis (either in a syncope unit or an ED observation unit) in most cases. Only patients with a risk of a short-term serious outcome should be considered for hospital admission.
- To reduce inappropriate admissions, patients who have a cardiac device and syncope should undergo prompt device interrogation.
- Risk stratification scores perform no better than good clinical judgement and should not be used alone to perform risk stratification in the ED.

ED = emergency department; OH = orthostatic hypotension.

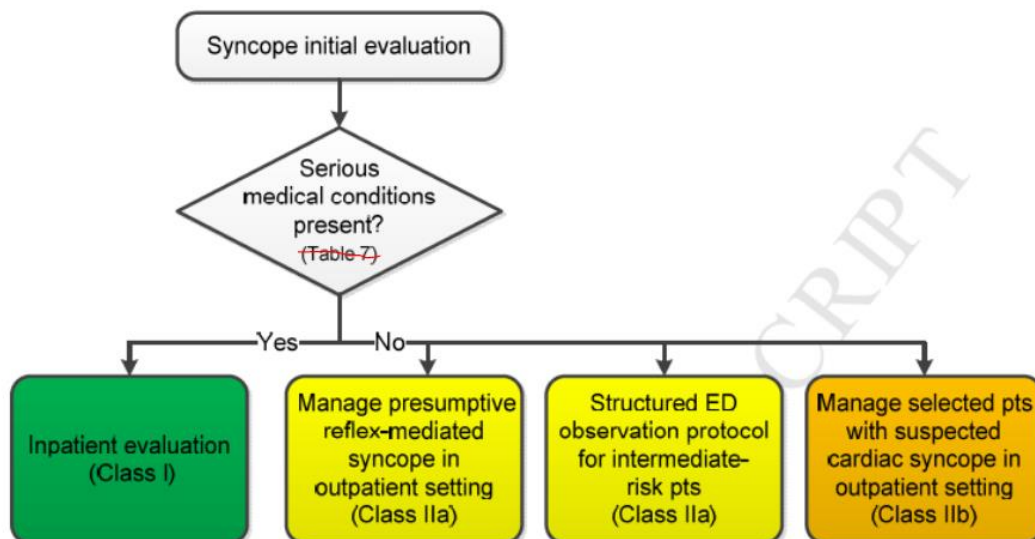


Figure 4. ACC/AHA/HRS 2017 GL on Syncope. Patient Disposition After Initial Evaluation for Syncope

ED indicates emergency department

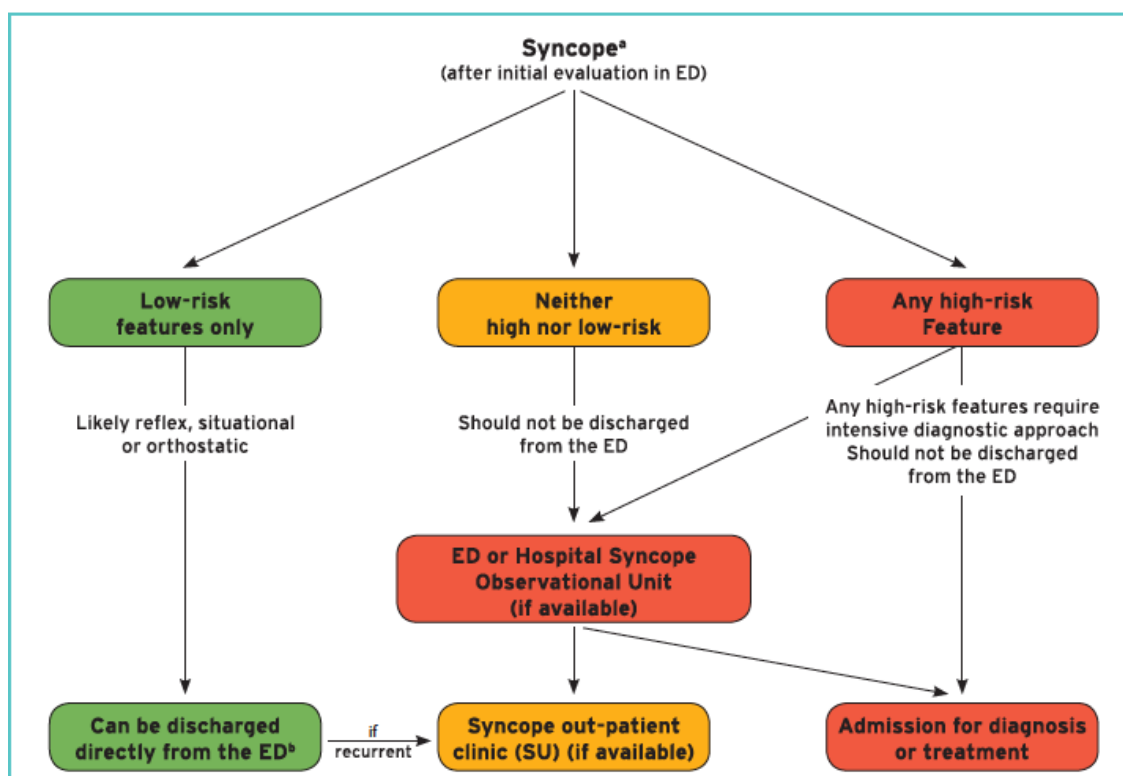


Figure 5. ESC 2018 GL on syncope. Emergency department risk stratification flow chart.

ED= emergency department; SU = syncope unit.

Patients with low-risk features. These patients do not need further diagnostic tests in the ED as they are likely to have reflex, situational, or orthostatic syncope. They may benefit from reassurance, or counselling (see Web Practical Instructions section 9.1: ESC information sheet for patients affected by reflex syncope).

Patients with high-risk features. These patients should be classified as HIGH RISK; they require an intensive diagnostic approach and may need urgent treatment and admission. These patients should be monitored (although it is unclear for how long this should be, most studies suggesting up to 6 hours in the ED and up to 24 hours in hospital) in a setting where resuscitation can be performed in case of Deterioration.

Patients that have neither high- nor low-risk features. These patients will require expert syncope opinion, which can probably be safely managed in an outpatient setting. There is no direct evidence that admitting patients to hospital changes their outcome, whilst there is evidence that management in an ED observation unit and/or fast-track to a syncope outpatient unit is beneficial.

a Recent studies have suggested that outcomes in patients presenting with presyncope are similar to those presenting with syncope.

b These patients may still require admission to hospital for associated illness, injury or welfare reasons. Low-risk patients can be referred to the outpatient syncope clinic for therapy purposes, if needed.

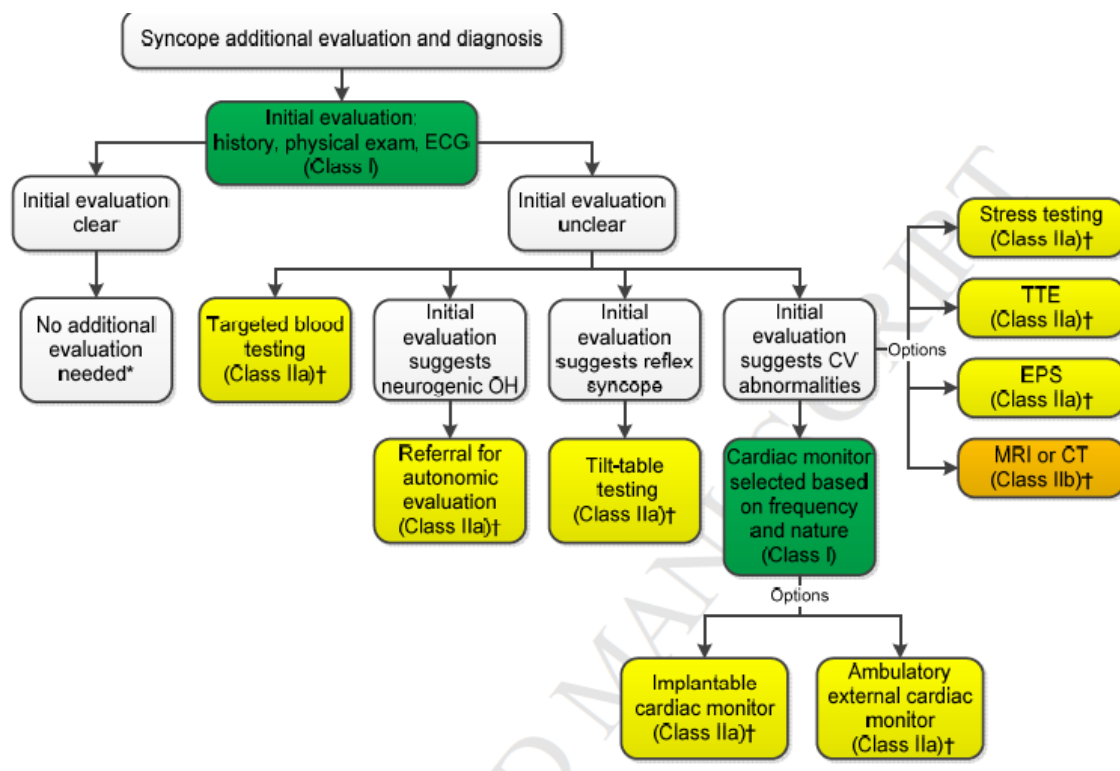


Figure 6. ACC/AHA/HRS 2017 GL on Syncope. Additional Evaluation and Diagnosis for Syncope

†In selected patients

Table 14. ACC/AHA/HRS 2017 GL on syncope .

Electrocardiography

In the initial evaluation of patients with syncope, a resting 12-lead electrocardiogram 1 B-NR

Blood testing

Targeted blood tests on the basis of clinical assessment from history, physical examination, and ECG IIa-B-NR

Usefulness of brain natriuretic peptide and high-sensitivity troponin measurement is uncertain in patients for whom a cardiac cause of syncope is suspected IIb-C-LD

Routine and comprehensive laboratory testing is not useful III-B-NR (no benefit)

Table 15. 2018 ESC GL on syncope. Echocardiography**Indications**

Diagnosis and risk stratification in patients with suspected structural heart disease.	I-B
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Two-dimensional and Doppler echocardiography during exercise in the standing, sitting, or semi-supine position to detect provokable left ventricular outflow tract obstruction in patients with HCM, a history of syncope, and a resting or provoked peak instantaneous left ventricular outflow tract gradient <50 mmHg.	I-B
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Diagnostic criteria

Aortic stenosis, obstructive cardiac tumours or thrombi, pericardial tamponade, and aortic dissection are the most probable causes of syncope when the ECG shows the typical features of these conditions.	I-C
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Additional advice and clinical perspectives

- For patients without suspected cardiac disease after history taking, physical examination, and electrocardiography, the ECG does not provide additional useful information, suggesting that syncope alone is not an indication for echocardiography.
- Computed tomography or MRI should be considered in selected patients presenting with syncope of suspected cardiac structural origin when echocardiography is not diagnostic.

ECG = echocardiogram; HCM = hypertrophic cardiomyopathy; MRI = magnetic resonance imaging.

Table 16. ACC/AHA/HRS 2017 GL on syncope . Cardiac imaging

Transthoracic echocardiography if structural heart disease is suspected	Ila-B-NR
Computed tomography or magnetic resonance in selected patients presenting with syncope of suspected cardiac etiology	Iib-B-NR
Routine cardiac imaging is not useful if cardiac etiology is not suspected	III-B-NR (no benefit)

Table 17. Exercise testing**ACC/AHA/HRS 2017 GL on syncope .**

Exercise stress testing in selected patients who experience syncope or presyncope during exertion	IIa-C-LD
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2018 ESC GL on syncope.**Indications**

Patients who experience syncope during or shortly after exertion.	I-C
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Diagnostic criteria

Syncope due to second- or third-degree AV block is confirmed when the AV block develops during exercise, even without syncope.	I-C
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Reflex syncope is confirmed when syncope is reproduced immediately after exercise in the presence of severe hypotension.	I-C
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Additional advice and clinical perspectives

There are no data supporting routine exercise testing in patients with syncope

Table 18. 2018 ESC GL on syncope. Carotid sinus massage.**Indications**

CSM is indicated in patients >40 years of age with syncope of unknown origin compatible with a reflex mechanism.	I-B
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Diagnostic criteria

CSS is confirmed if CSM causes bradycardia (asystole) and/or hypotension that reproduce spontaneous symptoms, and patients have clinical features compatible with a reflex mechanism of syncope.	I-B
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Additional advice and clinical perspectives

- History of syncope and its reproduction by CSM defines CSS; positive CSM without a history of syncope defines carotid sinus hypersensitivity. Carotid sinus hypersensitivity in patients with unexplained syncope may be a non-specific finding because it is present in <40% of older populations and should be used with caution for diagnosis of the mechanism of syncope.
- CSM should be performed with the patient in the supine and upright positions, and with continuous beat-to-beat BP monitoring. This may be more readily performed in the tilt laboratory.
- Although neurological complications are very rare, the risk of provocation of TIA with the massage suggests that CSM should be undertaken with caution in patients with previous TIA, stroke, or known carotid stenosis >70%.

BP = blood pressure; CSM = carotid sinus massage; CSS = carotid sinus syndrome; TIA = transient ischaemic attack.

Table 19. 2018 ESC GL on syncope. Association of orthostatic intolerance and orthostatic hypotension

		History of syncope and orthostatic complaints	
		Highly suggestive of OH; syncope and pre-syncope are present during standing, absent while lying, and less severe or absent while sitting; a predilection for the morning; sitting or lying down must help; complaints may get worse immediately after exercise, after meals or in high temperatures; no "autonomic activation"	Possibly due to OH; not all of the features highly suggestive of OH are present
Supine and standing BP measurement	Symptomatic abnormal BP fall	Syncope is due to OH (Class I)	Syncope is likely due to OH (Class IIa)
	Asymptomatic abnormal BP fall	Syncope is likely due to OH (Class IIa)	Syncope may be due to OH (Class IIb)
	No abnormal BP drop	Unproven	Unproven

BP = blood pressure; OH = orthostatic hypotension.

Table 20. Orthostatic challenge

2018 ESC GL on syncope. Active standing

Indications

Intermittent determination by sphygmomanometer of BP and HR while supine and during active standing for 3 min at initial syncope evaluation. I-C

Continuous beat-to-beat non-invasive BP and HR measurement when short-lived BP variations are suspected, such as in initial OH. IIb-C

Diagnostic criteria

Syncope due to OH is confirmed when there is a fall in systolic BP from baseline value $>_{20}$ mmHg or diastolic BP $>_{10}$ mmHg, or a decrease in systolic BP to <90 mmHg that reproduces spontaneous symptoms. I-C

Syncope due to OH is likely when there is an asymptomatic fall in systolic BP from baseline value $>_{20}$ mmHg or diastolic BP $>_{10}$ mmHg, or a decrease in systolic BP to <90 mmHg, and symptoms (from history) are consistent with OH. IIa-C

Syncope due to OH is likely when there is a symptomatic fall in systolic BP from baseline value $>_{20}$ mmHg or diastolic BP $>_{10}$ mmHg, or a decrease in systolic BP to <90 mmHg, and not all of the features (from history) are suggestive of OH. IIa-C

POTS is likely when there is an orthostatic HR increase (>30 b.p.m. or to >120 b.p.m. within 10 min of active standing) in the absence of OH that reproduces spontaneous symptoms. IIa-C

Syncope due to OH is possible when there is an asymptomatic fall in systolic BP from baseline value ≥ 20 mmHg or diastolic BP ≥ 10 mmHg, or a decrease in systolic BP to <90 mmHg, and symptoms (from history) are less consistent with OH. IIb-C

BP = blood pressure; b.p.m. = beats per min; OH = orthostatic hypotension; HR = heart rate; POTS = postural orthostatic tachycardia syndrome.

2018 ESC GL on syncope Tilt testing

Indications

Tilt testing in patients with suspected reflex syncope, OH, POTS, or PPS. IIa-B

Tilt testing to educate patients to recognize symptoms and learn physical manoeuvres. IIb-B

Diagnostic criteria

Reflex syncope, OH, POTS, or PPS are likely if tilt testing reproduces symptoms along with the characteristic circulatory pattern of these conditions. IIa-B

Additional advice and clinical perspectives

- A negative tilt table response does not exclude a diagnosis of reflex syncope.
- While sensitivity and specificity are at acceptable levels when measured in patients with VVS and healthy controls, in usual clinical settings of syncope of uncertain origin tilt testing suggests the presence of a hypotensive susceptibility, which may exist not only in reflex syncope but also with other causes of syncope including some forms of cardiac syncope. The concept of hypotensive susceptibility rather than diagnosis has important practical utility, because the presence or absence of hypotensive susceptibility plays a major role in guiding pacemaker therapy in patients affected by reflex syncope and in the management of hypotensive therapies, which are frequently present in the elderly with syncope.
- A positive cardioinhibitory response to tilt testing predicts, with high probability, asystolic spontaneous syncope; this finding is relevant for therapeutic implications when cardiac pacing is considered. Conversely, the presence of a positive vasodepressor, a mixed response, or even a negative response does not exclude the presence of asystole during spontaneous syncope.
- Tilt testing may be helpful in separating syncope with abnormal movements from epilepsy.
- Tilt testing may have value in distinguishing syncope from falls.
- Tilt testing may be helpful in separating syncope from PPS. In suspected PPS, the tilt test should preferably be performed together with EEG monitoring; a normal EEG helps to confirm the diagnosis. In the absence of an EEG, a video recording will be helpful in confirming the diagnosis.
- Tilt testing should not be used to assess the efficacy of a drug treatment.

EEG = electroencephalogram; OH = orthostatic hypotension; POTS = postural orthostatic tachycardia syndrome; PPS = psychogenic pseudosyncope; VVS = vasovagal syncope.

ACC/AHA/HRS 2017 GL on syncope.

Tilt-table testing

For suspected vasovagal syncope IIa-B-R
if the diagnosis is unclear after initial evaluation.

For suspected delayed orthostatic hypotension when initial evaluation is not diagnostic	IIa-B-NR
To distinguish convulsive syncope from epilepsy	IIa-B-NR
To establish diagnosis of pseudosyncope	IIa-B-NR
Not recommended to predict a response to medical treatments for vasovagal syncope	III-B-R (no benefit)

Table 21. 2018 ESC GL on syncope Basic autonomic function tests

Valsalva manoeuvre

For the assessment of autonomic function in patients with suspected neurogenic OH. IIa-B

For confirming the hypotensive tendency induced by some forms of situational syncope, e.g. coughing, brass instrument playing, singing, and weightlifting. IIB-C

Deep-breathing test

For the assessment of autonomic function in patients with suspected neurogenic OH. IIa-B

Other autonomic function tests

Other autonomic function tests (30:15 ratio, cold pressure test, sustained hand grip test, and mental arithmetic test) may be considered for the assessment of autonomic function in patients with suspected neurogenic OH. IIB-C

ABPM

ABPM to detect nocturnal hypertension in patients with autonomic failure. I-B

ABPM to detect and monitor the degree of OH and supine hypertension in daily life in patients with autonomic failure. IIa-C

ABPM and HBPM to detect whether BP is abnormally low during episodes suggestive of orthostatic intolerance. IIB-C

Additional advice and clinical perspectives

- Whenever possible, reproduction of the trigger situation (e.g. coughing, swallowing, laughing, brass instrument playing, weightlifting) under beat-to-beat non-invasive HR and BP measurement should be performed in patients with suspected situational syncope.
- The effects of age and sex should be considered when interpreting autonomic function tests.
- Compliance with autonomic function tests may be limited in patients with dementia. Patients with tremor or Parkinsonism may not succeed in performing the sustained hand grip test. The cold pressure test may be uncomfortable in patients with Raynaud's phenomena.

ABPM = ambulatory blood pressure monitoring; BP = blood pressure; HBPM = home blood pressure monitoring; HR = heart rate; OH = orthostatic hypotension.

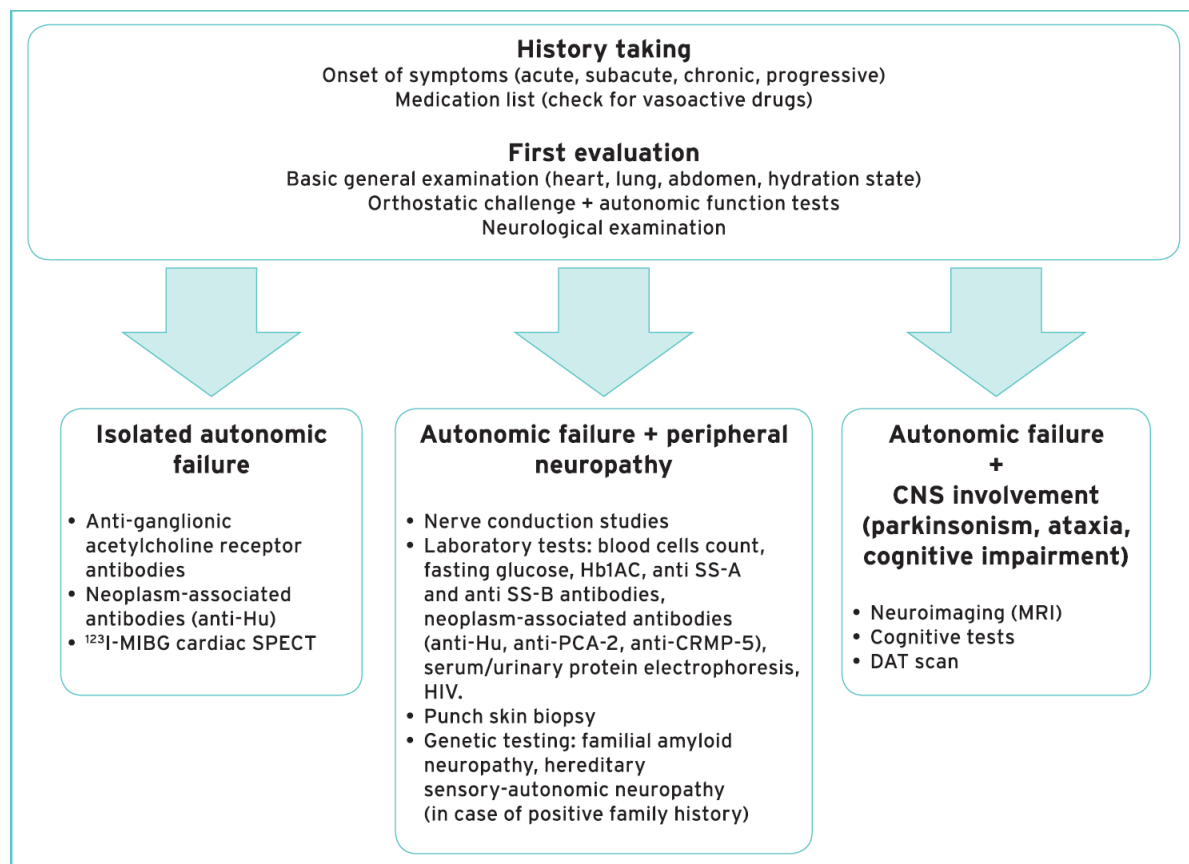


Figure 7. ESC 2018 GL on syncope. Diagnostic work-up of cardiovascular autonomic failure.

CNS = central nervous system; CRMP-5 = collapsin response mediator protein 5; DAT = dopamine active transporter; HbA1c = haemoglobin A1c; HIV = human immunodeficiency virus; ¹²³I-MIBG = ¹²³I-metaiodobenzylguanidine; MRI = magnetic resonance imaging; PCA-2 = Purkinje cell cytoplasmic autoantibody type 2; SPECT = singlephoton emission computed tomography; SS-A = Sjogren's syndrome-associated antigen A; SS-B = Sjogren's syndrome-associated antigen B.

Table 22. Electrocardiographic monitoring**ACC/AHA/HRS 2017 GL on syncope . Cardiac monitoring and in-hospital telemetry**

The choice of a specific cardiac monitor should be determined on the basis of the frequency and nature of syncope events.	I-C-EO
To evaluate selected ambulatory patients with syncope of suspected arrhythmic etiology, the following external cardiac monitoring approaches can be useful: 1. Holter monitor 2. Transtelephonic monitor 3. External loop recorder 4. Patch recorder 5. Mobile cardiac outpatient telemetry	IIa-B-NR
Implantable cardiac monitor to evaluate selected ambulatory patients with syncope of suspected arrhythmic etiology.	IIa-B-R
Continuous ECG monitoring in hospitalized patients admitted for syncope evaluation with suspected cardiac etiology	I-B-NR

2018 ESC GL on syncope Electrocardiographic monitoring**Indications**

Immediate in-hospital monitoring (in bed or by telemetry) in high-risk patients	I-C
Holter monitoring in patients who have frequent syncope or presyncope (>_1 episode per week).	IIa-B
External loop recorders, early after the index event, in patients who have an inter-symptom interval <_4 weeks.	IIa-B
ILR in an early phase of evaluation in patients with recurrent syncope of uncertain origin, absence of high-risk criteria (Table 10), and a high likelihood of recurrence within the battery life of the device.	I-A
ILR in patients with high-risk criteria (Table 10) in whom a comprehensive evaluation did not demonstrate a cause of syncope or lead to a specific treatment, and who do not have conventional indications for primary prevention ICD or pacemaker indication.	I-A
ILR in patients with suspected or certain reflex syncope presenting with frequent or severe syncopal episodes.	IIa-B
ILR in patients in whom epilepsy was suspected but the treatment has proven ineffective.	IIb-B
ILR in patients with unexplained falls.	IIb-B

Diagnostic criteria

Arrhythmic syncope is confirmed when a correlation between syncope and an arrhythmia (bradyarrhythmia or tachyarrhythmia) is detected. I-B

In the absence of syncope, arrhythmic syncope is likely when periods of Mobitz II second- or third degree AV block or a ventricular pause >3 s (with the possible exception of young trained persons, during sleep or rate-controlled atrial fibrillation), or rapid prolonged paroxysmal SVT or VT are detected.¹ IIa-C

Additional advice and clinical perspectives

- Be aware that the pre-test selection of the patients influences the subsequent findings. Include patients with a high likelihood of arrhythmic events. The duration (and technology) of monitoring should be selected according to the risk and the predicted recurrence rate of syncope.
- Exclude patients with a clear indication for ICD, pacemaker, or other treatments independent of a definite diagnosis of the cause of syncope.
- Include patients with a high probability of recurrence of syncope in a reasonable time. Owing to the unpredictability of syncope recurrence, be prepared to wait up to 4 years or more before obtaining such a correlation.
- In the absence of a documented arrhythmia, presyncope cannot be considered a surrogate for syncope, whereas the documentation of a significant arrhythmia at the time of presyncope can be considered a diagnostic finding.
- The absence of arrhythmia during syncope excludes arrhythmic syncope.

AV = atrioventricular; ICD = implantable cardioverter defibrillator; ILR = implantable loop recorder; SVT = supraventricular tachycardia; VT = ventricular tachycardia.

Table 23. ACC/AHA/HRS 2017 GL on syncope. Cardiac rhythm monitors

Types of Monitor	Device Description	Patient Selection
Holter monitor (151-153)	• A portable, battery-operated device, • Continuous recording for 24–72 h; up to 2 wk with newer models • Symptom rhythm correlation can be achieved through a patient event diary and patient-activated annotations	• Symptoms frequent enough to be detected within a short period (24–72 h) of monitoring*
Patient-activated, transtelephonic monitor (event monitor) (150,154,155)	• A recording device that transmits patient-activated data (live or stored) via an analog phone line to a central remote monitoring station (e.g., physician office)	• Frequent, spontaneous symptoms likely to recur within 2–6 wk • Limited use in patients with frank syncope associated with sudden incapacitation
External loop recorder (patient or auto triggered)† (150,154,155)	• A device that continuously records and stores rhythm data over weeks to months • Patient activated, or auto triggered (e.g., to record asymptomatic arrhythmias) to provide a recording of events antecedent to (3–14 min), during, and after (1–4 min) the triggered event • Newer models are equipped with a cellular phone, which transmits triggered data automatically over a wireless network to a remote monitoring system	• Frequent, spontaneous symptoms related to syncope, likely to recur within 2–6 wk
External patch recorders (157-159)	• Patch device that continuously records and stores rhythm data, with patient-trigger capability to allow for symptom-rhythm correlation • No leads or wires, and adhesive to chest wall/sternum • Various models record from 2–14 d • Offers accurate means of assessing burden of atrial fibrillation • Patient activated, or auto triggered (e.g., to record asymptomatic arrhythmias) to provide a recording of events antecedent to, during, and after the triggered event	• Can be considered as an alternative to external loop recorder • Given that it is leadless, can be accurately self-applied, and is largely water resistant, it may be more comfortable and less cumbersome than an external loop recorder, potentially improving compliance • Unlike Holter monitors and other external monitors, it offers only 1-lead recording
Mobile cardiac outpatient telemetry (160,161)	• Device that records and transmits data (up to 30 d) from preprogrammed arrhythmias or patient activation to a communication hub at the patient's home • Significant arrhythmias are detected; the monitor automatically transmits the patient's ECG data through a wireless network to the central monitoring station, which is attended by trained technicians 24 h/d • This offers the potential for real-time, immediate feedback to a healthcare provider for evaluation	• Spontaneous symptoms related to syncope and rhythm correlation • In high-risk patients whose rhythm requires real-time monitoring
Implantable cardiac monitor (162,167,179-181)	• Subcutaneously implanted device, with a battery life of 2–3 y • Triggered by the patient (or often family member witness) to store the event • Models allow for transtelephonic transmission, as well as automatic detection of significant arrhythmias with remote monitoring	• Recurrent, infrequent, unexplained syncope (or suspected atypical reflex syncope) of suspected arrhythmic cause after a nondiagnostic initial workup, with or without structural heart disease

*Includes history, physical examination, and 12-lead ECG; may include nondiagnostic tilt-table test or electrophysiological study.

†Higher yield in patients who are able to record a diary to correlate with possible arrhythmia.
ECG indicates electrocardiogram.

Table 24. 2018 ESC GL on syncope. Video recording in suspected syncope

Physicians should encourage patients and their relatives to obtain home video recordings of spontaneous events.	Ila-C
Adding video recording to tilt testing to increase the reliability of clinical observation of induced events.	Iib-C

Table 25. 2018 ESC GL on syncope. Coronary angiography**Indications**

In patients with syncope, the same indications for coronary angiography should be considered as in patients without syncope.	Ila-C
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Additional advice and clinical perspectives

Angiography alone is not diagnostic of the cause of syncope

Table 26. Electrophysiology study**ACC/AHA/HRS 2017 GL on syncope**

Syncope of suspected arrhythmic etiology	Ila-B-NR
Not recommended for syncope evaluation in patients with a normal ECG and normal cardiac structure and function, unless an arrhythmic etiology is suspected	III-B-NR (no benefit)

2018 ESC GL on syncope**Indications**

In patients with syncope and previous myocardial infarction, or other scar-related conditions, when syncope remains unexplained after non-invasive evaluation.	I-B
In patients with syncope and bifascicular BBB, EPS should be considered when syncope remains unexplained after non-invasive evaluation.	Ila-B
In patients with syncope and asymptomatic sinus bradycardia, when non-invasive tests (e.g. ECG monitoring) have failed to show a correlation between syncope and bradycardia.	Iib-B
In patients with syncope preceded by sudden and brief palpitations, when syncope remains unexplained after non-invasive evaluation.	Iib-C

EPS-guided therapy

In patients with unexplained syncope and bifascicular BBB, a pacemaker is indicated in the presence of either a baseline H-V interval of ≥ 70 ms, second- or third-degree His-Purkinje block during incremental atrial pacing, or with pharmacological challenge. I-B

In patients with unexplained syncope and previous myocardial infarction, or other scar-related conditions, induction of sustained monomorphic VT is managed according to the current ESC Guidelines for VA. I-B

In patients without structural heart disease with syncope preceded by sudden and brief palpitations, the induction of rapid SVT or VT, which reproduce hypotensive or spontaneous symptoms, is managed with appropriate therapy according to the current ESC Guidelines. I-C

In patients with syncope and asymptomatic sinus bradycardia, a pacemaker should be considered if a prolonged corrected SNRT is present. IIa-B

Additional advice and clinical perspectives

- In general, whereas a positive EPS predicts the cause of syncope, a negative study is unable to exclude an arrhythmic syncope and further evaluation is warranted.
- The induction of polymorphic VT or VF in patients with ischaemic cardiomyopathy or DCM cannot be considered a diagnostic finding of the cause of syncope.
- EPS is generally not useful in patients with syncope, normal ECG, no heart disease, and no palpitations.

BBB = bundle branch block; DCM = dilated cardiomyopathy; ECG = electrocardiogram; EPS = electrophysiological study; ESC = European Society of Cardiology; SNRT = sinus node recovery time; SVT = supraventricular tachycardia; VA = ventricular arrhythmia; VF = ventricular fibrillation; VT = ventricular tachycardia.

Table 27. Neurological evaluation**ACC/AHA/HRS 2017 GL on syncope . Neurological diagnosis**

Simultaneous monitoring of an EEG and hemodynamic parameters during tilt-table testing to distinguish among syncope, pseudosyncope, and epilepsy	IIa-C-LD
MRI and CT of the head are not recommended in the absence of focal neurological findings or head injury	III-B-NR (no benefit)
Carotid artery imaging is not recommended in the absence of focal neurological findings	III-B-NR (no benefit)
Routine recording of an EEG is not recommended in the absence of specific neurological features	III-B-NR (no benefit)

ACC/AHA/HRS 2017 GL on syncope. Autonomic evaluation

Referral for autonomic evaluation to improve diagnostic and prognostic accuracy in selected patients with syncope and known or suspected neurodegenerative disease

IIa-C

2018 ESC GL on syncope**Neurological evaluation**

Neurological evaluation is indicated when syncope is due to autonomic failure to evaluate the underlying disease. I-C

Neurological evaluation is indicated in patients in whom TLOC is suspected to be epilepsy. I-C

TLOC = transient loss of consciousness.

Neurological tests

Brain MRI if neurological examination indicates Parkinsonism, ataxia, or cognitive impairment. I-C

Screening for paraneoplastic antibodies and antiganglionic acetylcholine receptor antibodies in cases of acute or subacute onset of multidomain autonomic failure. I-B

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

Additional advice and clinical perspectives

Seropositivity for any paraneoplastic antibody or for antiganglionic acetylcholine receptor antibodies should prompt further investigations for occult malignancy.

EEG = electroencephalogram; MRI = magnetic resonance imaging.

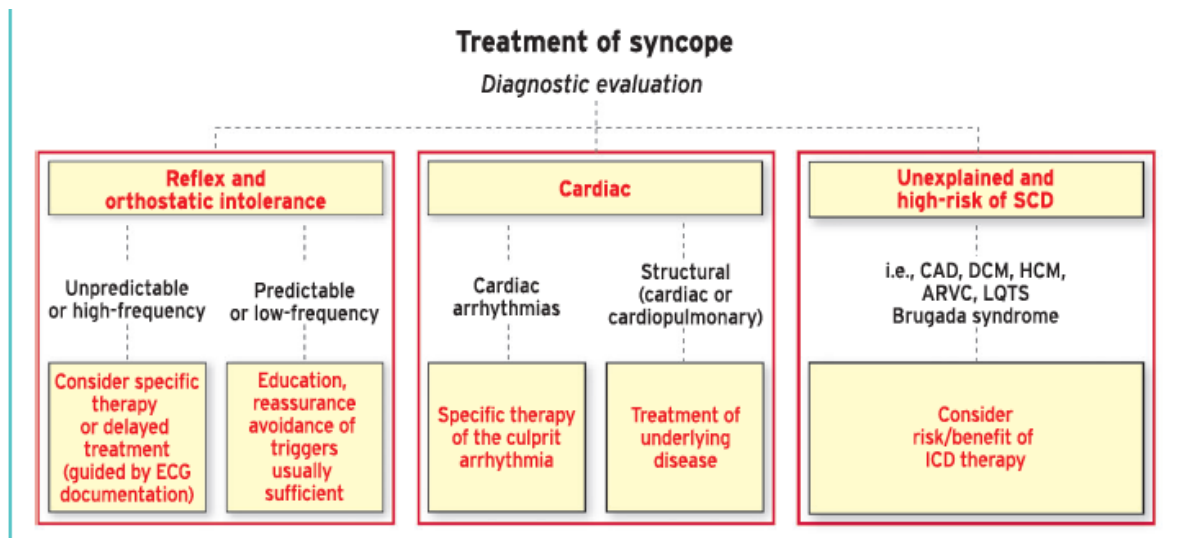


Figure 8. ESC 2018 GL on syncope. General framework of treatment is based on risk stratification and the identification of specific mechanisms when possible.

ARVC = arrhythmogenic right ventricular cardiomyopathy; CAD = coronary artery disease; DCM = dilated cardiomyopathy; ECG = electrocardiographic; HCM = hypertrophic cardiomyopathy; ICD = implantable cardioverter defibrillator; LQTS = longQT syndrome; SCD = sudden cardiac death.

Table 28. Therapy of reflex syncope**ACC/AHA/HRS 2017 GL on syncope. Reflex conditions****Vasovagal syncope (VVS)**

Patient education on the diagnosis and prognosis of VVS	I-C-EO
Physical counter-pressure maneuvers in patients who have a sufficiently long prodromal period	IIa-B-R
Midodrine in patients with recurrent VVS with no history of hypertension, HF, or urinary retention	IIa-B-R
The usefulness of orthostatic training is uncertain in patients with frequent VVS	IIb-B-R
Fludrocortisone for recurrent VVS and inadequate response to salt and fluid intake, unless contraindicated	IIb-B-R
Beta blockers in patients 42 years of age or older for recurrent VVS	IIb-B-NR
Increased salt and fluid intake, unless contraindicated	IIb-C-LD
Reduce or withdraw medications that cause hypotension when appropriate	IIb-C-LD
A selective serotonin inhibitor for recurrent VVS	IIb-C-LD

Pacemakers

Dual chamber pacing in patients 40 years of age or older for recurrent VVS and prolonged spontaneous pauses	IIb-B-R ^{SR}
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Carotid sinus syndrome (CSS)

Permanent pacing in cardioinhibitory or mixed CSS and prolonged spontaneous pauses	IIa-B-R
Dual chamber pacemaker when pacing is indicated	IIb-B-R

2018 ESC GL on syncope. Treatment of reflex syncope**Education and lifestyle modifications**

Explanation of the diagnosis, the provision of reassurance, and explanation of the risk of recurrence and the avoidance of triggers and situations in all patients.	I-B
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Discontinuation/reduction of hypotensive therapy

Modification or discontinuation of hypotensive drug regimen in patients with vasodepressor syncope, if possible.	IIa-B
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Physical manoeuvres

Isometric PCM in patients with prodromes who are <60 years of age.	IIA-B
Tilt training for the education of young patients.	IIb-B
B	

Pharmacological therapy

Fludrocortisone in young patients with the orthostatic form of VVS, low-normal values of arterial BP, and the absence of contraindication to the drug. I Ib-B

Midodrine in patients with the orthostatic form of VVS. I Ib-B

Beta-adrenergic blocking drugs are not indicated.. III-A

Cardiac pacing

Cardiac pacing to reduce syncopal recurrences in patients aged >40 years, with spontaneous documented symptomatic asystolic pause(s) >3 s or asymptomatic pause(s) >6 s due to sinus arrest, AV block, or the combination of the two. IIa-B

Cardiac pacing to reduce syncope recurrence in patients with cardioinhibitory carotid sinus syndrome who are >40 years with recurrent frequent unpredictable syncope. IIa-B

Cardiac pacing to reduce syncope recurrences in patients with tilt-induced asystolic response who are >40 years with recurrent frequent unpredictable syncope. I Ib-B

Cardiac pacing to reduce syncope recurrences in patients with the clinical features of adenosine-sensitive syncope. I Ib-B

B

Cardiac pacing is not indicated in the absence of a documented cardioinhibitory reflex. III-B

Additional advice and clinical perspectives

- In general, no therapy can completely prevent syncope recurrence during long-term follow-up. A decrease of the syncope burden is a reasonable goal of therapy.
- The fact that pacing may be effective does not mean that it is also always necessary. It must be emphasized that the decision to implant a pacemaker needs to be made in the clinical context of a benign condition that frequently affects young patients. Thus, cardiac pacing should be limited to a highly selected small proportion of patients affected by severe reflex syncope. Patients suitable for cardiac pacing are older with a history of recurrent syncope beginning in middle or older age and with frequent injuries, probably due to presentation without warning. Syncope recurrence is still expected to occur despite cardiac pacing in a minority of patients.
- Tilt test response is the strongest predictor of pacemaker efficacy. Patients with a negative tilt test response will have a risk of syncope recurrence of as low as that observed in patients paced for intrinsic AV block. Further research is very unlikely to change the confidence in the estimate of effect. On the contrary, patients with a positive tilt test response will have a higher risk of recurrence of syncope with a large confidence range, which makes any estimate of the benefit of pacing uncertain. Further research is warranted.

AV = atrioventricular; BP = blood pressure; PCM = physical counter-pressure manoeuvres; VVS = vasovagal syncope.

ESC 2021 guidelines on pacing and cardiac resynchronization. Recommendations for pacing for reflex syncope

Dual-chamber cardiac pacing to reduce recurrent syncope in patients aged >40 years, with severe, unpredictable, recurrent syncope who have: I A

- spontaneous documented symptomatic asystolic pause(s) >3 s or asymptomatic pause(s)

>6 s due to sinus arrest or AVB; or

- cardioinhibitory carotid sinus syndrome; or
- asystolic syncope during tilttesting.

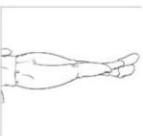
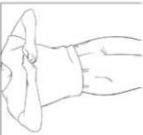
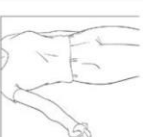
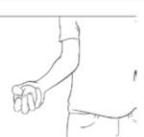
Dual-chamber cardiac pacing to reduce syncope recurrences in patients with the clinical features of adenosine-sensitive syncope.

IIB B

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

AVB = atrioventricular block.

Table 29. AHA 2019 Update to the GL on First Aid. Description of Recommended counter-pressure maneuvers

Method	Description	Illustration
Lower-body PCMs		
Leg crossing with muscle tensing	Leg crossing with tensing of the leg, abdominal, and buttock muscles while lying down or, if necessary, while standing	 
Squatting	Lowering the body into a squatting position. Adjunctive lower-body and abdomen muscle tensing can be done during the squat and then on standing once symptoms have resolved.	
Upper-body PCMs		
Arm tensing	Gripping opposing hands with fingers and pulling with arms in opposing directions with maximum force	 
Isometric handgrip	Clenching fist at maximum contraction with or without an item in the hand	 
Neck flexion	Touching the chin to the chest and tightening the neck musculature	 

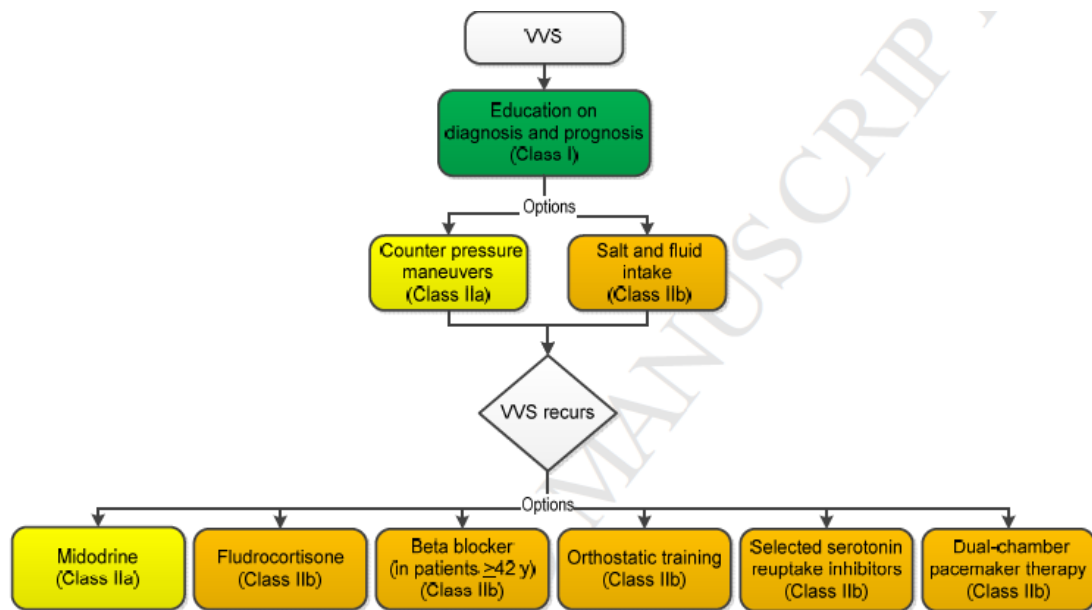


Figure 9. ACC/AHA/HRS 2017 GL on Syncope. Vasovagal Syncope (VVS)

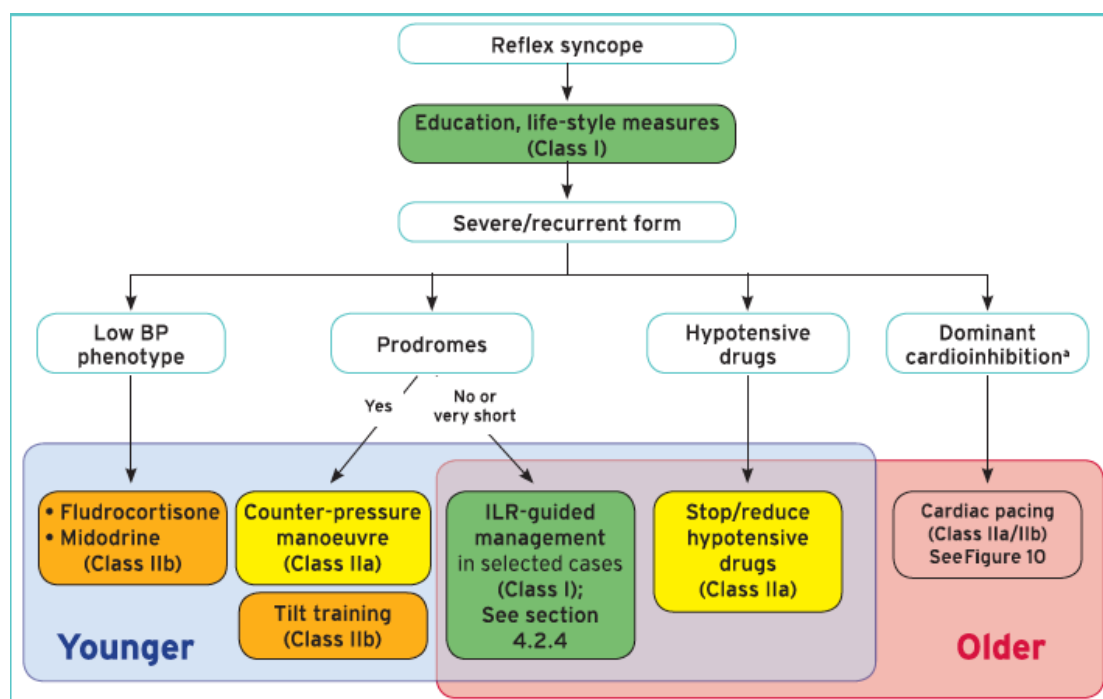


Figure 10. ESC 2018 GL on syncope. Schematic practical decision pathway for the first-line management of reflex syncope (based on patient's history and tests) according to age, severity of syncope, and clinical forms.

Younger patients are those aged <40 years while older patients are >60 years, with an overlap between 40 and 60 years. Severity of reflex syncope is defined in the text. The duration of prodrome is largely subjective and imprecise. A value of <5 s distinguishes arrhythmic from reflex syncope; in patients without structural heart disease, a duration >10 s can distinguish reflex syncope from cardiac syncope. In practice, the prodrome is 'absent or very short' if it does not allow patients enough time to act, such as to sit or lie down. The heading 'low BP phenotype' identifies patients with chronic low BP values (in general, systolic around 110 mmHg, who have a clear history of orthostatic intolerance and orthostatic VVS). The group 'dominant cardioinhibition' identifies patients in whom clinical features and results of tests suggest that sudden cardioinhibition is mainly responsible for syncope. One such clue is lack of prodrome, so patients without prodromes may, after analysis, fall into this category.

Remark:

- _ Overlap between subgroups is expected.
 - _ In selected cases, pacing may be used in patients aged <40 years. This Task Force cannot give recommendations due to the lack of sufficient evidence from studies.
 - _ In selected cases, fludrocortisone may be used in patients aged >60 years. This Task Force cannot give recommendations due to the lack of sufficient evidence from studies.
 - _ Midodrine can be used at any age even if existing studies were performed in young patients.
 - _ Patients with short or no prodrome should continue investigations to identify the underlying mechanism and guide subsequent therapy.
 - _ Sometimes an ILR strategy should also be considered in patients aged <40 years.
- BP = blood pressure; ILR = implantable loop recorder; VVS = vasovagal syncope.

a Spontaneous or provoked by, sequentially, carotid sinus massage, tilt testing, or ILR.

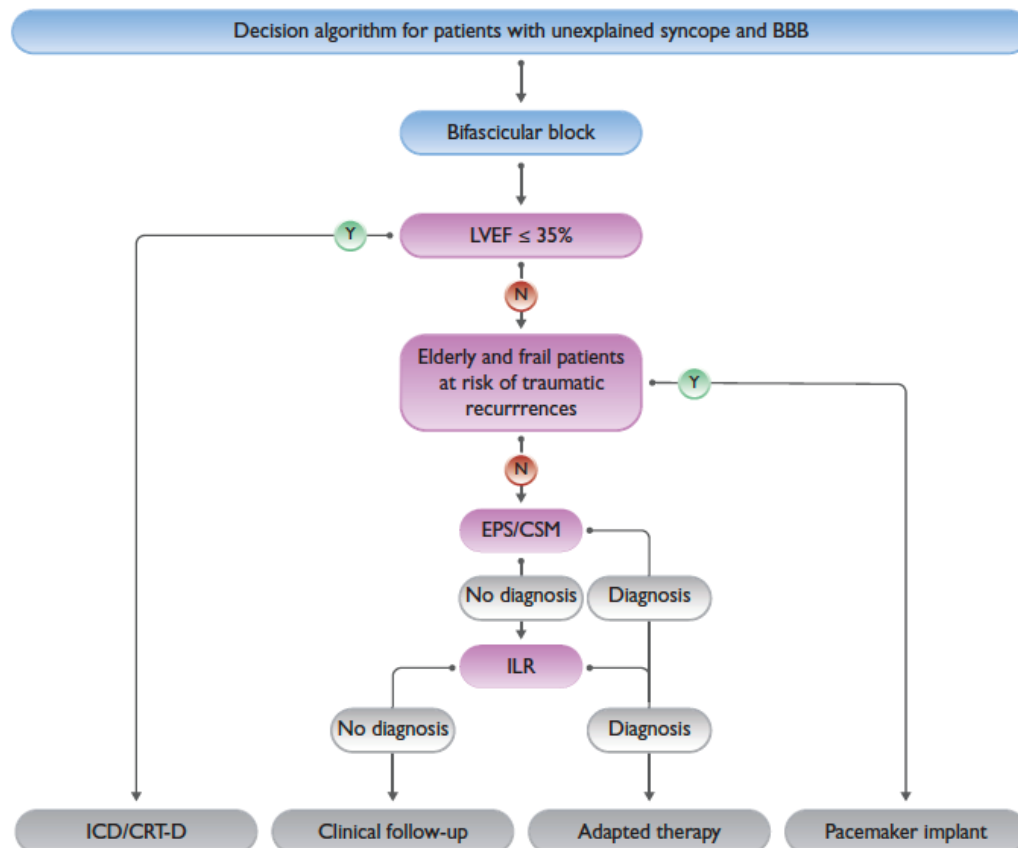


Figure 11. ESC 2021 guidelines on pacing and CRT. Decision pathway for cardiac pacing in patients with reflex syncope.

DDD = dual-chamber, atrioventricular pacing.

Note: cardioinhibitory carotid sinus syndrome is defined when the spontaneous syncope is reproduced by the carotid sinus massage in the presence of an asystolic pause >3 s; asystolic tilt positive test is defined when the spontaneous syncope is reproduced in the presence of an asystolic pause >3 s. A symptomatic asystolic pause(s) >3 s or asymptomatic pause(s) >6 s due to sinus arrest, atrioventricular block, or the combination of the two similarly define asystole detected by implantable loop recorder.

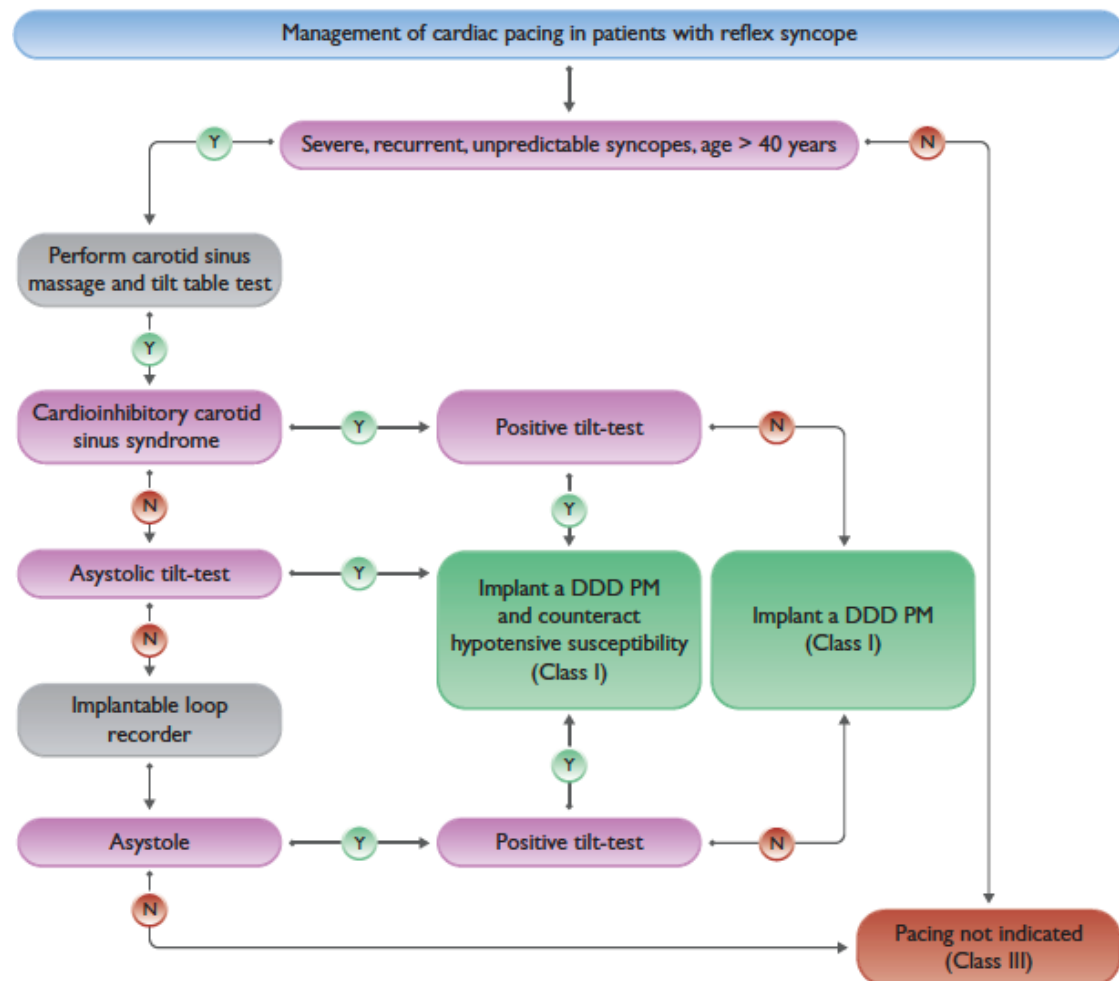


Figure 12. ESC 2021 guidelines on pacing and CRT. Summary of indications for pacing in patients >40 years of age with reflex syncope.

CI-CSS = cardioinhibitory carotid sinus syndrome.

Note: spontaneous asystolic pause = 3 s symptomatic or 6 s asymptomatic

Table 30. Therapy of orthostatic hypotension**ACC/AHA/HRS 2017 GL on syncope. Neurogenic orthostatic hypotension (OH)**

Acute water ingestion for occasional, temporary relief	I-B-R
Physical counter-pressure maneuvers in neurogenic OH with syncope	IIa-C-LD
Compression garments in neurogenic OH with syncope	IIa-C-LD
Midodrine in syncope due to neurogenic OH	IIa-B-R
Doxidropa in syncope due to neurogenic OH	IIa-B-R
Fludrocortisone in syncope due to neurogenic OH	IIa-C-LD
Pyridostigmine in syncope due to neurogenic OH refractory to other treatments	IIb-C-LD
Octreotide in syncope and refractory recurrent postprandial neurogenic OH	IIb-C-LD
Increased salt and fluid intake	IIb-C-LD

AHA/ACC 2025 guideline on hypertension.

1	A	1. In adults with hypertension, improved BP control is recommended to reduce the risk for OH. ¹⁻⁴
2a	A	2. In adults receiving intensive BP-lowering therapy with asymptomatic OH, treatment with a goal of SBP <130 mm Hg is reasonable due to increased CVD and mortality benefit. ^{3,5}
2a	B-R	3. In adults with hypertension initiating treatment or adding medication with a goal of SBP <130 mm Hg, assessment for symptomatic OH is reasonable to detect other chronic conditions. ^{1-4,6,7}

ESC 2024 GL on hypertension. Recommendations for managing hypertension in patients with orthostatic hypotension

Before starting or intensifying BP-lowering medication, it is recommended to test for orthostatic hypotension, by first having the patient sit or lie for 5 min and then measuring BP 1 and/or 3 min after standing. ^{97,99}	I	B
It is recommended to pursue non-pharmacological approaches as the first-line treatment of orthostatic hypotension among persons with supine hypertension. For such patients, it is also recommended to switch BP-lowering medications that worsen orthostatic hypotension to an alternative BP-lowering therapy and not to simply de-intensify therapy. ^{726,727,729,730}	I	A

2018 ESC GL on syncope. Treatment of orthostatic hypertension

Explanation of the diagnosis, the provision of reassurance, and explanation of the risk of recurrence and the avoidance of triggers and situations in all patients.	I-C
Adequate hydration and salt intake	I-C
Modification or discontinuation of hypotensive drug regimens	IIa-B
Isometric PCM	IIa-C
Abdominal binders and/or support stockings to reduce venous pooling	IIa-B
Head-up tilt sleeping (>10 degrees) to increase fluid volume	IIa-C
Midodrine if symptoms persist.	IIa-B
Fludrocortisone if symptoms persist.	IIa-C

Additional advice and clinical perspectives

- In individuals with established OH and risk factors for falls, aggressive BP-lowering treatment should be avoided; their treatment targets should be revised to a systolic BP value of 140–150 mmHg and medication withdrawal should be considered.
- The BP-lowering agents (angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, and calcium channel blockers) should be used preferentially, especially among patients at high risk of falls, as diuretics and beta-blockers are associated with OH and falls and should be avoided in at-risk individuals.

BP = blood pressure; OH = orthostatic hypertension; PCM = physical counterpressure manoeuvres.

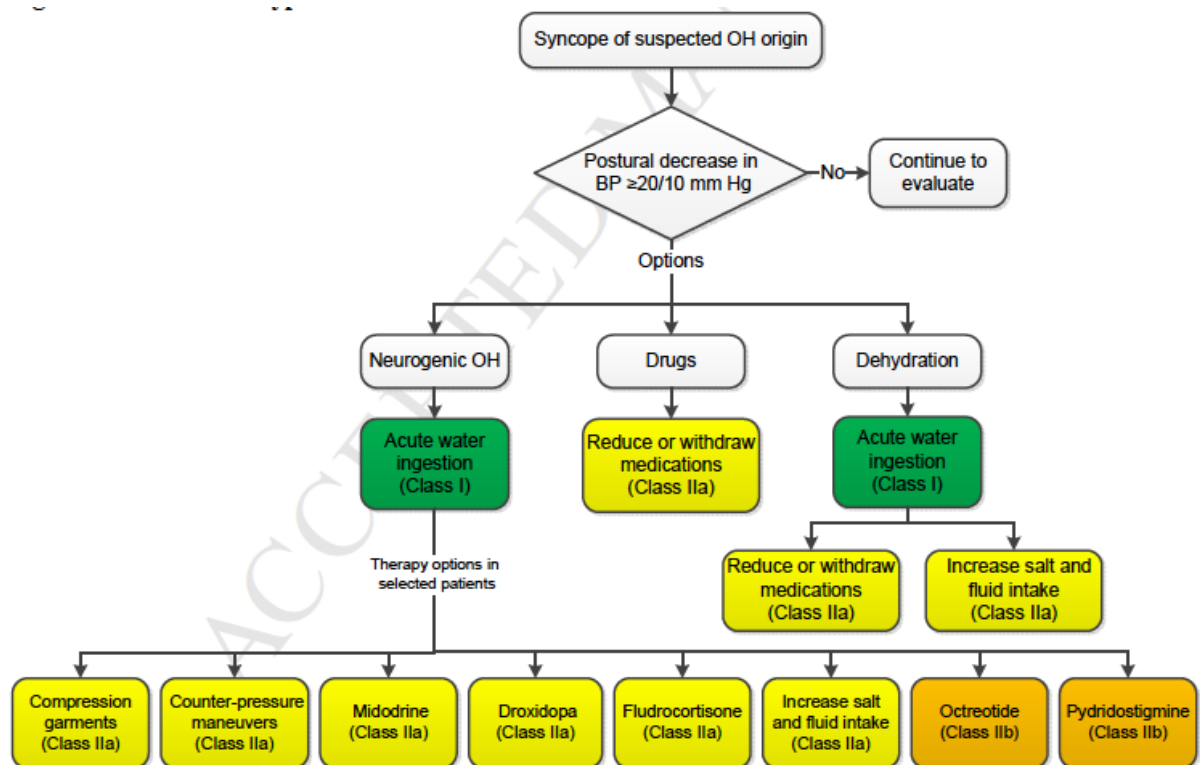


Figure 13. ACC/AHA/HRS 2017 GL on Syncope. Orthostatic Hypotension (OH)

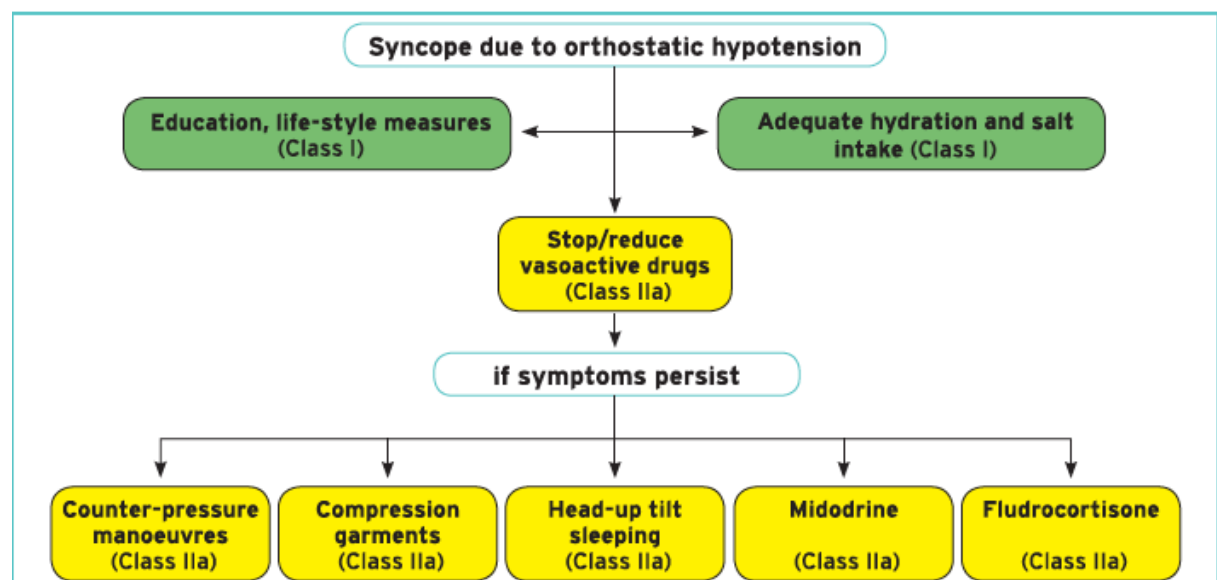


Figure 14. ESC 2018 GL on syncope. Schematic practical guide for the treatment of orthostatic hypotension.

Table 31. Therapy of syncope due to cardiac arrhythmias**ACC/AHA/HRS 2017 GL on syncope. Recommendations on bradycardia, supraventricular tachycardias, and ventricular arrhythmia.**

In patients with syncope guideline-directed management and therapy is indicated I-C-EO

2018 ESC GL on syncope Treatment of syncope due to cardiac arrhythmias**Bradycardia (intrinsic)**

Cardiac pacing when there is an established relationship between syncope and symptomatic bradycardia due to sick sinus syndrome or intrinsic AV block. I-B

Cardiac pacing in patients with intermittent/paroxysmal intrinsic third- or second-degree AV block (including AF with slow ventricular conduction), although there is no documentation of a correlation between symptoms and ECGs. I-C

Cardiac pacing when the relationship between syncope and asymptomatic sinus node dysfunction is less established. IIa-C

Cardiac pacing is not indicated in patients when there are reversible causes for bradycardia. III-C

Bifascicular BBB

Cardiac pacing in patients with syncope, BBB, and a positive EPS or ILR-documented AV block. I-B

B

Cardiac pacing in patients with unexplained syncope and bifascicular BBB. IIb-B

Tachycardia

Catheter ablation in patients with syncope due to SVT or VT in order to prevent syncope recurrence. I-B

ICD in patients with syncope due to VT and an ejection fraction $\leq$ 35%. I-A

ICD in patients with syncope and previous myocardial infarction who have VT induced during EPS. I-C

ICD in patients with an ejection fraction $>$ 35% with recurrent syncope due to VT when catheter ablation and pharmacological therapy have failed or could not be performed. IIa-C

Antiarrhythmic drug therapy, including rate-control drugs, in patients with syncope due to SVT or VT. IIa-C

Additional advice and clinical perspectives

- The major factors predicting the efficacy of pacing in preventing syncope recurrence are an established relationship between symptoms and bradycardia and the absence of associated hypotensive susceptibility. When this relationship is less established, or some hypotensive mechanism is present, syncope can recur in a minority of patients.
- Pacing is not indicated in unexplained syncope without evidence of any conduction disturbance.
- Less than half of the patients with bifascicular BBB and syncope have a final diagnosis of cardiac syncope, albeit the probability is different among the types of BBB. We recommend conducting any useful investigation (e.g. CSM, EPS, or ILR) to provoke/document the mechanism of syncope before deciding to implant a pacemaker or selecting the correct therapy.
- Elderly patients with bifascicular BBB and unexplained syncope after a reasonable workup might benefit from empirical pacemaker implantation, especially if syncope is unpredictable (with no or short prodromes) or has occurred in the supine position or during effort.
- When indicated, ICD prevents SCD but it may be unable to prevent syncope due to VT recurrence. Thus, when syncope is due to VT (including when the diagnosis is established by the induction of VT during EPS), catheter ablation should be always attempted when feasible in addition to ICD implantation.

AF = atrial fibrillation; AV = atrioventricular; BBB = bundle branch block; CSM = carotid sinus massage; ECG = electrocardiogram; EPS = electrophysiological study; ICD = implantable cardioverter defibrillator; ILR = implantable loop recorder; SCD = sudden cardiac death; SVT = supraventricular tachycardia; VT = ventricular tachycardia.

2018 ESC GL on syncope.

Expected syncope recurrence rates with a permanent pacemaker in different clinical settings

Clinical setting	Expected 2-year syncope recurrence rate with cardiac pacing
Syncope due to established bradycardia and absence of hypotensive mechanism	High efficacy ($\leq 5\%$ recurrence rate)
Syncope due to established bradycardia and associated hypotensive mechanism	Moderate efficacy (5–25% recurrence rate)
Syncope due to suspected bradycardia and associated hypotensive mechanism	Low efficacy ($> 25\%$ recurrence rate)

Implantable cardioverter defibrillator indications in patients with unexplained syncope^a and left ventricular systolic dysfunction

ICD to reduce SCD in patients with symptomatic heart failure (NYHA class II–III) and LVEF $< 35\%$ after > 3 months of optimal medical therapy, who are expected to survive > 1 year with good functional status. I-A

ICD in patients with unexplained syncope^a with systolic impairment, but without a current indication for ICD, to reduce the risk of sudden death. IIa-C

Instead of an ICD, an ILR may be considered in patients with recurrent episodes of unexplained syncope^a with systolic impairment, but without a current indication for ICD. IIb-C

Additional advice and clinical perspectives

- The presence of syncope increases mortality regardless of its cause. Thus, syncope is a risk factor for life-threatening events.

- The decision to implant an ICD or to complete the investigation (e.g. ILR implantation) in patients with unexplained syncope depends on a global clinical evaluation of the patient's conditions, the potential benefit and harm of such therapy, and the presence of other risk factors for SCD.

ICD = implantable cardioverter defibrillator; ILR = implantable loop recorder;

LVEF = left ventricular ejection fraction; NYHA = New York Heart Association;

SCD = sudden cardiac death.

a: Unexplained syncope is defined as syncope that does not meet a class I diagnostic criterion. In the presence of clinical features, unexplained syncope is considered a risk factor for ventricular tachyarrhythmias.

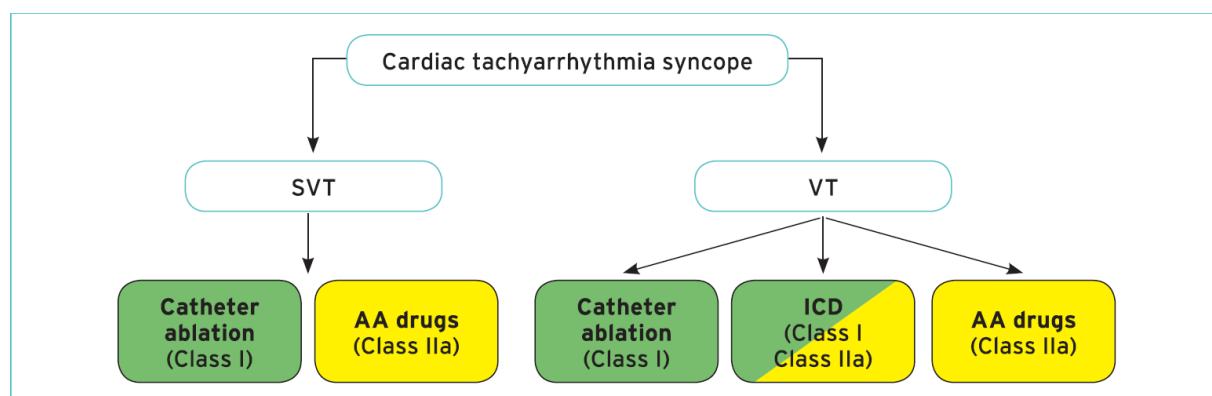


Figure 15. ESC 2018 GL on syncope. Choice of therapy for patients presenting with syncope due to cardiac tachyarrhythmias as the primary cause.

AA = antiarrhythmic; ICD= implantable cardioverter defibrillator; SVT = supraventricular tachycardia; VT = ventricular tachycardia.

Table 32. ACC/AHA/HRS 2017 GL on syncope. Dehydration and Drugs

Fluid resuscitation via oral or intravenous bolus in syncope due to acute dehydration	I-C-LD
Reduce or withdraw medications that may cause hypotension	IIa-B-NR
Increased salt and fluid intake	IIa-C-LD

Table 33. Syncope in the elderly and patients with frailty**ACC/AHA/HRS 2017 GL on syncope. Geriatric patients.**

Comprehensive approach in collaboration with an expert in geriatric care for the assessment and management of older adults with syncope	IIa-C-EO
Consider syncope as a cause of nonaccidental falls in older adults	IIa-B-NR

2018 ESC GL on syncope**Syncope in patients with comorbidity and frailty**

Multifactorial evaluation and intervention is recommended in older patients because more than one possible cause for syncope and unexplained fall may be present.	I-B
Cognitive assessment and physical performance tests are indicated in older patients with syncope or unexplained fall.	I-C
Modification or discontinuation of possible culprit medications, particularly hypotensive drugs and psychotropic drugs, should be considered in older patients with syncope or unexplained fall.	IIa-B
In patients with unexplained fall, the same assessment as for unexplained syncope should be considered.	IIa-C

Additional advice and clinical perspectives

- In some frail elderly patients, the rigour of assessment will depend on compliance with tests and on prognosis. Otherwise, the evaluation of mobile, non-frail, cognitively normal older adults must be performed as for younger individuals.
- Orthostatic BP measurements, CSM, and tilt testing are well tolerated, even in the frail elderly with cognitive impairment.
- Not infrequently, patients who present with unexplained falls—although orthostatic BP measurements, CSM, and tilt testing reproduce syncope—may deny TLOC, thus demonstrating amnesia for TLOC.
- Failure of orthostatic BP to stabilize is present in up to 40% of community-dwelling people >80 years of age when BP is measured using phasic BP technology. Such failure of systolic BP to

stabilize is a risk factor for subsequent falls and syncope.

- In the absence of a witness account, the differential diagnosis between falls, epilepsy, TIA, and syncope may be difficult.

BP = blood pressure; CSM = carotid sinus massage; TIA = transient ischaemic attack; TLOC = transient loss of consciousness.

Table 34. ESC 2021 guidelines on pacing and CRT. Recommendations for cardiac pacing in patients with suspected (undocumented) syncope and unexplained falls

In patients with recurrent unexplained falls, the same assessment as for unexplained syncope should be considered.	Ila C
Pacing is not recommended in patients with unexplained falls in the absence of any other documented indication.	III B
Pacing is not recommended in patients with unexplained syncope without evidence of SND or conduction disturbance.	III C
SND = sinus node dysfunction	

Table 35. ACC/AHA/HRS 2017 GL on syncope. Athletes

Cardiovascular assessment by a care provider experienced in treating athletes with syncope prior to resuming competitive sports.	I-C-EO
Assessment by a specialist with disease-specific expertise for athletes with syncope and high-risk markers	Ila-C-LD
Extended monitoring for athletes with unexplained exertional syncope after an initial cardiovascular evaluation	Ila-C-LD
Participation in competitive sports is not recommended for athletes with syncope and phenotype-positive HCM, CPVT, LQTS1, or ARVC before evaluation by a specialist	III-B-NR (Harm)

Table 36. ACC/AHA/HRS 2017 GL on syncope. Conditions Uncommonly Associated With Syncope

Condition	Clinical Characteristics	Notes
Cardiovascular and Cardiopulmonary		
Cardiac tamponade	Hypotension, tachycardia, cardiogenic shock.	Often tachycardia and hypotension; may be hypotensive and bradycardic acutely.
Constrictive pericarditis (533-535)	Severe HF symptoms, including edema, exertional dyspnea, orthopnea.	May be associated with cough syncope.
LV noncompaction (536-539)	Cardiomyopathy characterized by prominent LV trabeculae and deep intertrabecular recesses, due to embryologic perturbation.	Syncope reported in 5%–9% of both adult and pediatric patients. The mechanism may be a tachyarrhythmia.
Takotsubo cardiomyopathy (540,541)	Apical ballooning and basal hypercontractility, often due to stress. Chest pain and ECG changes consistent with ischemia are commonly seen.	Syncope is uncommon and may be multifactorial.
Pulmonary embolus (128,542,543)	Hypoxemia, tachycardia; hypotension and shock leading to pulseless electrical activity cardiac arrest in severe cases.	Syncope due to bradycardia and/or hypotension. One study showed higher prevalence of pulmonary embolus in older patients with first episode of syncope after admission to the hospital. Further confirmation of this finding in the older populations is warranted.
Pulmonary arterial hypertension	Occurs more often during exertion in younger patients.	Syncope due to inability to augment or sustain cardiac output during exertion, followed by vasodilatation.
Neuromuscular		
Myotonic dystrophy (12,560,561)	Autosomal dominant inheritance with multiple organ systems affected. Grip myotonia, weakness, temporal wasting, alopecia, cataracts, glucose intolerance, and daytime somnolence.	Both bradyarrhythmia and tachyarrhythmias.
Friedreich ataxia (562,563)	Autosomal recessive inheritance with limb and gait ataxia, bladder dysfunction, and daytime somnolence. Diffuse interstitial fibrosis and HCM.	Syncope can be bradycardic or tachycardic. SCD is known to occur.
Kearns Sayre (564,565)	Mitochondrial myopathy. Chronic progressive external ophthalmoplegia; pigmentary retinopathy.	Many patients develop significant His Purkinje disease.
Erb dystrophy (566)	Limb girdle muscular dystrophy, manifesting as scapulohumeral and/or pelvifemoral weakness and atrophy.	AV conduction disease, dilated cardiomyopathy.
Anatomic		
Lev's and Lenegre's diseases (567-571)	Progressive fibrosis and sclerosis of cardiac conduction system, including the cardiac skeleton, including the aortic and mitral rings.	Syncope is usually due to high-grade AV block.
Cardiac tumors (572)	Triad of obstruction, embolic, and systemic signs and symptoms.	Syncope is often due to obstruction to blood flow.
Prosthetic valve thrombosis (573-575)	Ranges from asymptomatic to profound HF.	May have similar presentation to a cardiac tumor, with a high risk of embolic phenomenon and obstruction.
Anomalous coronary artery (576-579)	Common cause of exertional syncope or SCD, classically in young athletes.	Syncope can be due to Bezold Jarisch reflex, hypotension, VT, or AV block.
Aortic dissection (580-582)	Aortic dissection may manifest with neurological symptoms, myocardial	The risk of in-hospital death, tamponade, and neurological deficits is higher in

	infarction, and HF. Syncope can occur in as many as 13% of aortic dissections.	patients with syncope. Otherwise, syncope alone does not appear to increase the risk of death.
Subclavian steal (583-587)	The phenomenon of flow reversal in a vertebral artery ipsilateral to a hemodynamically significant stenosis of the subclavian artery. Severe cases resulting in vertebrobasilar ischemia may rarely result in syncope.	Syncope is generally associated with upper-extremity activity.
Coarctation of the aorta (588)	If severe, it can result in HF or aortic dissection.	Associated bicuspid aortic valve stenosis may be considered with syncope.
Rheumatoid arthritis (589)	Chronic, autoimmune inflammatory disorder with systemic manifestations.	Rarely associated with complete heart block and syncope.
Syringomyelia (590-597) Chiari malformation (598)	Arnold Chiari malformations are the most common form of syringomyelia.	Syringomyelia-induced disruption of sympathetic fibers in the thoracic spinal cord is a rare mechanism of syncope (599).
Neck/vagal tumor (600,601)	Recurrent syncope is an uncommon complication of neck malignancy.	The mechanism may be invasion of the carotid sinus or the afferent nerve fibers of the glossopharyngeal nerve.
Endocrine		
Carcinoid syndrome (602) Pheochromocytoma (602,603) Mastocytosis (602-609) Vasoactive intestinal peptide tumor	These tumors can release vasoactive peptides and cause vasodilation, flushing, pruritus, and gastrointestinal symptoms.	Syncope is usually due to transient hypotension.
Hematologic		
Beta thalassemia major (610)	Severe anemia, multiple organ failure, and dilated cardiomyopathy due to iron overload.	Syncope may be arrhythmic.
Neurological disorders		
Seizure induced bradycardia/hypotension (611-614)	Generally due to temporal lobe epilepsy.	Postictal bradyarrhythmia is uncommon and likely originates from the temporal lobe or limbic system.
Migraine (615,616)	Migraine headaches are statistically associated with syncope.	Syncope may be vasovagal or due to orthostatic intolerance.

ACC indicates American College of Cardiology; AHA, American Heart Association; AV, atrioventricular; ECG, electrocardiogram; HCM, hypertrophic cardiomyopathy; HF, heart failure; HRS, Heart Rhythm Society; LV, left ventricular; LVH, left ventricular hypertrophy; SCD, sudden cardiac death; VA, ventricular arrhythmias; VT, ventricular tachycardia; and VVS, vasovagal syncope.

Table 37. Pseudosyncope**ACC/AHA/HRS 2017 GL on syncope.** Treatment of pseudosyncope.

A candid discussion with the patient with suspected pseudosyncope about the diagnosis	IIb-C-LD
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Cognitive behavioral therapy	IIb-C-LD
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ESC 2018 GL on syncope Diagnosis and management of psychogenic pseudosyncope**Diagnosis**

The recording of spontaneous attacks with a video by an eyewitness should be considered IIa-C for diagnosis of PPS.

Tilt testing, preferably with concurrent EEG recording and video monitoring, may be considered for diagnosis of PPS.	IIb-C
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Management

Doctors who diagnose PPS should present the diagnosis of PPS to the patient.	IIa-C
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Cognitive behavioural therapy may be considered in the treatment of PPS if attacks persist after explanation.	IIb-C
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EEG = electroencephalogram; PPS = psychogenic pseudosyncope.

Table 38. Driving after syncope

ACC/AHA/HRS 2017 GL on syncope. Avoidance of Private Driving After an Episode of Syncope: Suggested Symptom-Free Waiting Times for Various Conditions

Condition	Symptom-Free Waiting Time*
OH	1 month
VVS, no syncope in prior year (698)	No restriction
VVS, 1–6 syncope per year (694)	1 month
VVS, >6 syncope per year (694,698)	Not fit to drive until symptoms resolved
Situational syncope other than cough syncope	1 month
Cough syncope, untreated	Not fit to drive
Cough syncope, treated with cough suppression	1 month
Carotid sinus syncope, untreated (698)	Not fit to drive
Carotid sinus syncope, treated with permanent pacemaker (698)	1 week
Syncope due to nonreflex bradycardia, untreated (698)	Not fit to drive
Syncope due to nonreflex bradycardia, treated with permanent pacemaker (12,698)	1 week
Syncope due to SVT, untreated (698)	Not fit to drive
Syncope due to SVT, pharmacologically suppressed (698)	1 month
Syncope due to SVT, treated with ablation (698)	1 week
Syncope with LVEF <35% and a presumed arrhythmic etiology without an ICD (699,700)	Not fit to drive
Syncope with LVEF <35% and presumed arrhythmic etiology with an ICD (701,702)	3 months
Syncope presumed due to VT/VF, structural heart disease, and LVEF ≥35%, untreated	Not fit to drive
Syncope presumed due to VT/VF, structural heart disease, and LVEF ≥35%, treated with an ICD and guideline-directed drug therapy (701,702)	3 months
Syncope presumed due to VT with a genetic cause, untreated	Not fit to drive
Syncope presumed due to VT with a genetic cause, treated with an ICD or guideline-directed drug therapy	3 months
Syncope presumed due to a nonstructural heart disease VT, such as RVOT or LVOT, untreated	Not fit to drive
Syncope presumed due to a nonstructural heart disease VT, such as RVOT or LVOT, treated successfully with ablation or suppressed pharmacologically (698)	3 months
Syncope of undetermined etiology	1 month

*It may be prudent to wait and observe for this time without a syncope spell before resuming driving.

ICD indicates implantable cardioverter-defibrillator; LVEF, left ventricular ejection fraction; LVOT, left ventricular outflow tract; OH, orthostatic hypotension; RVOT, right ventricular outflow tract; SVT, supraventricular tachycardia; VF, ventricular fibrillation; VT, ventricular tachycardia; and VVS, vasovagal syncope.

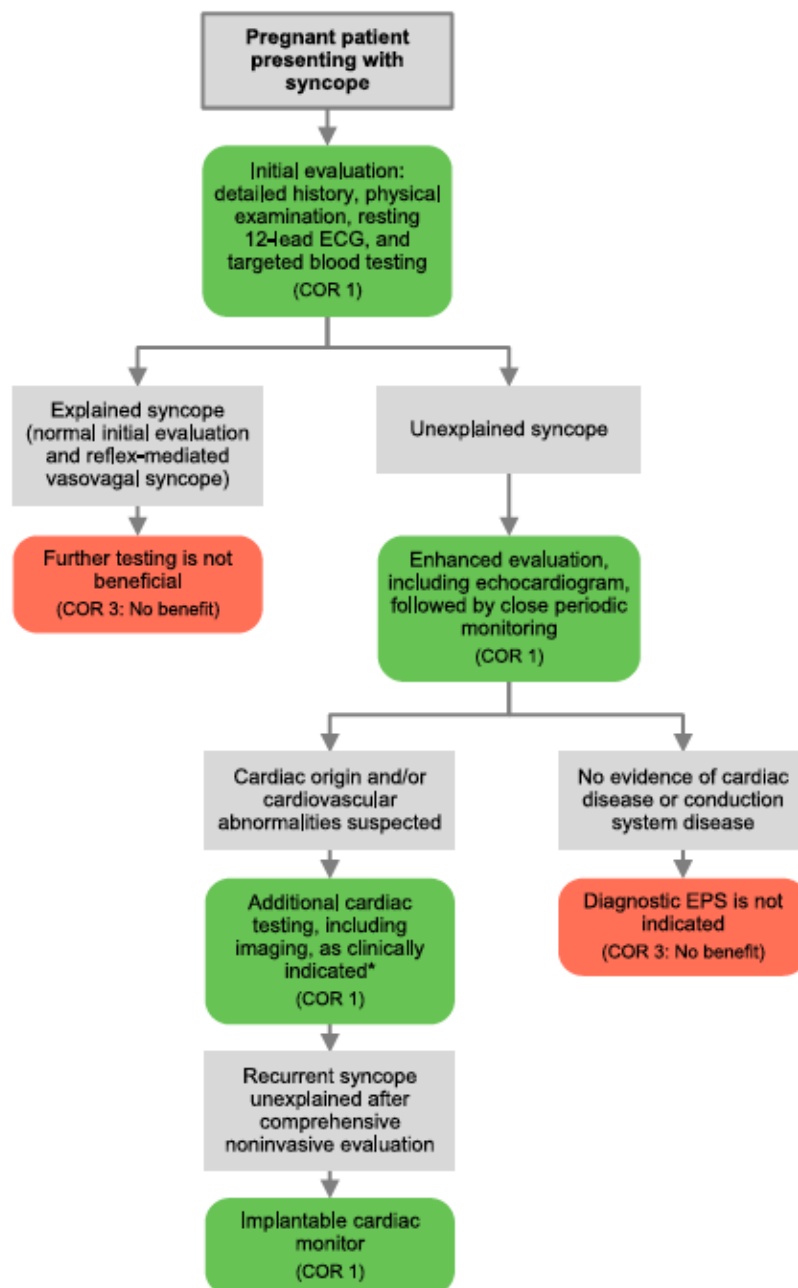


Figure 16. 2023 HRS expert consensus statement on the management of arrhythmias during pregnancy. Diagnosis of pregnant patients presenting with syncope.

*In consultation with a cardiologist or electrophysiologist with expertise in cardiovascular diseases in pregnancy. ECG 5 electrocardiogram, EPS 5 electrophysiology study.

Table 39. ESC 2018 GL on syncope. Syncope unit**Key components of a syncope unit**

- The syncope unit should take the lead in service delivery for syncope, and in education and training of healthcare professionals who encounter syncope.
- The syncope unit should be led by a clinician with specific knowledge of TLOC and additional necessary team members (i.e. clinical nurse specialist) depending on the local model of service delivery.
- The syncope unit should provide minimum core treatments for reflex syncope and OH, and treatments or preferential access for cardiac syncope, falls, psychogenic pseudosyncope, and epilepsy.
- Referrals should be directly from family practitioners, EDs, in-hospital and out-hospital services, or self-referral depending on the risk stratification of referrals. Fast-track access, with a separate waiting list and scheduled follow-up visits, should be recommended.
- Syncope units should employ quality indicators, process indicators, and desirable outcome targets.

ED = emergency department; OH = orthostatic hypotension; TLOC = transient loss of consciousness.

Structure of the syncope unit**Staffing of a syncope unit is composed of:**

- (1) One or more physicians of any specialty who are syncope specialists. Owing to the multidisciplinary nature of TLOC management, each syncope unit should identify specific specialists for the syncope unit and for consultancies.
- (2) A staff comprising professionals who will advance the care of patients with syncope. These may be physicians, specialized nurses, or others who bring multidisciplinary skills to the facility, coupled with administrative support. The roles played by members of the team may vary according to local circumstances and individual skill. Nurses may be expected to take very important roles including initial assessment, follow-up clinic evaluation, selection of investigations (including tilt testing), and implantation/insertion of ECG loop recorders according to predefined protocols and local regulations (see Table 14).
- (3) Given that the syncope unit is integrated within a hospital organization, syncope specialists and staff are not necessarily employed full-time, but frequently have other duties depending on the volume of activity in the unit.

Facility, protocol, and equipment

- (1) A syncope unit will deliver most of its care to outpatients in addition to ED and inpatients.
- (2) The syncope unit should follow an internal protocol, which applies to diagnosis and management and is agreed by stakeholders.
- (3) An equipped facility must be available.
- (4) Essential equipment/tests:
 - 12-lead ECG and 3-lead ECG monitoring
 - Non-invasive beat-to-beat BP monitor with recording facilities for subsequent analysis
 - Tilt-table
 - Holter monitors/external loop recorders
 - ILRs
 - Follow-up of ILRs^a
 - 24-hour BP monitoring
 - Basic autonomic function tests.
- (5) Established procedures for:
 - Echocardiography
 - EPS
 - Stress test
 - Neuroimaging tests.
- (6) Specialists' consultancies (cardiology, neurology, internal medicine, geriatric, psychology), when needed.

Therapy

Patients with syncope will receive their therapy under the care of the syncope unit unless expertise outside that of the unit is required.

Database management

The syncope unit is required to keep medical records that should also include follow-up when appropriate. The database will also offer the possibility of collaborative research with other syncope units.

BP = blood pressure; ECG = electrocardiogram; ED = emergency department; EPS = electrophysiological study; ILR = implantable loop recorder; TLOC = transient loss of consciousness.

^aImplantation of loop recorders may be performed either by syncope unit physicians or by external cardiologists at the request of the syncope unit physicians.

Test and assessments available in a syncope unit

Initial assessment	
History and physical evaluation including 3-min orthostatic BP measurement ^a 12-lead standard ECG	
Subsequent tests and assessments (only when indicated)	
Blood tests	Electrolytes, haemoglobin, troponin, B-type natriuretic peptide, glucose, D-dimer, haemogas analysis/oxygen saturation
Provocative tests	CSM, tilt testing
Monitoring	External loop recording, implantable loop recording, ambulatory 1–7 days ECG monitoring, 24–48-hour BP monitoring
Autonomic function tests	Standing test, Valsalva manoeuvre, deep-breathing test, cold pressor test, and/or established procedures for access to other autonomic function tests
Cardiac evaluation	Established procedures for access to echocardiogram, stress test, electrophysiological study, coronary angiography
Neurological evaluation	Established procedures for access to neurological tests (computed tomography, magnetic resonance imaging, EEG, video-EEG)
Geriatric evaluation	Established procedures for access to fall risk assessment (cognitive, gait and balance, visual, environmental) and for gait and balance retraining
Psychological or psychiatric evaluation	Established procedures for access to psychological or psychiatric consultancy (mental health problem or psychogenic syncope)

BP = blood pressure; CSM = carotid sinus massage; ECG = electrocardiogram; EEG = electroencephalogram.

^aPostural orthostatic tachycardia may require longer period of standing.