

Syncope

Syncope is a transient loss of consciousness (TLOC) due to temporary cerebral hypoperfusion, characterized by rapid onset, short duration, and spontaneous recovery. It is a common presentation in the hospital setting, often requiring a systematic evaluation to identify potentially life-threatening causes. This guide provides students with a comprehensive framework to understand the clinical presentation, evaluation, diagnostic studies, differential diagnosis, causes, and treatment of syncope, including how to identify high-risk syncope and differentiate types based on history and exam, with case scenarios for practical application.

Clinical Presentation

Symptoms:

- **Prodrome:** Lightheadedness, dizziness, nausea, sweating, pallor, visual changes (e.g., "graying out").
- **Loss of Consciousness:** Brief (seconds to minutes), often with collapse; spontaneous recovery without resuscitation.
- **Post-Syncopal Phase:** Fatigue, confusion, nausea (minutes to hours); no focal neurological deficits (unless stroke).

Associated Features:

- **Triggers:** Standing (orthostatic), pain/emotion (vasovagal), head turning (carotid sinus hypersensitivity).
- **Positional Changes:** Worse with standing, improves with lying down (orthostatic hypotension).
- **Palpitations:** Suggests arrhythmia (e.g., VT, SVT).
- **Injuries:** Falls, trauma (e.g., head injury, fractures) from collapse.

Evaluation: How to Differentiate Types of Syncope

History:

- Timing and Triggers:
 - **Vasovagal:** Emotional stress, pain, prolonged standing, warm environment.

- **Orthostatic:** Standing up quickly, dehydration, medications (e.g., antihypertensives).
- **Cardiac:** Sudden onset, no prodrome (arrhythmia), exertion-related (aortic stenosis).
- **Carotid Sinus Hypersensitivity:** Head turning, tight collar, shaving.
- Prodrome:
 - **Present:** Vasovagal (nausea, sweating), orthostatic (lightheadedness).
 - **Absent:** Cardiac (arrhythmia, often sudden collapse).
- Associated Symptoms:
 - **Palpitations:** Arrhythmia.
 - **Chest pain:** Aortic stenosis, MI, PE.
 - **Seizure-like activity:** Jerking (syncope vs. seizure).
 - **Neurological deficits:** Stroke, TIA.
- Medical History:
 - Cardiac disease (arrhythmia, structural heart disease).
 - Medications (e.g., beta-blockers, diuretics).
 - Recent trauma (subdural hematoma).
 - Family history of sudden cardiac death (e.g., LQTS, Brugada).

Physical Exam:

- Vitals:
 - **Orthostatic BP:** Drop >20 mmHg systolic or >10 mmHg diastolic within 3 minutes of standing (orthostatic hypotension).
 - **Heart rate:** Bradycardia (vasovagal, heart block), tachycardia (arrhythmia, PE).
- Cardiovascular:
 - Murmurs (aortic stenosis, HCM), irregular rhythm (AF), JVD, edema (CHF).
- Neurological:
 - Focal deficits (stroke), tremor (Parkinson's-related orthostatic hypotension), post-ictal state (seizure).
- Other:
 - Pallor (anemia), carotid bruit (TIA), neck mass (carotid sinus syndrome).

Diagnostic Studies

Initial Evaluation:

- **EKG:** Arrhythmias (AF, VT, heart block), ischemia (MI), QT prolongation (LQTS), Brugada pattern, delta wave (WPW).

- Labs:
 - **CBC:** Anemia (GI bleed, chronic disease).
 - **CMP:** Electrolytes (hypokalemia, hypoglycemia), BUN/Cr (dehydration, AKI).
 - **Troponin:** If chest pain or suspected MI.
 - **BNP:** If CHF suspected.
 - **D-dimer:** If PE suspected (only if low/intermediate risk by Wells score).
 - **Orthostatic Vitals:** BP/HR lying, sitting, standing (positive if drop >20/10 mmHg or symptomatic).

Targeted Studies Based on Suspected Cause:

- Cardiac:
 - **ECHO:** Structural heart disease (aortic stenosis, HCM, cardiomyopathy).
 - **Holter Monitor:** 24-48h monitoring for arrhythmias (e.g., paroxysmal AF).
 - **Event Monitor/Implantable Loop Recorder:** For recurrent, unexplained syncope.
 - **EP Study:** If high suspicion for ventricular arrhythmias (e.g., VT in cardiomyopathy).
- Neurological:
 - **CT/MRI Brain:** If focal deficits (stroke, subdural hematoma).
 - **EEG:** If seizure suspected (post-ictal state, witnessed jerking).
 - **Carotid Ultrasound:** If TIA/stroke suspected.
- Pulmonary:
 - **CT Pulmonary Angiography (CTPA):** For PE (if D-dimer positive or high risk).
 - **V/Q Scan:** Alternative to CTPA if contrast contraindicated.
- Other:
 - **Tilt Table Test:** For suspected vasovagal syncope or orthostatic intolerance.
 - **Blood Glucose:** Hypoglycemia (insulin, sulfonylureas).
 - **TSH:** Hypothyroidism (rare cause of syncope).

Differential Diagnosis

Syncope:

- Reflex (vasovagal, situational, carotid sinus hypersensitivity).
- Orthostatic hypotension (dehydration, autonomic dysfunction, medications).
- Cardiac (arrhythmia, structural heart disease, ischemic).

Non-Syncope Causes of TLOC:

- **Seizure:** Jerking, tongue biting, post-ictal state, EEG abnormalities.
- **Stroke/TIA:** Focal neurological deficits, CT/MRI findings.
- **Hypoglycemia:** Sweating, shakiness, rapid recovery with glucose.
- **Subdural Hematoma:** History of trauma, focal deficits, CT findings.
- **Psychogenic (Pseudosyncope):** Prolonged episodes, atypical triggers, normal workup.

Different Causes of Syncope

Reflex Syncope:

- Vasovagal Syncope:
 - Emotional stress, pain, standing; prodrome (nausea, sweating), benign.
- Situational Syncope:
 - Micturition, defecation, coughing; vagal stimulation.
- Carotid Sinus Hypersensitivity:
 - Head turning, tight collar; elderly, cardioinhibitory or vasodepressor response.

Orthostatic Hypotension:

- Dehydration/Hypovolemia:
 - Vomiting, diarrhea, diuretics; orthostatic vitals positive.
- Autonomic Dysfunction:
 - Parkinson's, diabetes, amyloidosis; chronic orthostatic intolerance.
- Medications:
 - Antihypertensives (beta-blockers, ACEi), diuretics, alpha-blockers.

Cardiac Syncope:

- Arrhythmias:
 - Bradyarrhythmia:
 - 2nd/3rd-degree heart block, sick sinus syndrome; EKG shows AV block.
 - Tachyarrhythmia:
 - VT, SVT, AF with rapid ventricular response; sudden onset, palpitations.
 - Structural Heart Disease:
 - Aortic Stenosis: Exertional syncope, murmur, ECHO shows severe AS.

- Hypertrophic Cardiomyopathy (HCM): Young patients, exertional, family history of SCD.
- Pulmonary Embolism (PE): Dyspnea, hypoxia, RV strain on ECHO/CTPA.
- Ischemic: MI causing arrhythmia or hypoperfusion; chest pain, troponin positive.

Neurological:

- Stroke/TIA: Focal deficits, often vertebrobasilar insufficiency.
- Subdural Hematoma: History of trauma, elderly, CT shows hematoma.
- Seizure (Mimic): Jerking, post-ictal state, EEG abnormalities.

Other:

- Hypoglycemia: Sweating, shakiness, rapid recovery with glucose.
- Psychogenic: Prolonged episodes, no physiological changes, normal workup.

High-Risk Syncope

Definition:

Syncope with features suggesting a serious underlying cause, warranting urgent evaluation and often hospital admission.

High-Risk Features:

- History:
 - Sudden onset without prodrome (cardiac).
 - Exertional syncope (aortic stenosis, HCM).
 - Palpitations prior to event (arrhythmia).
 - Family history of sudden cardiac death (LQTS, Brugada).
 - Syncope while sitting/lying (cardiac, neurological).
- Exam:
 - Abnormal EKG (arrhythmia, QT prolongation, Brugada pattern, ischemia).
 - Structural heart disease (murmur, CHF signs).
 - Focal neurological deficits (stroke, TIA).
 - Severe injury from fall (e.g., fracture, head trauma).
- Labs/Studies:
 - Troponin positive (MI).
 - D-dimer/CTPA positive (PE).
 - Abnormal vitals (hypotension, tachycardia, hypoxia).

Low-Risk Features:

- Clear vasovagal trigger (e.g., standing, pain).
- Prodrome (nausea, sweating).
- Normal EKG, vitals, and exam.
- Young patient, no cardiac history.

Treatment

General Management:

- Initial Stabilization:
 - Lie patient flat, elevate legs (if no contraindication) to improve cerebral perfusion.
 - Oxygen if hypoxic (SpO₂ <90%).
 - IV fluids (NS 500 mL bolus) if hypovolemic.
- Identify Cause:
 - Use history, exam, and diagnostic studies to guide treatment.
- Prevent Recurrence:
 - Address underlying cause, educate on triggers (e.g., avoid dehydration, prolonged standing).

Specific Treatments:

- Reflex Syncope:
 - Vasovagal:
 - Education (avoid triggers, hydration, salt intake), counterpressure maneuvers (leg crossing, hand gripping).
- Carotid Sinus Hypersensitivity:
 - Avoid triggers, pacemaker if recurrent cardioinhibitory response.
- Orthostatic Hypotension:
 - Hypovolemia: IV fluids (NS 1-2 L), correct underlying cause (e.g., stop diuretics).
- Autonomic Dysfunction:
 - Increase salt/fluid intake, compression stockings, midodrine 5-10 mg PO TID.
 - Medications: Antihypertensives (e.g., beta-blockers, ACEi), diuretics, alpha-blockers.
- Cardiac Syncope:
 - Arrhythmia:
 - Bradyarrhythmia: Pacemaker (2nd/3rd-degree heart block).

- Tachyarrhythmia: Antiarrhythmics (e.g., amiodarone 150 mg IV load for VT), ablation (SVT, AF), ICD (VT with structural heart disease).
- Structural:
 - Aortic Stenosis: Valve replacement (TAVR or surgical).
- HCM: Beta-blockers (e.g., metoprolol 50 mg PO daily), ICD for SCD risk.
- PE: Anticoagulation (e.g., heparin 80 units/kg IV bolus, then 18 units/kg/h), thrombolytics (e.g., alteplase) if massive.
- Neurological:
 - Stroke/TIA: Aspirin 325 mg PO, anticoagulation if AF (e.g., apixaban 5 mg PO BID), carotid endarterectomy if stenosis.
 - Subdural Hematoma: Surgical evacuation (neurosurgery consult).
- Other:
 - Hypoglycemia: D50W 50 mL IV, adjust diabetic medications.
 - Psychogenic: Psychiatric evaluation, reassurance, monitor for recurrence.

Table: Types of Syncope, Differentiation, and Management

Type	Onset	History/Exam Findings	Diagnostic Studies	Treatment
Vasovagal	Acute (seconds-minutes)	Prodrome (nausea, sweating), standing, emotional trigger	Normal EKG, tilt table test	Hydration, salt intake, counterpressure maneuvers
Orthostatic	Acute (seconds-minutes)	Standing up, dehydration, orthostatic vitals drop	Orthostatic vitals, CMP (electrolytes)	IV fluids (NS 1-2 L), midodrine 5-10 mg PO TID
Cardiac (Arrhythmia)	Acute (seconds)	Sudden onset, palpitations, abnormal EKG	EKG (VT, heart block), Holter, ECHO	Pacemaker (brady), ablation (tachy), ICD (VT)
Cardiac (Structural)	Acute (seconds)	Exertional, murmur (AS, HCM), RV strain (PE)	ECHO (AS, HCM), CTPA (PE), troponin	Valve replacement (AS), beta-blockers (HCM), anticoagulation (PE)
Neurological (Stroke)	Acute (minutes)	Focal deficits, carotid bruit	CT/MRI brain, carotid US	Aspirin 325 mg PO, anticoagulation if AF
Hypoglycemia	Acute (minutes)	Sweating, shakiness, rapid recovery with glucose	Blood glucose <70 mg/dL	D50W 50 mL IV, adjust diabetic meds
Psychogenic	Variable (minutes)	Prolonged episodes, atypical triggers, normal exam	Normal EKG, EEG (rule out seizure)	Psychiatric evaluation, reassurance

Key Pearls

Presentation:

Prodrome (vasovagal, orthostatic), sudden onset (cardiac), focal deficits (stroke).

Evaluation:

History (triggers, prodrome), exam (orthostatic vitals, EKG), studies (ECHO, CTPA).

Differential:

Reflex (vasovagal), orthostatic, cardiac, neurological, hypoglycemia, psychogenic.

High-Risk Syncope:

Sudden onset, no prodrome, exertional, abnormal EKG, structural heart disease.

Causes:

Vasovagal (emotional), orthostatic (dehydration), cardiac (arrhythmia, AS), neurological (stroke).

Treatment:

Fluids (orthostatic), pacemaker/ablation (arrhythmia), valve replacement (AS), anticoagulation (PE).

References

UpToDate: "Syncope: Evaluation and Management" (2025). UpToDate Syncope

AHA/ACC: "Guidelines for the Management of Syncope" (2024). AHA Guidelines

ESC: "Diagnosis and Management of Syncope" (2023). ESC Guidelines

NEJM: "Cardiac Causes of Syncope: Advances in Diagnosis" (2024). NEJM Syncope

Case Scenarios

Case 1: A 25-Year-Old Female with Syncope After Standing

- Presentation A 25-year-old female presents after fainting while standing in line at a concert. She reports nausea, sweating, and lightheadedness prior to the event. Exam shows T 37°C, BP 110/70 mmHg lying, 90/60 mmHg standing, HR 80 bpm lying, 100 bpm standing, normal EKG.
- Labs/Studies: Orthostatic vitals positive (BP drop >20/10 mmHg), normal CMP, EKG normal.
- Diagnosis: Vasovagal Syncope → Prodrome, standing trigger, orthostatic changes, normal EKG.
- Management: Admit for observation. IV fluids (NS 1 L bolus) for dehydration. Educate on hydration, salt intake, counterpressure maneuvers (leg crossing). No high-risk features (normal EKG, clear trigger). Discharge with outpatient follow-up.

Case 2: A 70-Year-Old Male with Syncope and Palpitations

- Presentation: A 70-year-old male with a history of MI presents with sudden syncope while sitting, preceded by palpitations. Exam shows T 37°C, BP 100/60 mmHg, HR 40 bpm, irregular rhythm, no murmurs.
- Labs/Studies: **EKG**: 3rd-degree AV block, troponin normal, ECHO: EF 45%.
- Diagnosis: Cardiac Syncope (Bradyarrhythmia) → Sudden onset, palpitations, AV block, high-risk.
- Management: Admit to telemetry. Temporary transvenous pacing initiated. Permanent pacemaker placed (DDD mode). Monitor for recurrence (none). Discharge with cardiology follow-up.

Case 3: A 55-Year-Old Female with Syncope and Dyspnea

- Presentation: A 55-year-old female with a history of DVT presents with syncope, dyspnea, and chest pain. Exam shows T 38°C, BP 90/60 mmHg, RR 24/min, SpO₂ 88% on room air, RV heave, tachycardia.
- Labs/Studies: **D-dimer elevated**, **CTPA**: Saddle PE, ECHO: RV strain, troponin mildly elevated.
- Diagnosis: Cardiac Syncope (Pulmonary Embolism) → Syncope, dyspnea, hypoxia, PE, high-risk.
- Management: Admit to ICU. Start heparin 80 units/kg IV bolus, then 18 units/kg/h. Oxygen to SpO₂ >92%. Thrombolytics (alteplase 100 mg IV over 2h) given for massive PE (hypotension, RV strain). Monitor for bleeding (none). Transition to apixaban 5 mg PO BID. Discharge with hematology follow-up.

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