



EPIX Patient Safety Brief

Syncope Part 1

by Dr. Stephen Colucciello

“The floor scooped me up where I stood, and I blinked as it hit me.”

— M. Beth Bloom, *Drain You*

Introduction

As we know from daily experience, syncope is a frequent complaint in the emergency department, accounting for up to 3% of patient visits.¹ Annually, over 1.3 million Americans visit an ED for syncope² and at least one third of these patients are admitted³ at a cost of over \$2 billion dollars⁴.

While the causes of syncope are legion, the majority are benign. Our job is to risk stratify patients into high, moderate/indeterminate, or low risk for complications. We also must carefully search for any fall-related injuries. Such injuries including subdural hematoma or cervical spine fracture may be more dangerous than the syncopal cause.

Syncope Definition

ACEP defines syncope as “symptom complex that is composed of a brief loss of consciousness associated with an inability to maintain postural tone that spontaneously and completely resolves without medical intervention.”⁵ True syncope is secondary to global cerebral hypoperfusion and divided into three main categories: reflex or vasovagal syncope, syncope secondary to orthostatic hypotension, and cardiogenic syncope.⁶ In the ED, we are most concerned with possible cardiac syncope.

The most dangerous cardiac causes of syncope include tachyarrhythmias such as ventricular tachycardia (VT); brady-arrhythmias such as heart block; left heart-filling problems such as pulmonary embolism and cardiac tamponade; and heart-emptying problems such as severe aortic stenosis. Orthostatic hypotension, while often considered nonthreatening may be lethal if secondary to an aortic catastrophe such as aneurysmal rupture or a massive GI bleed. While reflex (vasovagal) syncope is most common and benign (more than 20%), nearly 10% of events are caused by cardiac syncope (higher in the elderly) and an equal number from orthostatic hypotension. Notably almost 40% of syncope is of undetermined etiology.⁷

Presyncope or near syncope is the sensation that a person is going to pass out (or in my ED “fixin to fall out”; as opposed to “done fall out” or true syncope). For years, emergency providers felt comfortable skipping the syncope workup for patients with *near syncope*. This was an error. In a recent study on presyncope, about 5% of presyncope patients had serious outcomes within 30 days of their ED visit. Only two-thirds of the serious etiologies were identified in the ED.⁸

Syncope Demographics

Approximately 20% of adults will experience syncope during their lifetime, females more often than males.⁹ Older patients have a much higher incidence of syncope and the risk of a cardiac cause increases dramatically. The incidence of syncope increases from 5.7 per 1000 patients per year in their 70’s to almost 4 times that rate for nonagenarians.¹⁰ After age 80 almost 60% of elderly “syncopizers” are admitted to the hospital (justifiably or not).¹¹ One study showed that 40% of syncopal events in patients 65 or older were cardiac in nature.¹²

Differential Diagnosis for Transient Loss of Consciousness

Mnemonic: Head, Heart, Vessels
HEAD
H – Hypoxia / Hypoglycemia E – Epilepsy A – Anxiety D – Disorders of brain stem
HEART (CVS Causes)
H – Heart attack (MI) E – Embolism (PE) A – Aortic stenosis / Acute coronary syndrome R – Rhythm abnormalities (drug induced, AFib) T – Tachycardia
VESSELS (Vascular and Other Causes)
V – Vasovagal causes (common faint) E – Electrolyte abnormalities S – Situational (cough, sneeze, micturition) S – Subclavian steal syndrome E – ENT causes (glossopharyngeal neuralgia) L – Low systemic vascular resistance (Addison’s disease, diabetic nephropathy) S – Sensitive carotid sinus / Sick sinus syndrome Substance Abuse
Adapted from http://indulgy.com/post/3xBtZhHep2/photos-neuro-social-networking-for-medica

Syncope Mimics

In addition to distinguishing benign from dangerous causes of syncope, we must discriminate between syncope and numerous mimics. While there are many conditions that masquerade as syncope, the emergency practitioner *must* focus upon the most dangerous.

Potentially Dangerous Syncope Mimics ¹³ (adapted):

- Seizure
- Subarachnoid hemorrhage (SAH)
- Hypoglycemia
- Carbon monoxide poisoning
- Hypoxia
- Heat stroke
- TIA/Stroke
- Toxins
- Increased intracranial pressure
- Ruptured AAA
- Aortic dissection

ED Evaluation

Triage

The most important triage intervention for a patient with syncope is to quickly obtain an ECG. If the patient bypasses triage, the ECG can be obtained on arrival to the room. Patients with abnormal vital signs require cardiac and blood pressure monitoring. The nurse should alert the ED provider regarding unstable patients, start an IV line(s) and obtain blood. **In EDs where nurses have less autonomy, develop a syncope standing order set to ensure a rapid response to potentially unstable patients.**

History

History of Present Illness

The history is the most important part of the ED evaluation for syncope. It can also be the most problematic since a good percentage of patients cannot recall the sequence of events. Make an effort to interview witnesses (by phone is fine) as well as talking to the medics or reading their run report. For institutionalized patients, have your patient rep call the nursing facility and find an eyewitness to speak with you.

If the syncope was witnessed, determine if the patient had a seizure. While several myoclonic jerks can occur with syncope, sustained tonic-clonic jerking, or tonic posturing, suggests a seizure, especially if the collapse is followed by a period of confusion. In a recent study, observers were much better at differentiating between syncope and seizure than patient-reported history (no surprise there). ¹⁴

Many emergency providers were taught that urinary incontinence points to a seizure rather than syncope. However, a pooled analysis of data shows that urinary incontinence cannot distinguish between seizures, syncope or other non-epileptic events.¹⁵ However, nausea or sweating before the event, occurs far more often with syncope, and are useful historical features to **exclude** seizure.¹⁶

Crucial to the investigation is to determine, “What was the patient doing just prior to losing consciousness?”

Red flags for **serious causes of syncope** include:

- During exertion (structural heart disease)
- While sitting or lying down (cardiac syncope)
- Lack of prodrome (arrhythmia)
- Chest pain or shortness of breath (acute coronary syndrome (ACS), pulmonary embolism (PE), or aortic dissection (AD))
- Thunderclap headache (subarachnoid hemorrhage (SAH))
- Sudden flank or back pain (ruptured abdominal aortic aneurysm (AAA))

Syncope upon standing is likely secondary to volume depletion or lack of appropriate postural vascular tone.

Certain scenarios are classically associated with benign “situational syncope”; urination (micturition syncope), cough or sneeze, swallowing, defecating, laughing, and even playing brass instruments (Valsalva-related syncope). Be cautious about making the diagnosis of micturition or defecation syncope especially in the elderly. Elderly patients often fall or syncope *on the way to* the bathroom or *on the way back* from the bathroom or when standing up off the toilet. Clarify if they were in *the act* of urinating or defecating when they passed out.

Carotid sinus syndrome causes syncope when rubbing or massaging the carotid artery and may occur during shaving. The subclavian steal syndrome (SSS) is an unusual etiology of syncope where the vertebral artery flow is reversed into the ipsilateral arm secondary to stenosis of the subclavian artery. The combination of syncope and arm symptoms suggests this diagnosis.¹⁷

If syncope occurred upon standing, determine if patients have a reason for volume depletion such as nausea, vomiting, diarrhea or polyuria. While not every patient with syncope requires a rectal exam, questions regarding melena or bloody stools are appropriate, especially in those with a prior GI bleed, abdominal pain or coagulopathy. Medications are also a major cause of postural syncope as we will see below.

Past Medical History

Obviously you want to know about prior syncopal events and if the workup showed anything. Did they ever wear an ambulatory heart monitor or have an echocardiogram or other cardiac tests? Interestingly, one study showed that in older adults with syncope, a prior history of syncope within the year *does not* increase the risk for serious 30-day events.¹⁸ However, it seems obvious that the more times an elderly patient collapses, the greater risk for injury.

Any heart disease should raise the suspicion of cardiac-related syncope. In ED patients with syncope, **a history of congestive heart failure (CHF) or prior arrhythmias is strongly associated with serious clinical events in the next 30 days.**¹⁹

High risk past medical history includes²⁰ (adapted):

- CHF
- Arrhythmias
- Antiarrhythmic medications
- Heart blocks
- Aortic stenosis (AS)
- History of MI or coronary artery disease
- Hypertrophic cardiomyopathy (HCM)
- Cardiac masses (myxoma, tumors)
- Pericardial disease (especially effusion)
- Prosthetic valve
- Pacemaker/ Internal cardiac defibrillator (ICD)
- Aortic disease
- Pulmonary embolism
- Pulmonary hypertension
- Dialysis

The Obligatory Pie Chart



<https://imgur.com/gallery/7CNVNoS>

Family History

A presentation for syncope is one of the few times that family history is essential in the ED. In particular, we want to know if there is a **family history of sudden death**. There are numerous structural and arrhythmogenic heart conditions that are genetic in nature including hypertrophic cardiomyopathy, Brugada syndrome, catecholaminergic polymorphic ventricular tachycardia, and long or short QT syndromes.²¹

Medications

A comprehensive medication history is crucial to the syncope work up. Medications are the number one cause of orthostatic hypotension leading to syncope.²⁰ Ask if the patient started any new medications or recently increased the dose of an old medication. Ask about missed doses. Patients sometimes “double up” on their medications if they miss a dose, leading to orthostasis.

Antihypertensives (especially diuretics), beta blockers, and psychiatric medications are often implicated. In one study, hydrochlorothiazide, lisinopril, trazodone, furosemide and terazosin were the most frequent causes of medication-associated symptomatic orthostatic hypotension among an elderly population.

Antiarrhythmics are of special concern as they can paradoxically cause cardiac dysrhythmias.

While anticoagulant and antiplatelet agents do not cause syncope, they dramatically change the equation once the patient falls. Have a very low threshold for obtaining a head CT in such patients even with ground level falls.

Physical Exam

Focus your physical examination on possible injuries from a fall as well as clues to the cause of syncope. In one study of over a thousand patients with syncope, almost 30% suffered injury, while 5% had injuries characterized as “severe”.²²

C Spine. Early in the encounter, determine the need for cervical immobilization. Use either the NEXUS or Canadian C-spine rules (although in the Canadian rule, age of 65 or older is an indication for imaging in the context of possible cervical trauma). Elderly patients, especially those with rheumatoid arthritis or spinal diseases, are particularly susceptible to cervical spine injuries. Those with unstable fractures and patients with cervical spinal stenosis may suffer injury to the cord.

Head. Look for signs of head trauma such as hematoma, bruising, or stigmata of basilar skull fractures. Check the teeth and jaw for signs of dental trauma or mandibular fracture and pay special attention to the tongue. In one study, lateral tongue biting was 100% specific to grand mal seizures.²³ Biting the *tip* of the tongue is more likely associated with syncope.²⁴

Torso. Chest and abdominal trauma is rare in syncope unless the patient hits their torso on the edge of a table or chair (or worse, falls down some stairs). Consider imaging if there is significant tenderness of the chest or abdomen. A large pulsatile abdominal mass deserves immediate assessment for AAA (preferably a bedside ultrasound).

Cardiac. Pay special attention to the cardiac exam when evaluating for syncope. Two systolic murmurs in particular should prompt an echocardiogram; the murmur of hypertrophic cardiomyopathy (HCM) (previously known as hypertrophic obstructive cardiomyopathy or HOCM) and that of aortic stenosis. The murmur of HCM is best heard at the apex of the heart while AS is best heard over the right second interspace, lateral sternal border. Performing the Valsalva and squatting maneuvers can help distinguish between the two.

Distinguishing the murmur of HOCM and aortic stenosis

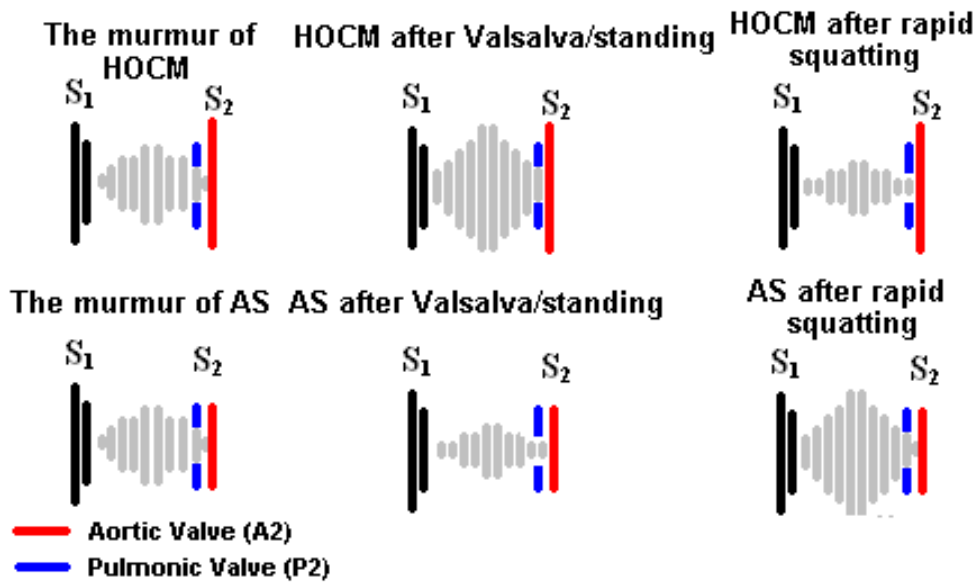


Image courtesy of Healio Learn the Heart.

To listen to the murmur of hypertrophic cardiomyopathy go to <https://www.easyauscultation.com/cases?coursecaseorder=7&courseid=26> and for aortic stenosis go to <https://www.easyauscultation.com/cases?coursecaseorder=4&courseid=26>.

If you are unsure of your auscultatory skills, just order an echocardiogram for patients with syncope and a previously undiagnosed murmur.

Extremities. If the patient was aware they were “going down” they may have tried to catch their *Fall On an Out-Stretched Hand* before losing consciousness; causing a *FOOSH* injury. Older patients may sustain a Colles fracture.

Check distal pulses for symmetry; as a pulse differential may be secondary to a thoracic aortic dissection.

Pelvis. Hip fractures are one of the more common injuries in the elderly with transient loss of consciousness; carefully range each hip for signs of pain (of course, no need to range a hip when the patient has hip tenderness and shortened limb!)

Neuro. A good neurologic exam is essential to determine if the patient had a stroke prior to the fall or suffered neurologic injury after the fall. Either way, emergent CT scan is indicated in the presence of a new deficit.

Gait. Of all the physical exam maneuvers after a fall, getting the patient to walk is one of the most revealing. Is the patient lightheaded upon standing? Is their gait stable? Do they have pain in their hip? A simple “road test” before discharge (along with rechecking abnormal vital signs) is one of the most powerful risk management tools at our disposal.

Vital Signs

Both the American Heart Association (AHA) and European syncope guidelines claim that orthostatic vital signs are an essential part of the syncope evaluation.^{2,20} The European guideline defines orthostatic hypotension as “a fall in systolic BP from baseline value ≥ 20 mmHg or diastolic BP ≥ 10 mmHg, or a decrease in systolic BP to < 90 mmHg” upon standing. Orthostatic blood pressure should be measured 3 minutes after standing from a supine position.²⁰ Measuring the blood pressure immediately upon standing is a common mistake and does not reflect orthostatic hypotension!

However, the recommendations for routine measurement of orthostatic blood pressure in syncope are not well referenced in the AHA and European guidelines. We know that a drop in systolic blood pressure of 20 points or more can occur in 11 to 50% of *asymptomatic* elderly patients.^{25,26} In an excellent review of the literature, Jason Schaffer notes that the physician should consider the pretest probability of OH (orthostatic hypotension) as a cause of syncope.²⁶ If the patient is not having symptoms upon standing and especially if there are other probable causes for syncope, measurement of orthostatic vital signs may be misleading. In such cases a serious cardiac cause of syncope may be overlooked because of a physiologic drop in blood pressure with standing.

Conversely, if the patient has a high pretest probability of orthostatic hypotension, such as recurrent postural symptoms, especially in the face of dehydration, a negative standing test does not exclude the diagnosis. Dr. Schaffer concludes that if performed safely (with someone to catch the person if they collapse), orthostatic vital signs are acceptable for patients being admitted for syncope; however this test “should infrequently alter the decision to admit.” **Overall, routinely testing for orthostatic symptoms is probably more valuable than routinely testing for orthostatic hypotension.**

Diagnostic Studies

ECG

An ECG is the single test mandated in every clinical decision rule for syncope. It is important to remember that the ECG covers only a snapshot of cardiac activity and is not nearly as sensitive for detecting intermittent rhythm disturbances as ambulatory or ED monitoring.

Examine every ECG you read for syncope with an eye to following **6 high-risk findings, the “Big Six”**:

1. Wolff-Parkinson-White pattern (WPW)
2. Prolonged QTc
3. Brugada Pattern
4. Hypertrophic cardiomyopathy
3. Arrhythmogenic right ventricular cardiomyopathy (ARVC)
4. Heart block

Wolff-Parkinson-White pattern (WPW)

Look for the delta wave and a short PR interval.

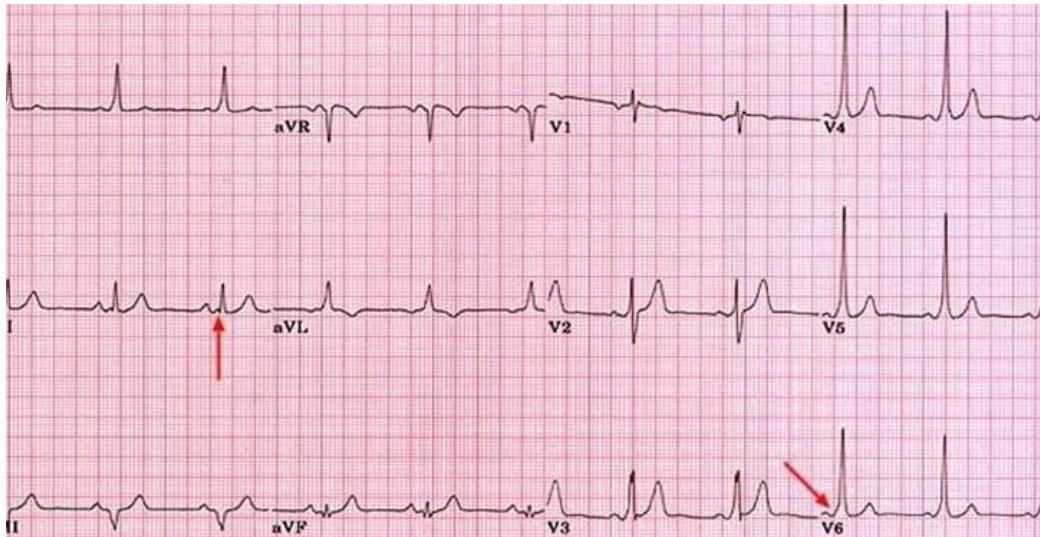
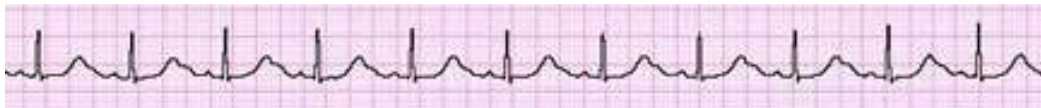


Image courtesy of Queen's University; Department of Emergency Medicine.

Arrow on left shows initial slurring of the QRS complex as a result of early ventricular depolarization
The arrow on the right shows the delta wave.

Prolonged QTc



Prolonged QTc may be congenital or acquired. It may lead to polymorphic ventricular tachycardia (Torsades de Pointes).

Brugada Pattern

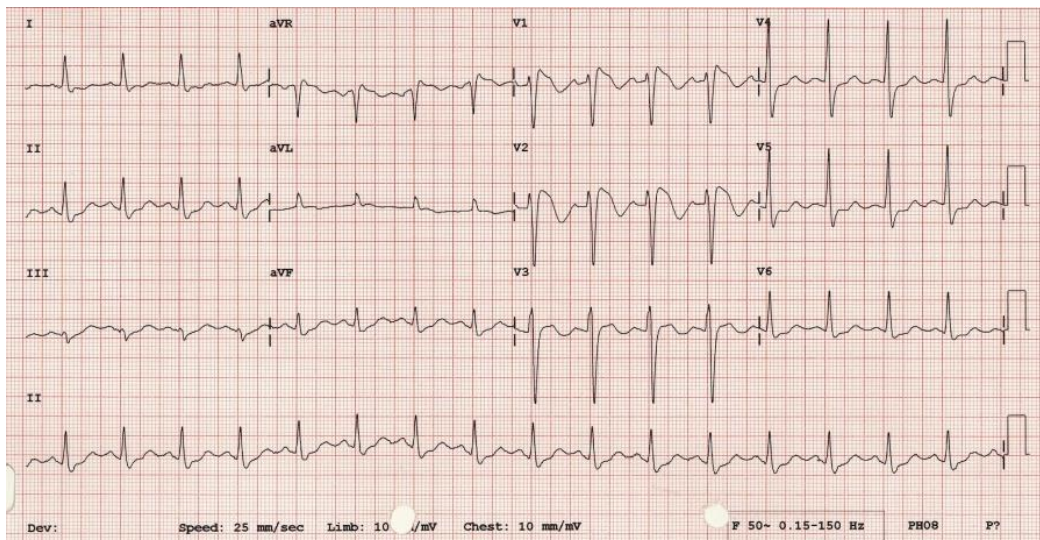


Image from litfl.com.

Type 1 (Coved ST segment elevation $>2\text{mm}$ in >1 of V1-V3 followed by a negative T wave) is the Brugada sign.

Brugada Type 2 can look “STEMI”-ish in V2 or V3

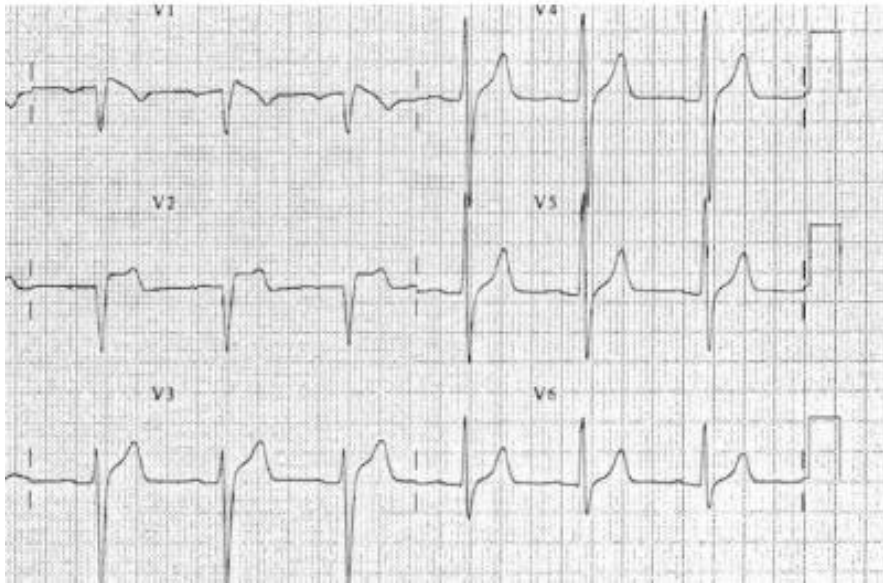


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Hypertrophic Cardiomyopathy

Most common cause of cardiac sudden death in young adults:

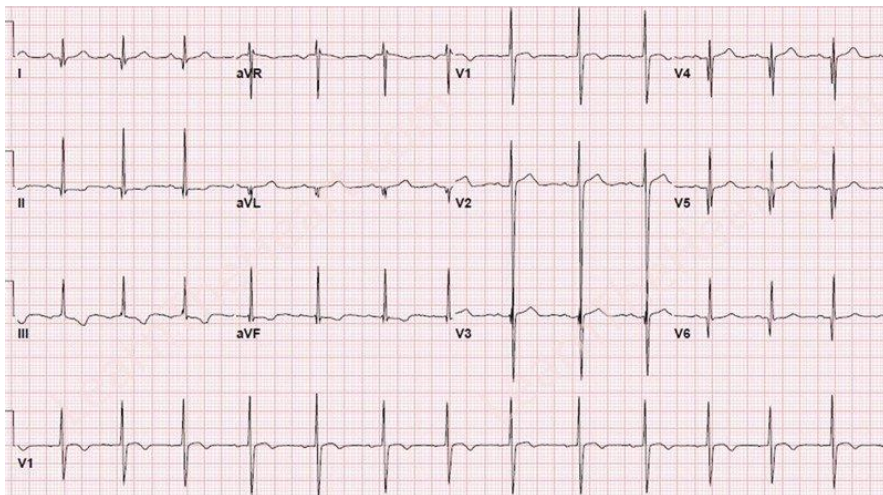


Image courtesy of Healio Learn the Heart.

Note the narrow “dagger-like” QRS complexes that touch between leads V2 and V3 (“kissing complexes”).

Arrhythmogenic Right Ventricular Cardiomyopathy (ARVC)

Second most common cause of sudden death in young adults after HCM.

Patients will have negative T waves in V1-V3 with or without epsilon waves.



Image from litfl.com.

Note Epsilon wave in V1

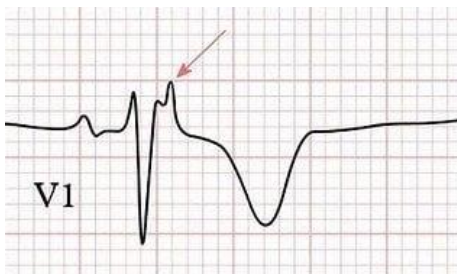


Image from litfl.com.

Prolonged S wave upstroke in V2 with QRS widening



Image from litfl.com.

Heart Blocks

3rd degree heart block demonstrates complete absence of AV conduction and requires admission, often for a pacemaker.

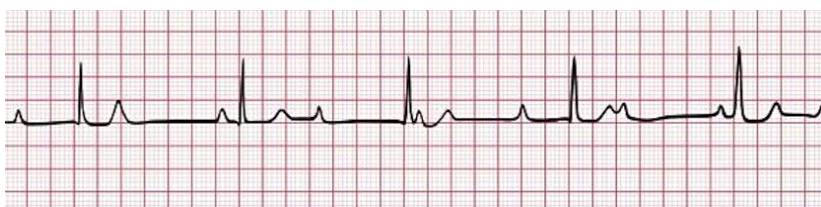


Image from litfl.com.

Summary

Many conditions can cause transient loss of consciousness and the mnemonic HEAD, HEART, and VESSELS is a useful tool. Syncope comes from transiently decreased cerebral perfusion and is distinct from the syncope mimics listed above. While most causes of syncope are benign, certain types of cardiac syncope can be fatal. Remember that patients can suffer serious fall-related injury even if the cause of syncope is benign.

The patient history is often the most revealing aspect of the ED exam and should include a family history of sudden death and a review of all medications. The physical exam (especially the cardiac exam) may occasionally reveal the cause of syncope but is often more useful to detect fall-related injuries. Look for lateral tongue biting as diagnostic for seizures.

The ECG is the single most important diagnostic test for syncope and the emergency providers should instantly recognize the "Big Six" dangerous tracings.

In Part 2 of Syncope, we will look at the role of diagnostic testing in syncope and the various clinical decision rules.

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Images

- Distinguishing the murmur of HOCM and aortic stenosis:
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- *Prolonged S wave:* <https://litfl.com/arrhythmogenic-right-ventricular-cardiomyopathy-arvc/>
- *3rd degree heart block:* <https://litfl.com/av-block-3rd-degree-complete-heart-block/>.

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