Syncope

(From a Cardiologist's Perspective)

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Internal Medicine Specialty Track
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Goals

- Formally define syncope, its associated causes and epidemiology
- Review the recommendations on the evaluation and management of syncope
- Discuss the different types of syncope and associated testing
- Review the driving recommendations for syncope

Outline

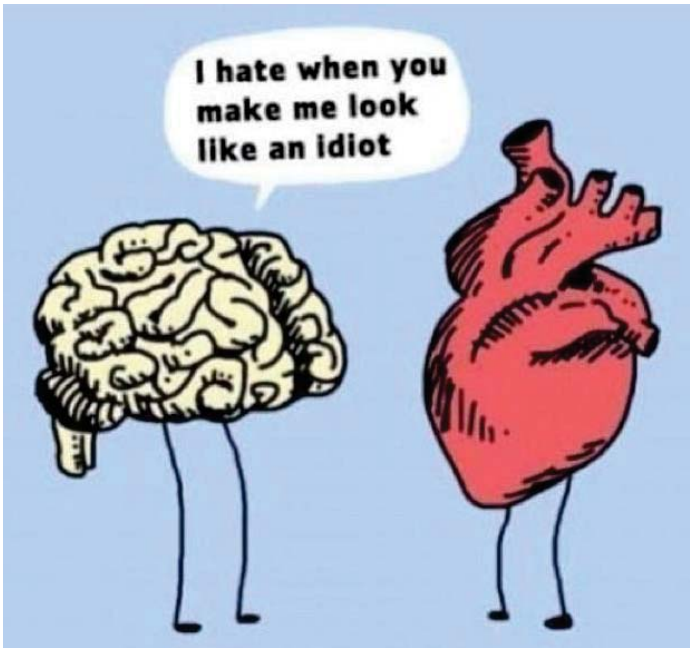
- Definition, epidemiology and demographics
- Initial evaluation
- Risk assessment and disposition
- Additional testing and recommendations
  - Cardiovascular and neurologic testing
- Non-cardiac syncope recommendations
  - Vasovagal, orthostatic, pseudosyncope, zebras

Not Covered

- Treatments for cardiac syncope
  - SVT, bradycardia, VT/VF, NICM, ARVC, HCM, valvular disease, sarcoid, brugada, LTQS, CPVT, etc.. – follow ACC/AHA guidelines
- Adult congenital heart disease patients
- Pediatric syncope
- Geriatric patient
- Athletes (referred to experienced care provider)

Outline

- Definition, epidemiology and demographics



Definition

- Syncope: A symptom that presents with an abrupt, transient, complete loss of consciousness, associated with the inability to maintain postural tone, with rapid and spontaneous recovery.
  - Presumed mechanism is cerebral hypoperfusion
  - NOT seizures (difficult if hypoxic), head trauma, pseudosyncope

Shen W-K et al. 2017 ACC/AHA/HRS Guidelines for the Evaluation and Management of Patients With Syncope. Circulation (2017)

- Syncop pe
- Loss of ncope
- Transie e
  Consci arotid Sinus,
- Presyn
- Unexpl cardia
- Orthost TS)
- Orthost
- Orthost e
  - Class
    Neur

TABLE 3 Relevant Terms and Definitions*

Term	Definition/Comments and References
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 (24,30). 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) (24,30).
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 (24). 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) (24,30,31).
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 (31),
▪ *Initial (immediate) OH*	A transient BP decrease within 15 s after standing, with presyncope or syncope (31,32).
▪ *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 (31).
▪ *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 (31).
▪ *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) (33,34). 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 (35,36).
Noncardiac syncope	Syncope due to noncardiac causes, which include reflex syncope, OH, volume depletion, dehydration, and blood loss (35).
Reflex (neurally mediated) syncope	Syncope due to a reflex that causes vasodilation, bradycardia, or both (24,30,31).
▪ *Vasovagal syncope (VVS)*	The most common form of reflex syncope mediated by the vasovagal reflex. VVS: 1) may occur with upright posture (standing or seated or with exposure to emotional stress, pain, or medical settings; 2) typically is characterized by diaphoresis, warmth, nausea, and pallor; 3) is associated with vasodepressor hypotension and/or inappropriate bradycardia; and 4) is often followed by fatigue. Typical features may be absent in older patients (24). VVS is often preceded by identifiable triggers and/or by a characteristic prodrome. The diagnosis is made primarily on the basis of a thorough history, physical examination, and eyewitness observation, if available.
▪ *Carotid sinus syndrome*	Reflex syncope associated with carotid sinus hypersensitivity (30). Carotid sinus hypersensitivity is present when a pause ≥3 s and/or a decrease of systolic pressure ≥50 mm Hg occurs upon stimulation of the carotid sinus. It occurs more frequently in older patients. Carotid sinus hypersensitivity can be associated with varying degrees of symptoms. Carotid sinus syndrome is defined when syncope occurs in the presence of carotid sinus hypersensitivity.
▪ *Situational syncope*	Reflex syncope associated with a specific action, such as coughing, laughing, swallowing, micturition, or defecation. These *syncope events are closely* associated with specific physical functions.
Postural (orthostatic) tachycardia syndrome (POTS)	A clinical syndrome usually characterized by all of the following: 1) frequent symptoms that occur with standing (e.g., lightheadedness, palpitations, tremulousness, generalized weakness, blurred vision, exercise intolerance, and fatigue); and 2) an increase in heart rate of ≥30 bpm during a positional change from supine to standing (or ≥40 bpm in those 12-19 y of age); and 3) the absence of OH (>20 mm Hg reduction in systolic BP). Symptoms associated with POTS include those that occur with standing (e.g., lightheadedness, palpitations); those not associated with particular postures (e.g., bloating, nausea, diarrhea, abdominal pain); and those that are systemic (e.g., fatigue, sleep disturbance, migraine headaches) (37). The standing heart rate is often >120 bpm (31,38-42).
Psychogenic pseudosyncope	A syndrome of *apparent* but not true loss of consciousness that may occur in the absence of identifiable cardiac, reflex, neurological, or metabolic causes (30).

*These definitions are derived from previously published definitions from scientific investigations, guidelines, expert consensus statements, and Webster dictionary after obtaining consensus from the WC.

BP indicates blood pressure; ECG, electrocardiogram; OH, orthostatic hypotension; POTS, postural tachycardia syndrome; and VVS, vasovagal syncope.

Epidemiology and Demographics

- Incidence of syncope depends on the population being evaluated
- Interpretation of symptoms varies among patients, observers (talk to family) and providers
- Classifications:
  - Reflex syncope (21%)
  - Cardiac syncope (9%)
  - Orthostatic hypotension (9%)
  - Unknown (37%)

Shen W-K et al. 2017 ACC/AHA/HRS Guidelines for the Evaluation and Management of Patients With Syncope. Circulation (2017)

Epidemiology and Demographics

- Syncope represents approximately 0.8-2.4% of all ED visits nationwide
- Up to 6% of hospital admission are for a diagnosis of syncope
- Up to 30% of unexplained falls in elderly patients may be due to syncope
- 1 in 3 people experience syncope in their lifetime
- Up to 10% of cases of Thoracic Aortic Dissection, Acute Coronary Syndrome, Subarachnoid Hemorrhage, or Pulmonary Embolus present with syncope

Huff et al. Clinical Policy: Critical Issues in the Evaluation and Management of Adult Patients Presenting to the Emergency Department with Syncope. Ann Emerg Med. 2007; 49: 431-444.
Shen W-K et al. 2017 ACC/AHA/HRS Guidelines for the Evaluation and Management of Patients With Syncope. Circulation (2017)

Epidemiology and Demographics

- 16 year old male is taking hospital tour and sees blood, losing consciousness. He is diagnosed with vasovagal syncope.

How long does it take someone to lose consciousness with cerebral hypoperfusion?

A) 2-4 seconds
B) 5-7 seconds
C) 8-10 seconds
D) >12 seconds

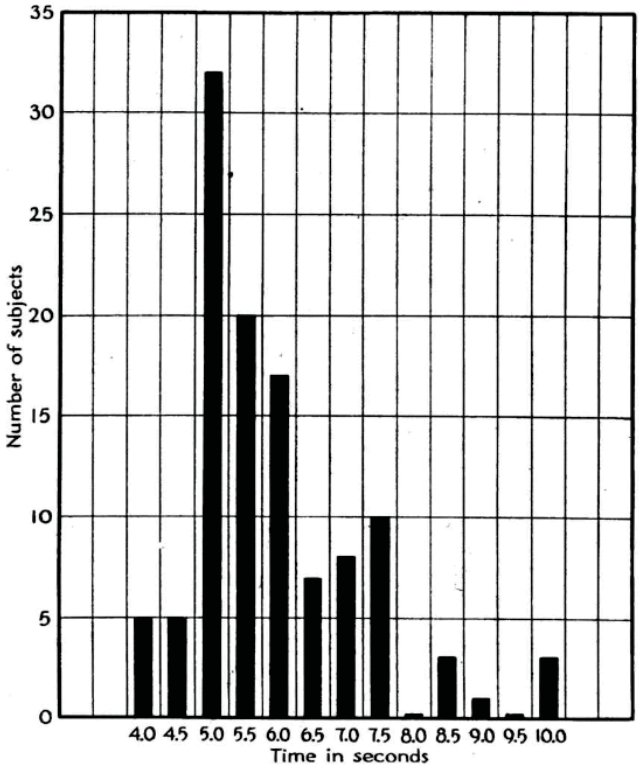
Rossen R, Kabat H, Anderson JP. Acute arrest of cerebral circulation in man. Arch Neurol Psychiatry. 1943;50(5):510–528.

Red Wing Studies

KRA apparatus in Red Wing, MN

Rossen R, Kabat H, Anderson JP. Acute arrest of cerebral circulation in man. Arch Neurol Psychiatry. 1943;50(5):510–528.

Red Wing Studies



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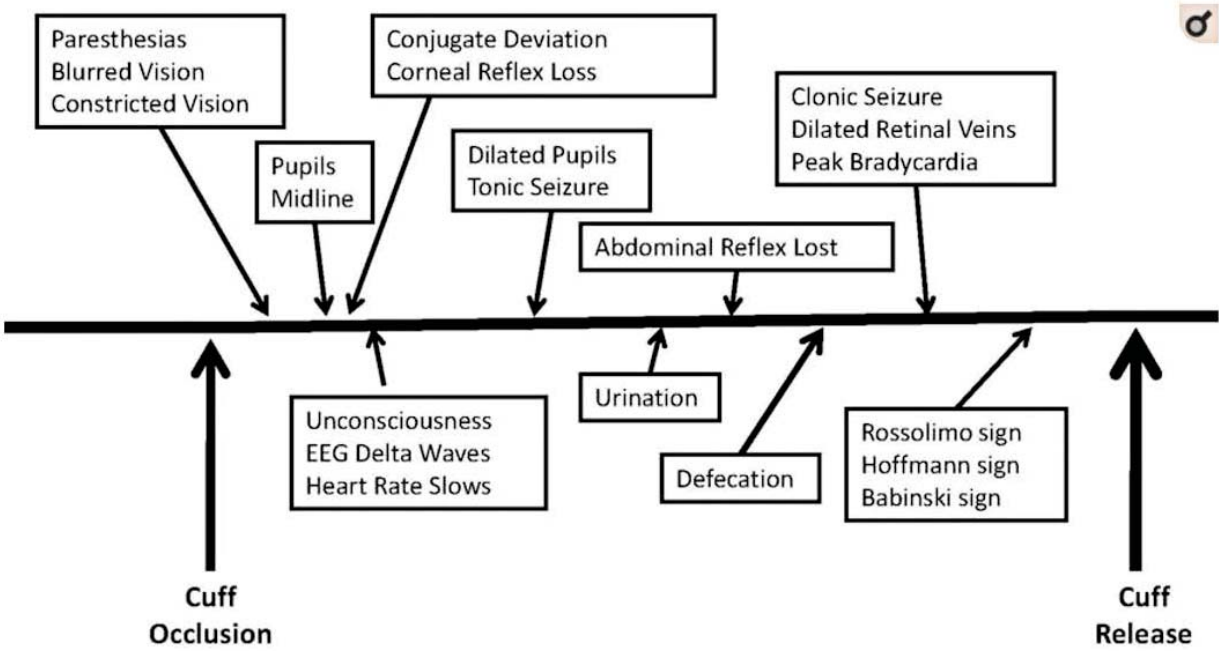

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Outline

- Definition, epidemiology and demographics
- Initial evaluation

"This needle made him faint. Maybe he would've been more comfortable if I had put some ink in it."

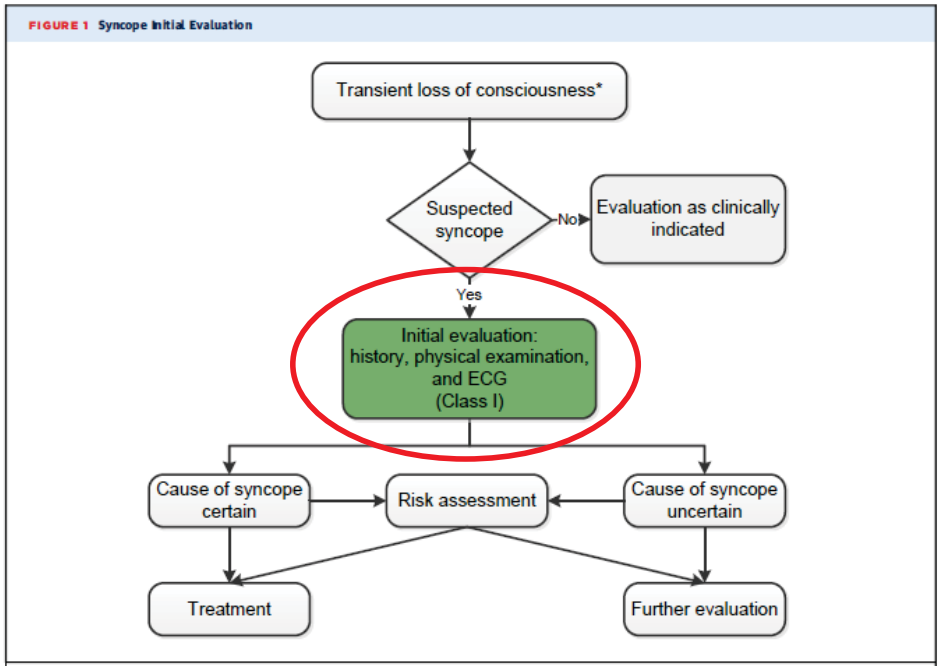
Initial Evaluation

- *Detailed History and Physical exam*
  - Take a good HPI (talk to family/witnesses)
  - Review past medical history and medications
  - Family History (any early deaths)
  - Physical exam
    - Orthostatic blood pressures/heart rate
    - Heart rate, rhythm, gallops, murmurs, etc.
    - Neurologic exam – focal deficits

Initial Evaluation

- *Resting 12 lead ECG*
  - Endless amounts of information
  - Easily available and inexpensive
  - May not alter subsequent management but can give great direction

Initial Evaluation

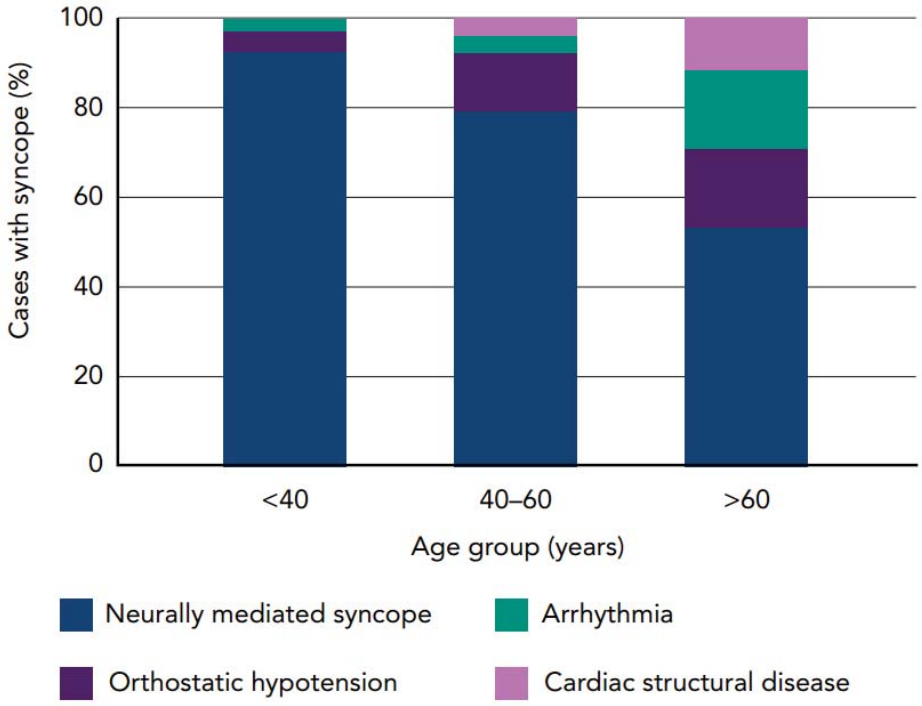


Symptoms associated with syncope

- More often cardiac
  - Older age (>60)
  - Male gender
  - Known cardiac disease (structural, congenital, CHF)
  - NO prodrome (or brief with palps)
  - Syncope while supine or *with exertion*
  - Infrequent episodes
- Noncardiac
  - Younger age (<40)
  - No hx of cardiac disease
  - Syncope while standing or positional changes
  - Prodrome
  - Specific triggers (pain, stress, medical, dehydrated)
  - Frequent recurrence

Shen W-K et al. 2017 ACC/AHA/HRS Guidelines for the Evaluation and Management of Patients With Syncope. Circulation (2017)

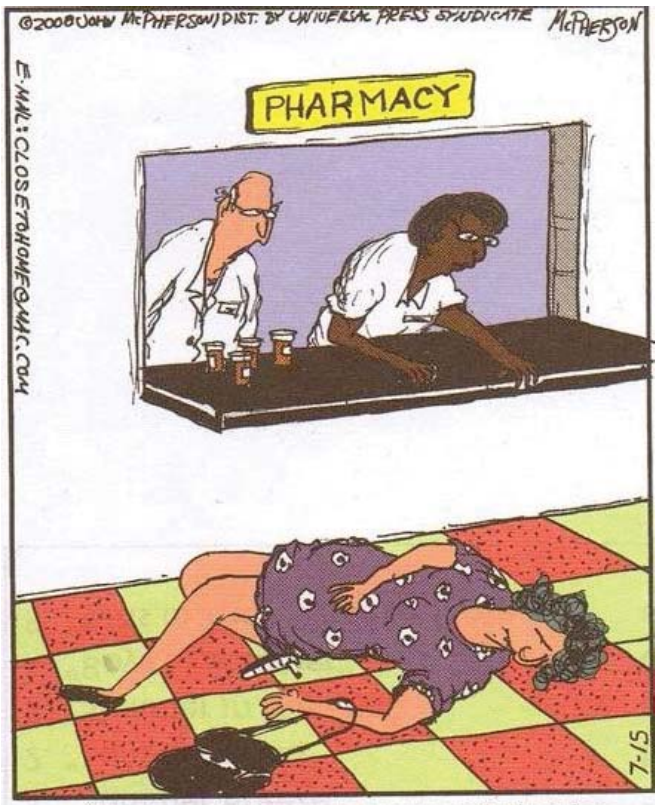
Causes of Syncope by Age



Parry et al. BMJ 2010

Outline

- Definition, epidemiology and demographics
- Initial evaluation
- Risk assessment and disposition



"She's going to need a prescription for light-headedness. She fainted when I told her how much her meds cost."

Risk Assessment

- Assess short and long term risks of mortality and morbidity
  - *<u>NOT</u> primary determinants for admission*
- Consider risk stratification scores
  - Limited use because of inconsistent definitions, outcomes, time frames, etc.
  - *Does <u>NOT</u> outperform clinical judgment*

Short-Term Risk Factors (<30d)

Short-Term Risk Factors (≤30 d)
History: Outpatient Clinic or ED Evaluation
Male sex (74,85,101,102)
Older age (>60 y) (88)
No prodrome (68)
Palpitations preceding loss of consciousness (83)
Exertional syncope (83)
Structural heart disease (70,83,88,101,103)
HF (74,83,85,88)
Cerebrovascular disease (70)
Family history of SCD (70)
Trauma (68,101)
Physical Examination or Laboratory Investigation
Evidence of bleeding (83)
Persistent abnormal vital signs (70)
Abnormal ECG (68,72,74,75,105)
Positive troponin (75)

Shen W-K et al. 2017 ACC/AHA/HRS Guidelines for the Evaluation and Management of Patients With Syncope. Circulation (2017)

Long-Term Risk Factors (>30d)

Long-Term Risk Factors (>30 d)
Male sex (68,90)
Older age (67,74,75,90)
Absence of nausea/vomiting preceding syncopal event (93)
VA (68,90)
Cancer (68)
Structural heart disease (68,103)
HF (90)
Cerebrovascular disease (68)
Diabetes mellitus (104)
High CHADS-2 score (95)
Abnormal ECG (84,90,93)
Lower GFR

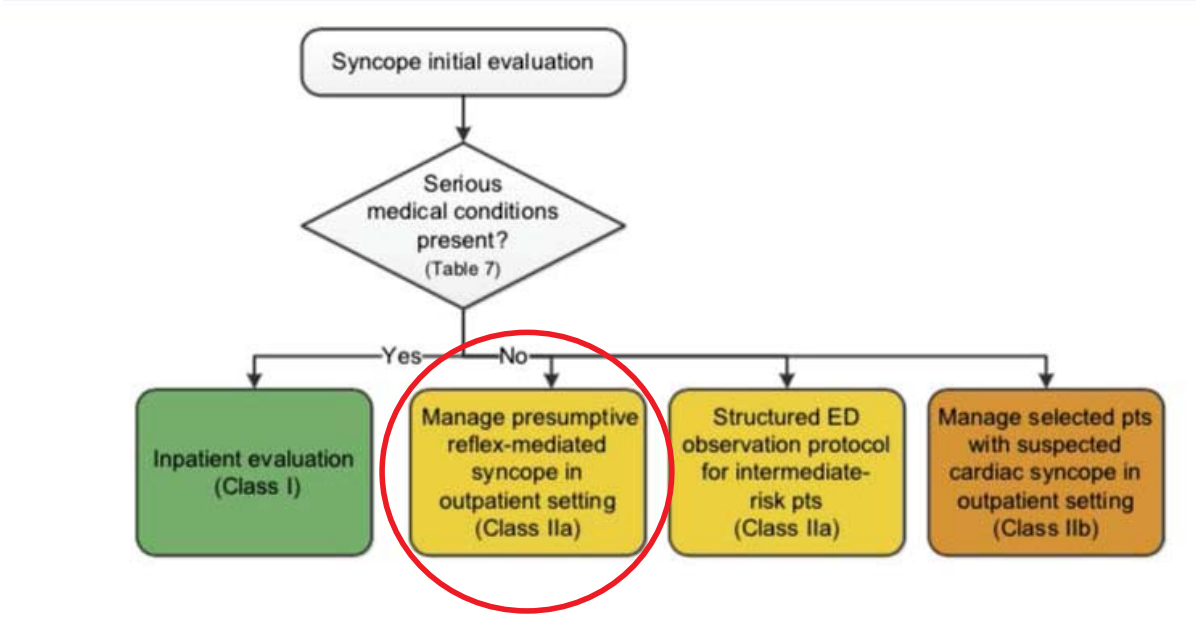
Shen W-K et al. 2017 ACC/AHA/HRS Guidelines for the Evaluation and Management of Patients With Syncope. Circulation (2017)

Disposition

- Insufficient support for disposition algorithms
- Reasonable to manage presumptive reflex-mediated syncope in the outpatient setting in the absence of serious medical conditions (COR 2A)

Shen W-K et al. 2017 ACC/AHA/HRS Guidelines for the Evaluation and Management of Patients With Syncope. Circulation (2017)

Disposition



Disposition - Hospitalized

- Hospital evaluation and treatment recommended for patients with syncope who have a serious medical condition potentially relevant to the cause of syncope identified on initial evaluation

Disposition

Cardiac or Vascular Nonarrhythmic Conditions

TABLE

Noncardiac Conditions

- Severe anemia/gastrointestinal bleeding
- Major traumatic injury due to syncope
- Persistent vital sign abnormalities
- Pulmonary embolism
- Aortic dissection
- Acute HF
- Moderate-to-severe LV dysfunction

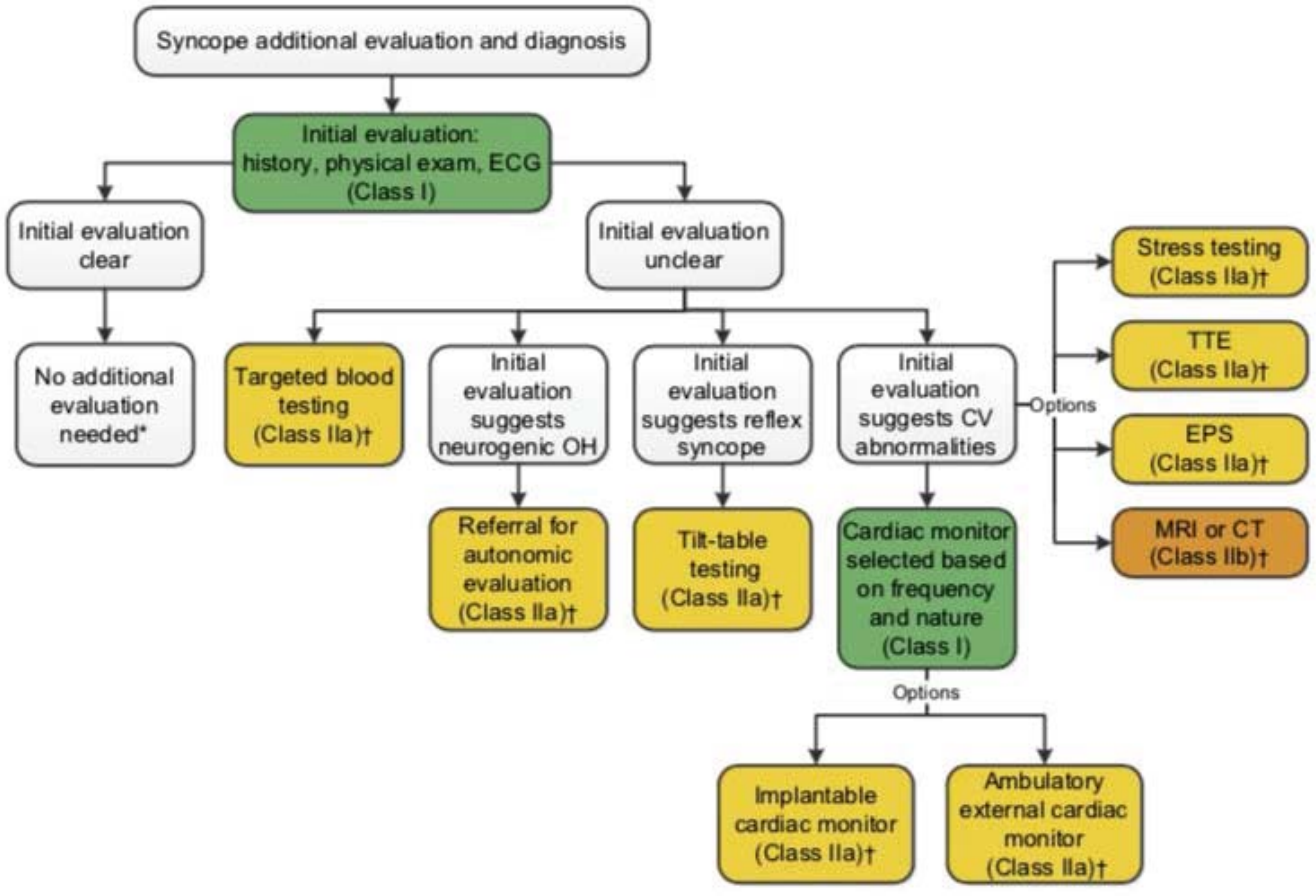
Outline

- Definition, epidemiology and demographics
- Initial evaluation
- Risk assessment and disposition
- Additional testing and recommendations
  - Cardiovascular and neurologic testing

Additional Testing

- This testing is *after* a H&P, ECG and risk stratification
- Need to understand the diagnostic and prognostic value of further testing

- *Broad-based use of additional testing is costly and often ineffective*



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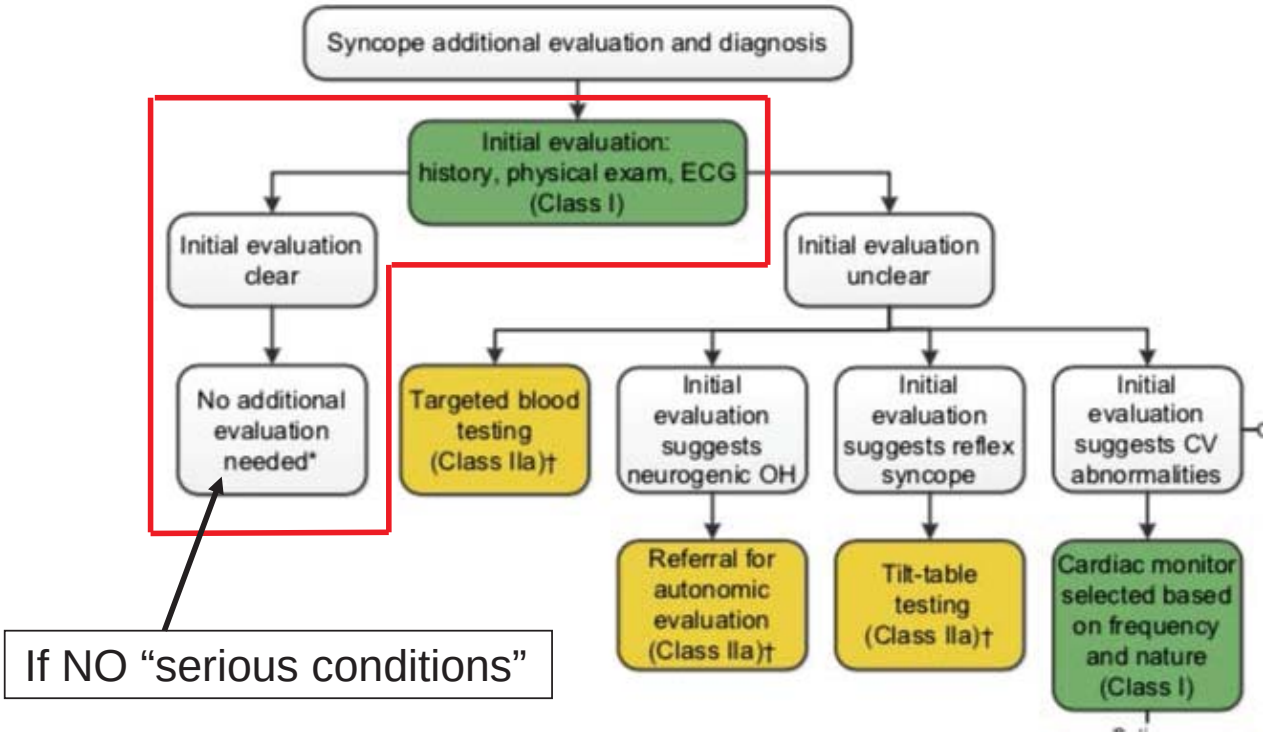
Additional Testing



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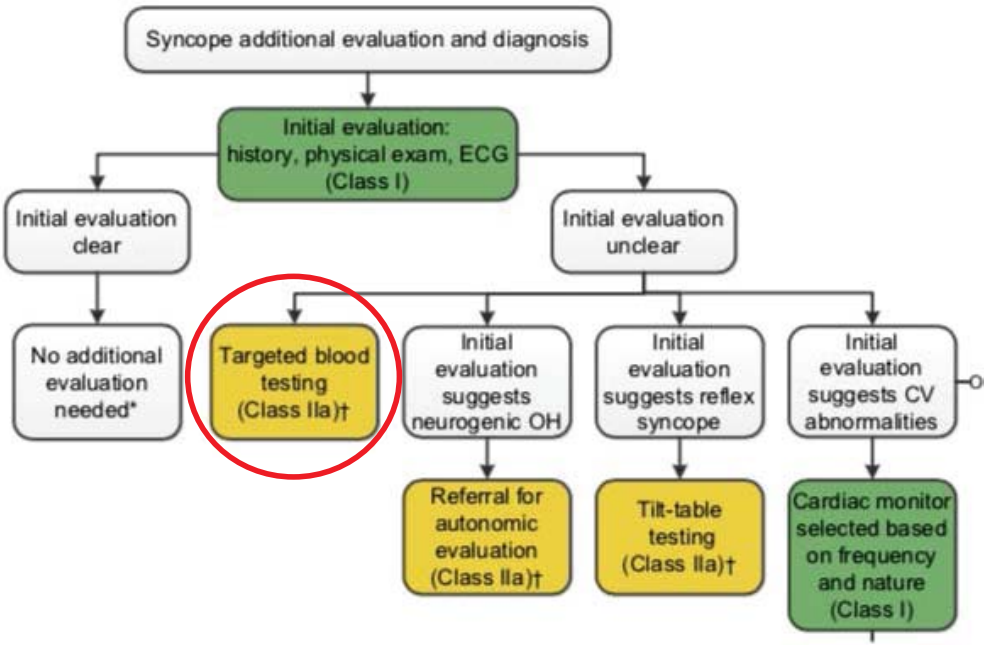
Additional Testing



Shen W-K et al. 2017 ACC/AHA/HRS Guidelines for the Evaluation and Management of Patients With Syncope. Circulation (2017)

Blood Testing

- Targeted blood tests – NO shotgun!
- Diagnostic yield of blood testing is low (when routinely used)
- Testing should be directed from H&P or other comorbidities
- BNP and troponin if cardiac etiology suspected

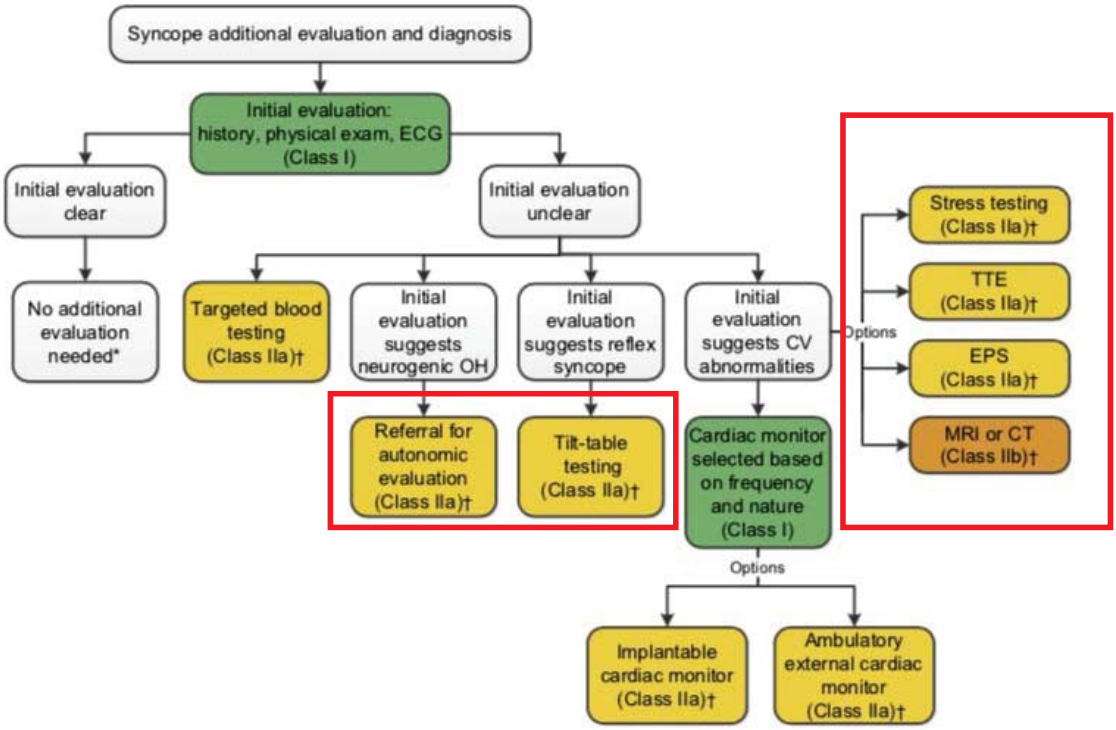
Shen W-K et al. 2017 ACC/AHA/HRS Guidelines for the Evaluation and Management of Patients With Syncope. Circulation (2017)

Cardiovascular Testing

- Important to realize that abnormalities found during cardiovascular testing *may not have causal relationship to syncope*
- Testing results require clinical judgment and appropriate selection

Shen W-K et al. 2017 ACC/AHA/HRS Guidelines for the Evaluation and Management of Patients With Syncope. Circulation (2017)

Cardiovascular Testing



Shen W-K et al. 2017 ACC/AHA/HRS Guidelines for the Evaluation and Management of Patients With Syncope. Circulation (2017)

Cardiovascular Testing

- Echo if structural disease is suspected
  - HCM, LV dysfunction, valvular disease, etc
- CT/MR if inconclusive or inadequate studies/imaging
- *NO routine cardiac imaging*
  - "Screening" echo is low utility
  - <2% made the diagnosis
  - <5% contributed to the diagnosis

Shen W-K et al. 2017 ACC/AHA/HRS Guidelines for the Evaluation and Management of Patients With Syncope. Circulation (2017)

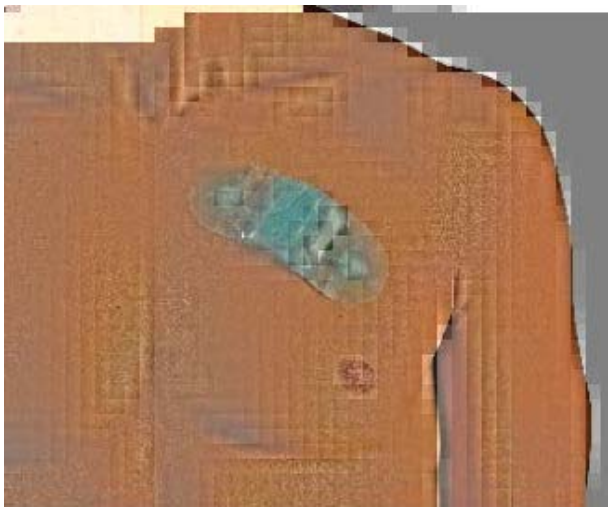
Cardiovascular Testing

- Exercise stress testing if syncope or presyncope *during* exertion
- Cath and radionuclide imaging has little role in syncope evaluation
- Cardiac monitoring devices
  - Depends on frequency, duration and nature
  - Be aware of patient's symptoms and whether he or she can trigger the recording system

Shen W-K et al. 2017 ACC/AHA/HRS Guidelines for the Evaluation and Management of Patients With Syncope. Circulation (2017)

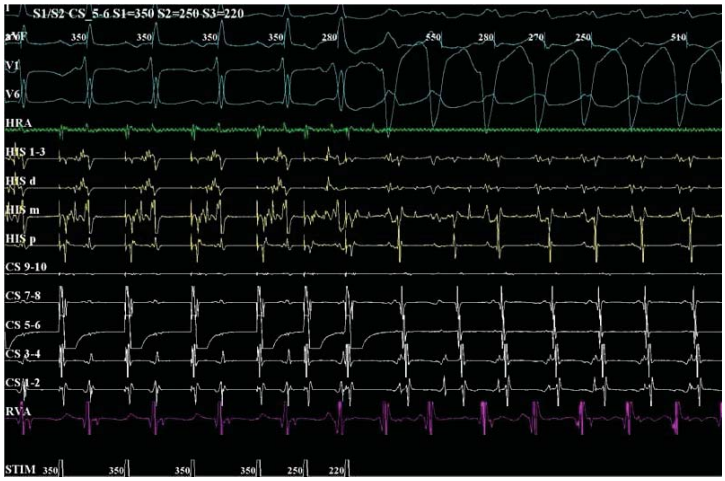
Cardiac Monitoring

- Holter monitor (24-72h)
- External loop recorder (2-6wks)
- Patch Recorder
- Mobile cardiac outpatient monitoring (2-14 days)
- Implantable monitor



Other Cardiovascular Testing

- Electrophysiological Study (EPS)
  - After other cardiac testing and high suspicion
  - NOT for normal ECG and echo



Other Cardiovascular Testing

- Tilt-Table Testing
  - Recurrent vasovagal syncope after negative work up (gives a diagnosis)
  - Delayed orthostatic hypotension (s/s >3 mins)
  - Can distinguish convulsive syncope from epilepsy
  - Evaluate pseudosyncope
  - *NOT* for evaluation of treatments

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Neurologic Testing

- MRI and CT of the head are ***NOT*** recommended in the *routine* evaluation of patients with syncope *in the absence of focal neurologic findings or head injury*. (Class III)
- Referral for autonomic evaluation if syncope and known/suspected neurodegenerative disease.

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Neurologic Testing

- Carotid artery imaging is ***NOT*** recommended in *routine* evaluation *without focal neurologic findings*
- Routine EEG is NOT recommended in the syncope evaluation without features of seizure

Shen W-K et al. 2017 ACC/AHA/HRS Guidelines for the Evaluation and Management of Patients With Syncope. Circulation (2017)

Outline

- Definition, epidemiology and demographics
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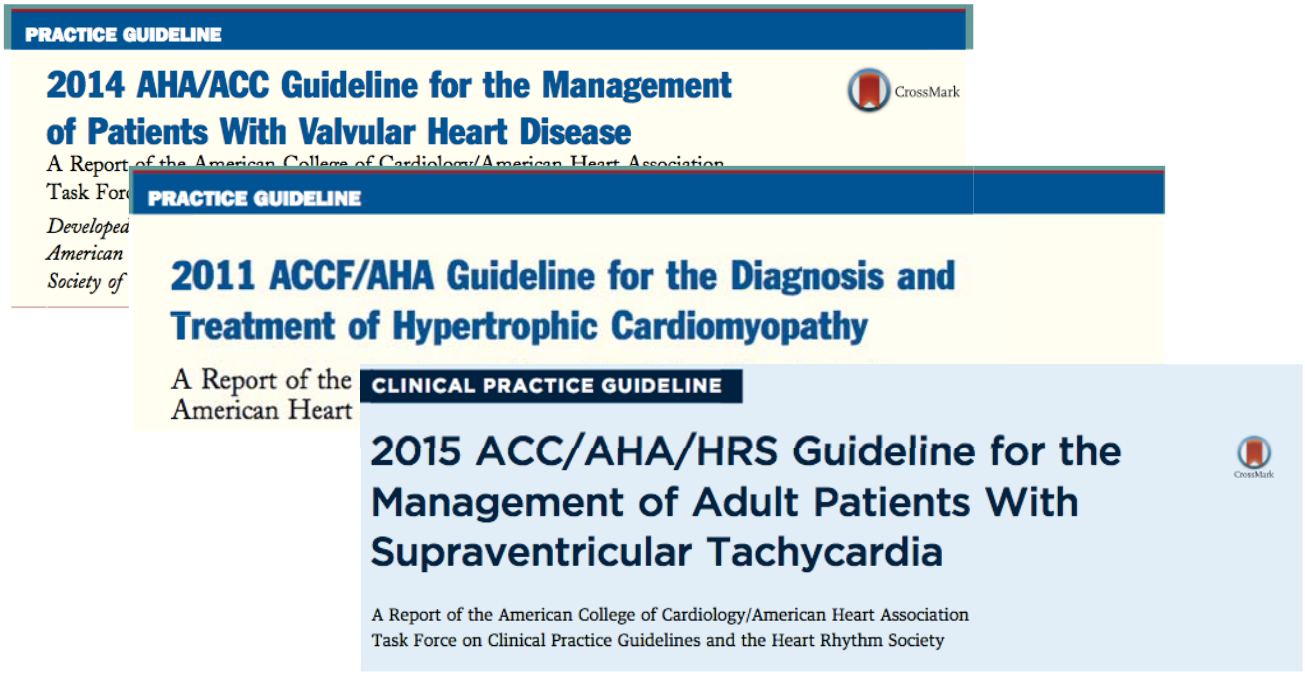
Treatment of Cardiac Syncope

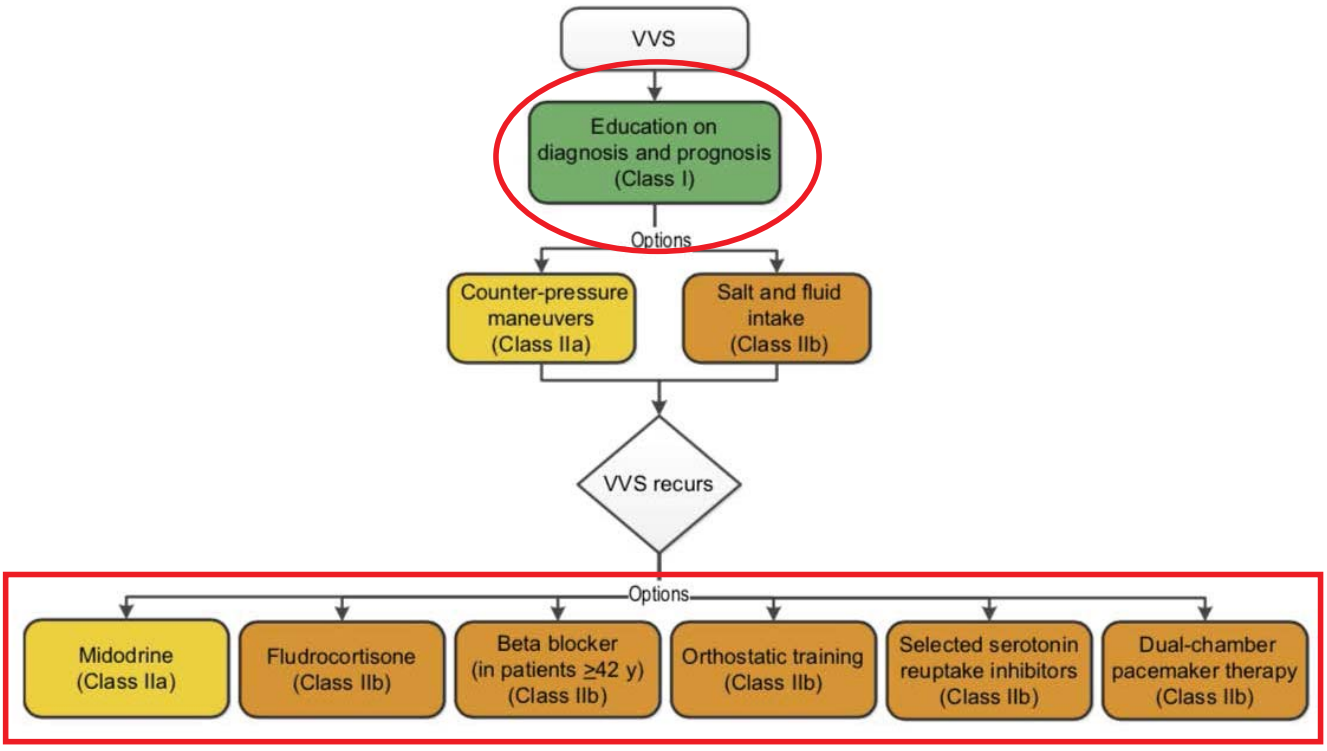
Follow ACC/AHA guidelines



Noncardiac Syncope

- Vasovagal syncope
  - Reflex causing hypotension and bradycardia, triggered by prolonged standing or exposure to emotional stress, pain or medical procedures.
  - Prodrome with diaphoresis, warmth, pallor and fatigue.

Shen W-K et al. 2017 ACC/AHA/HRS Guidelines for the Evaluation and Management of Patients With Syncope. Circulation (2017)



Shen W-K et al. 2017 ACC/AHA/HRS Guidelines for the Evaluation and Management of Patients With Syncope. Circulation (2017)

Vasovagal Treatment

- Patient education (essential)
  - Explain the diagnosis, awareness and avoidance of triggers with reassurance
- Physical counter-pressure maneuvers
- Medications (less effective)
  - Midodrine (2A), Fludrocortisone (2B), Beta Blockers (2B), SSRI (2B)
  - Adjust current BP medications
- Rare role for pacemakers
  - Also in carotid sinus syndrome

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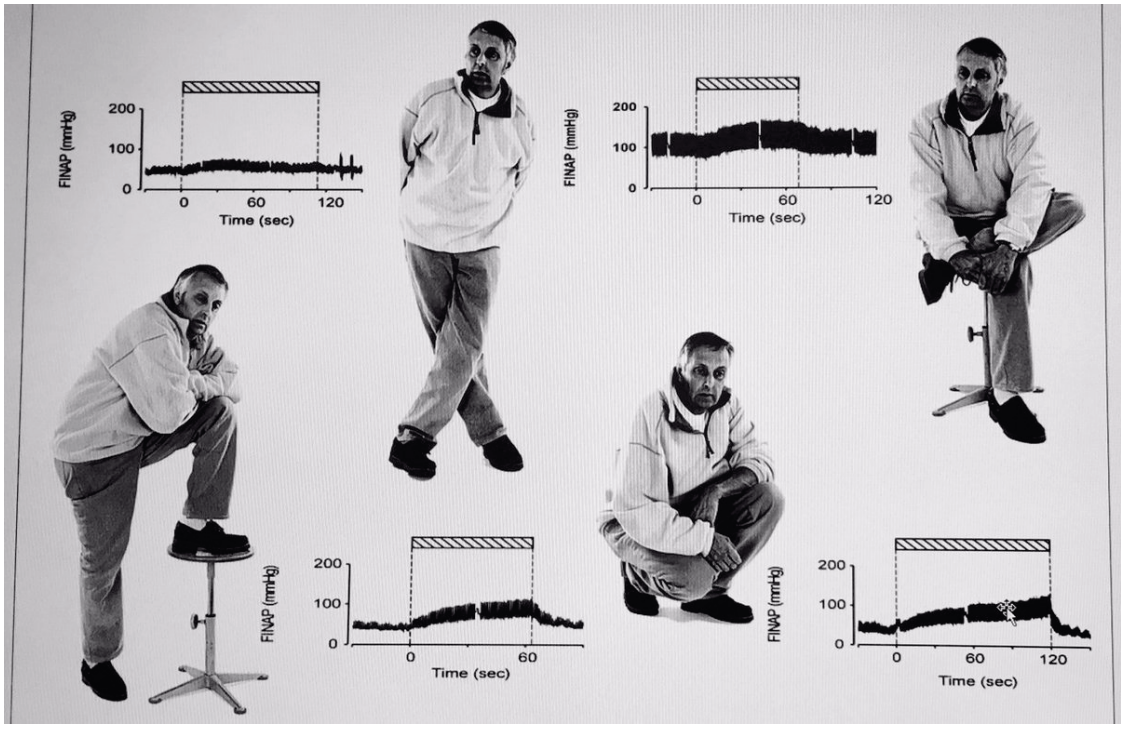
Physical Counter-Pressure Maneuvers



Noncardiac Syncope Treatment

- Orthostatic Hypotension
  - Well documented diagnosis. Treated with medication adjustments and IVF
- Dehyrdration and drugs
  - Fluids and adjust antihypertensive drugs
- Pseudosyncope
  - Apparent syncope without impaired cerebral perfusion
  - Conversion disorder - not malingering or Munchausen syndrome

Syncope Zebras

Rare Causes of Syncope

- Tamponade
- Constrictive Pericarditis
- LV Noncompaction
- Takotsubo
- Pulmonary emboli
- Pulmonary Hypertension
- Fabry, Amyloid, Hemochromatosis
- Myocarditis, Lyme, Chagas disease
- Neuromuscular disease, Myotonic dystrophy

Rare Causes of Syncope

- Lenegre-Lev Disease
- Cardiac tumors
- Prosthetic valve thrombosis
- Anomalous coronary artery
- Aortic dissection
- Subclavian steal
- Coarctation (BAV)
- Rheumatoid arthritis, neck tumor
- Carcinoid, pheos
- Beta thalassemia
- Seizures and migraines

Driving Recommendations

- Use your local driving laws and rules
- Not previously listed or available as reference with when taking care of syncope (especially recurrent syncope)

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

Conclusions

- Syncope is common diagnosis with variable definitions
- H&P and ECG are vital in the assessment
  - Remember the serious medical conditions
  - Use your medical judgment and experience
- Testing should be focused and pertinent
  - No “shotgun” approach to blood work
  - Appropriate echoes (not screening/routine)
  - Avoid head CT and carotid ultrasound without focal neurologic deficit or trauma.
- Acknowledge new driving recommendations

Questions and Discussion

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