Not for the Faint of Heart: Evidence-Based Evaluation & Management of Syncope

ZACHARY HARTSELL, MHA, PA-C
Objectives

Define syncope and its different sub-types

Describe the pathophysiologic mechanisms that lead to syncope

Identify and appropriately apply clinical scoring rules to patients with syncope

Employ evidence based recommendations to determine who requires in hospital evaluations
Disclosures

None

This presentation does not discuss off-label uses of products
Definition

A transient loss of consciousness, associated with loss of postural tone, with spontaneous return to baseline neurologic function, requiring no resuscitative efforts
  - Prodrome → presyncope

Underlying mechanism
  - Global hypoperfusion of both cerebral cortices
  - Focal hypoperfusion of reticular activating system
Prevalence

Impacts patients on a medical, social, and economic basis

Accounts for 3-5% of emergency department visits and 1-6% of hospital admissions
  - Most are benign

The underlying cause is established in ≈ 50%
  - Often remain undiagnosed
  - In one study, the cause was determined in 13/121 (11%) patients at a cost of $23,000 for each patient diagnosed.
1/3 of people will pass out in their lives

1/3 of people who pass out will have a recurrence

1/3 of people who pass out will injure themselves (requiring treatment)
The incidence rates of syncope per 1000 person-years of follow-up increased with age among both men and women. The increase in the incidence rate was steeper starting at the age of 70 years. Syncope rates were similar among men and women.

Utilization of Resources

Admission rate = 27-35%
Readmissions = 23%
Median length of stay = 2 days

Median hospital charges have increased, mainly due to invasive procedures
◦ 2005: $20,023
◦ 2011: $28,175

Mortality rate = 0.9% for primary and secondary syncope
◦ 13.7% in 1983!

Despite all this...undiagnosed syncope rates have remained relatively the same!

Joy, Kumar, Olshansky, American Journal of Medicine. 2017
Diagnosis

The underlying cause is established in ≈ 50%
   ◦ Often remain undiagnosed
   ◦ In one study, the cause was determined in 13/121 (11%) patients at a cost of $23,000 for each patient diagnosed.

Study of 341 patients
   ◦ 23% cardiac cause (brady- or tachyarrhythmia)
   ◦ 58% neurally-mediated cause
   ◦ 1 % neurologic or psychiatric cause
   ◦ 18% unexplained cause
Presumed Etiology of Syncope

- Neurally Mediated: 21%
- Orthostatic: 9%
- Idiopathic: 37%
- Cardiac: 9%
- Hypoadrenergic: 9%
- Other: 12%
- Psychiatric: 3%

Shen et al. JACC. 2017
Triaging Syncope

Life threatening
- Cardiovascular syncope
- Acute blood loss
- Pulmonary embolism
- ICH

Consider (but not true syncope)
- Stroke
- Seizure
Cardiovascular Syncope

Arrhythmia
- Ventricular tachycardia
- Brugada syndrome
- Bradycardia

Ischemic
- Acute coronary syndrome

Structural abnormalities
- Valvular heart disease (AS, MS)
- Cardiomyopathy (ischemic, dilated, hypertrophic)
- Atrial myxoma
- Cardiac tamponade
Life-Threatening Causes

Blood loss
- Trauma with significant blood loss
- Gastrointestinal bleeding
- Tissue rupture

Pulmonary embolism
- Saddle embolus

Intracranial Hemorrhage
Not Immediate Life-Threatening Causes

- Neurocardiogenic syncope (vasovagal)
- Carotid sinus hypersensitivity
- Orthostatic syncope
- Medication-related syncope
Orthostatic

Volume loss

Autonomic dysfunction

Deconditioning, prolonged bed rest
Medication Related

Vaso-active medications

Anti-HTNs, α and β-blockers, CCB, nitrates, diuretics, ED medications

Medications affecting conduction

Antiarrhythmics, digoxin

Medications affecting the QT interval

Antiemetics, antipsychotics, antidepressants
Neurally Mediated Syncope
Neurally Mediated Syncope
Zebras

- Atrial Myxoma
- Carcinoid
- Takayasu’s arteritis
- Arrhythmogenic Right Ventricular Dysplasia (ARVD)
- LV Noncompaction
- Takotsubo Cardiomyopathy
- Pheochromocytoma
Clinical Presentation

Highly variable

- Dizziness
- Lightheadedness
- Nausea/vomiting
- Pallor
- Diaphoresis
- Vertigo
- Unsteadiness
- Chest pain
History & Physical Exam

H& P lead to the cause of syncope in 45% of cases
- Number of episodes
- Position (erect vs. supine to erect vs. supine)
- Preceding events
- Duration of symptoms
- Recovery
- Past medical history
- Medications
- Vitals
- Cardiac murmurs
- Orthostatic BP
Characteristics of Syncope

<table>
<thead>
<tr>
<th>Characteristics Associated with Increased Probability of Cardiac Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;60 year old</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>History of known ischemic heart disease, structural heart disease, congenital heart disease, arrhythmia, or reduced LVF</td>
</tr>
<tr>
<td>Little to no prodrome</td>
</tr>
<tr>
<td>Syncope during exertion</td>
</tr>
<tr>
<td>Syncope while supine</td>
</tr>
<tr>
<td>Less then 2 syncopal episodes</td>
</tr>
<tr>
<td>Family history of sudden cardiac death age &lt;50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Characteristics Not Associated with Increased Probability of Cardiac Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Younger age</td>
</tr>
<tr>
<td>No known cardiac disease</td>
</tr>
<tr>
<td>Syncope while standing</td>
</tr>
<tr>
<td>Prodrome</td>
</tr>
<tr>
<td>Identified trigger: Dehydration, pain, stress, stimulus, cough, micturition, defecation</td>
</tr>
<tr>
<td>Recurrent episodes</td>
</tr>
</tbody>
</table>

Shen et al. JACC. 2017
Approach to Evaluation

Class I
Strong Evidence

Class IIa
Moderate Evidence

Class IIb
Weak Evidence
Further Evaluation

Let the history and physical guide you

Lab
ECG
Echocardiography
Neurodiagnostics
  ◦ Imaging
  ◦ EEG
  ◦ Carotid ultrasound
EKG

Normal ECG does not rule out an arrhythmic cause!

**Suggestive of arrhythmia:**
- Persistent sinus bradycardia, sinus pause >3 sec., Mobitz II, 3rd degree AV block, VT or PSVT, pacemaker malfunction, alternating BBB

**Suggestive of other abnormalities:**
- Bifascicular block, wide QRS, Mobitz I, long or short QT interval, ischemia/infarct pattern, WPW or Brugada patterns

Downs et al., 2014
CT Scan

Several studies have shown little benefit

2014 Review
- >1000 patients with syncope reviewed
  - Syncope with normal neurological exam - none had abnormal head CT

Insufficient evidence to recommend routine head CT in patients with normal neurologic exam and syncope

Downs et al., 2014
## Cost v. Benefit

<table>
<thead>
<tr>
<th>Test</th>
<th>Cost</th>
<th>Diagnostic Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>EKG</td>
<td>$100-$500+</td>
<td>7%</td>
</tr>
<tr>
<td>Troponin</td>
<td>$95</td>
<td>3%</td>
</tr>
<tr>
<td>External Event Recorder</td>
<td>$200</td>
<td>38% *</td>
</tr>
<tr>
<td>Telemetry (inpatient)</td>
<td>$2000</td>
<td>3%</td>
</tr>
<tr>
<td>Tilt test</td>
<td>$600</td>
<td>58%</td>
</tr>
<tr>
<td>Holter Monitor</td>
<td>$300</td>
<td>21%</td>
</tr>
<tr>
<td>Internal Loop Recorder</td>
<td>$3000</td>
<td>88%</td>
</tr>
<tr>
<td>EP Study</td>
<td>$20,000+</td>
<td>52%</td>
</tr>
<tr>
<td>Echo</td>
<td>$1000</td>
<td>3%</td>
</tr>
</tbody>
</table>

Krahn et al, 1999
Choosing Wisely

Choosingwisely.org

- American Board of Internal Medicine Foundation Initiative
  - Syncope testing recommendations:
    - American Academy of Neurology: Occlusive carotid artery disease causes focal neurologic deficits, not syncope...carotid imaging not recommended
    - American College of Emergency Physicians: “In the absence of signs of a stroke, CT scan of the brain should not be ordered”
Implantable Loop Recorder

Subcutaneous monitoring device (left chest)
Device is automatically activated according to programmed criteria
Patient can activate device to record

Useful in patients with:
- Infrequent symptoms
- Suspected arrhythmia but non-invasive testing has been negative
Internal Loop Recorder

In patients with suspected cardiac etiology
Lowers average cost of diagnosis
No change in outcomes from traditional methods
Requires cardiology referral
But What About Tilt Table Testing?

What is Tilt Table Testing?
Tilt Table Test

Useful in patients who are:
- Young and otherwise healthy and neurocardiogenic syncope is suspected

Monitored in supine position for five minutes to obtain baseline BP and HR

Positioned in a head-up tilt position and passively moved from a supine position to a head-up position between 60° and 90°

Should not be used in patients with baseline orthostatic hypotension
Tilt Table Test

BP, HR, and symptoms are recorded every 3-5 minutes
ECG is recorded continuously

If the patient experiences LOC or is unable to maintain posture in association with a significant fall in BP or HR, he or she is returned to a supine position, and the test is considered positive.

If, after a period of 20-45 minutes, no symptoms have developed, the patient is returned to the supine position.
Tilt Table Test

A. Classic neurocardiogenic (vasovagal) response

B. Dysautonomic response

C. POTS response

Table: Heart rate vs Blood pressure

Diagram: Tilt Table Test setup with labels

- Blood pressure cuff
- Electrocardiogram (ECG)
Management

First Three Questions

1. Is this truly syncope?

2. If syncope, is there a life threatening cause

3. If syncope, and not immediately life threatening, is the patient at high risk?
Risk Assessment

Is it reasonable to use a risk stratification tool to determine management?
Short-term (≤ 30 days) or Long-term (>30 days) risk factors
Cardiac syncope yields a worse prognosis than reflex syncope

Downs et al., 2014
## Risk Stratification

<table>
<thead>
<tr>
<th>Risk Stratification</th>
<th>Criteria</th>
</tr>
</thead>
</table>
| High Risk             | - Decompenated heart failure  
                      |   - Acute MI  
                      |   - Aortic dissection  
                      |   - Hemodynamic instability with any underlying structural cardiac disease |
| Intermediate Risk     | - Structural cardiac disease but no immediate instability  
                      |   - No family history of SCD                                           |
| Low Risk              | - No evidence of structural heart disease  
                      |   - Normal ECG  
                      |   - History suggestive of VVS or orthostasis                            |
## Risk Stratification

<table>
<thead>
<tr>
<th>Short Term Risk Factors (≤30 days)</th>
<th>Long Term Risk Factors (&gt;30 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male sex</td>
<td>Male sex</td>
</tr>
<tr>
<td>Older age</td>
<td>Older age</td>
</tr>
<tr>
<td>No prodrome</td>
<td>Absence of nausea/vomiting preceding syncopal event</td>
</tr>
<tr>
<td>Palpitations preceding LOC</td>
<td>Ventricular Arrhythmia</td>
</tr>
<tr>
<td>Exertional syncope</td>
<td>Cancer</td>
</tr>
<tr>
<td>Structural heart disease</td>
<td>Structural heart disease</td>
</tr>
<tr>
<td>Heart failure</td>
<td>Heart failure</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>Cerebrovascular disease</td>
</tr>
<tr>
<td>Trauma</td>
<td>Diabetes mellitus</td>
</tr>
<tr>
<td>Family history of SCD</td>
<td>High CHADS-2 score</td>
</tr>
</tbody>
</table>

Shen et al. JACC. 2017
Risk Stratification

Many different risk stratification systems developed
Each has their benefits and limitations
  ◦ San Francisco Rule
  ◦ Canadian Syncope Arrhythmia Risk Score
  ◦ OESIL
  ◦ Martin et al 1997

Risk stratification tools have not performed better than clinical judgement
San Francisco Rule

684 consecutive syncope patients
CHESS75
- CHF, HCT <30, EKG Abnormal, SOB secondary to CHF, SBP<90, Age >75
- Predictive of 7 day mortality

One study examined outcomes of patients admitted with a SFSR score of 0 (low-risk)
- Mean LOS = 1.73 days
- Mean tests = 10.8
- 13% adverse event occurrence rate
- 32% had “incidentalomas” of unclear significance
- 7% had beneficial findings that resulted in treatment

OESIL

Osservatorio Epidemiologico sulla Sincope nel Laszio

Italian Study looked at 1 year mortality

4 predictive factors
  ◦ Abnormal EKG
  ◦ History of CAD or HF
  ◦ Age >65
  ◦ Syncope without a prodrome
Insufficient evidence to support any recommended treatment (drugs or device) for the management of syncope
International Meta-analysis

45,000 patients over 20 years
3% of all admissions
42% of patients admitted to the hospital
1 month risk of death 4.4%
Statistically significant risk factors
  ◦ Palpitations preceding syncope
  ◦ Exertional syncope
  ◦ History of HF or CAD
  ◦ Evidence of bleeding

D'Ascenzo et al, 2013
How Do We Manage?

Inpatient Admission
- Serious underlying medical condition
  - Cardiac arrhythmia, cardiac or vascular nonarrhythmic conditions, non-cardiac conditions

Observation Admission
- “Intermediate-risk” patients

Outpatient management:
- Presumptive reflex-mediated syncope (class IIa)**
- Select patients with cardiac syncope (class IIb)
- Prompt follow-up necessary
Who Should Be Admitted?

**Bottom Line**
- Patients with life threatening conditions
- Evaluation of potential problems that cannot be examined outside the hospital
- A treatable problem to prevent recurrent syncope
- Patients at risk of injury from syncopal event or risk of SCD
Barriers to Not Admitting

Patients may be fearful of going home after syncopal episode

Patients want an answer!
  - *Syncope goes undiagnosed in 42% of cases!*

No Reliable stratification tool

“Observation” offers a good in-between
  - A challenge in itself
Treatment

Immediate treatment
○ Assess for pulse
○ Assist to the ground, chair, stretcher
  ○ Elevate legs if possible
○ Avoid potential external dangers
○ Observe for other signs
○ Attempt to arouse
○ Call for help if needed
Treatment

Vasovagal Syncope

- Avoidance of triggers, safety mechanism
- Education! Start with counter pressure maneuvers
- With suspected autonomic dysfunction:
  - Liberalize salt intake, water intake
  - Compression stockings
  - Education
  - Pacing?
Treatment

Orthostatic hypotension

- If due to dehydration
  - IV fluid bolus
- If drug related
  - Withdraw the drug!
- If neurogenic
  - Midodrine, droxidopa, fludrocortisone can be beneficial
  - Compression stockings – medical grade
- Physical counterpressure maneuvers
  - Isometric contraction
- Water intake – peak effect @ 30 min
- Liberalize salt intake: 6-9g/day
- If recurrence, consider pharmacologic intervention
  - Midodrine, Fludrocortisone
Treatment

Carotid Sinus Syndrome
- Avoid accidental mechanical manipulation of the carotids
- Pacemaker insertion?
  - May depend on response...cardioinhibitory vs. vasodepressor

Cardiac Syncope
- Possible pacemaker insertion, ICD insertion
- Anti-arrhythmics or other medications
- Fluid for preload dependent conditions
Prognosis

Cardiac syncope yields lower survival rates than other syncope

A new study published in 2017 showed the risk of death among patients with syncope increased by 31% and that risk DOUBLED among patients with cardiac syncope

- Neurologic syncope associated with 3x risk of stroke
- Reflex syncope was not associated with an increased risk of death from any cause, myocardial infarction or death from coronary heart disease, and fatal or non fatal stroke

Joy et al, 2017
Driving Limitations

Wide range of driving limitations

Estimated yearly risk of serious injury and death in VVS <0.0017% (POST I and POST II trials)

May be higher in patients with other etiologies of syncope or those who have syncope without prodrome or warning

Current laws don’t reflect these results

Federal law regulates commercial drivers, state law regulates private drivers

- Look at state laws before sending patients home!
- Some states have reporting laws
Take Home Points

Orthostatic vital signs are neither sensitive nor specific!
  ◦ Symptomatic orthostasis is more important

OH is a diagnosis of exclusion!!
  ◦ Don’t stop here in your work-up...rule out other underlying medical conditions/causes

Serious underlying medical conditions need to be admitted to the hospital for work-up
  ◦ If patient has risk of injury with recurrent syncope, admit!

Look at the medication list!
  ◦ Vasodilatory drugs, cardiotoxic meds, QT prolonging meds
References


