Understanding Syncope: Diagnosis, Risk Assessment and Treatment

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Conflict of Interest Statement

- There are NO CONFLICTS OF INTEREST related to this presentation.
- The information presented herein is for general educational purposes.
- This presentation should not be considered as an exclusive source of information on the topic.

My Workplace

L: Parkland Health & Hospital System, Dallas, Texas
R: UTSW Clement University Hospital, Dallas, Texas
I am grateful to the UT Southwestern administration and faculty physicians who teach and train me on a daily basis with practical case scenarios.

I especially acknowledge Drs. James Daniels, Jose Joglar, Mark Link, Richard Wu, and Mrs. Micki Lacker, NP for their continuous training/teaching efforts and patience. Without their help, I would not be standing here today.

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Acknowledgements

Syncope is a medical term used for dizziness, fainting or blacking out. Most of us are very familiar with terms like light-headedness, giddiness, wooziness, gray out, passing out, fainting spell, and swoon.

Most patients presenting with syncope usually come to the Emergency Department mentioning above terms.

Understanding Syncope, Diagnosis, Risk Assessment & Initial Treatment Approach

The usual presentation statements are:

- “I was not feeling well, got dizzy, and passed out.”
- “I felt sick in my stomach, nauseous, about to throw up but I felt dark, everything around me was black, and I passed out.”
- “I was feeling weird, not sure, felt kind of dizzy, woozy, and next thing I know is that I am here in Emergency Department”.
- “I was driving, suddenly I felt that my heart was rising, felt boom...boom (palpitations) and sweaty, and I'm not sure what happened”.

Patient - HPI
Definition of Syncope

- True syncope is the abrupt but transient loss of consciousness associated with absence of postural tone followed by rapid, usually complete recovery without the need for intervention to stop the episode (Olshansky, 2005).
- Syncope is a symptom, not a diagnosis.
- Syncope is a syndrome in which there is:
  - A sudden or abrupt loss of consciousness
  - For a very brief period of time usually
  - Followed by complete rapid recovery of consciousness
  - Due to transient global cerebral hypo perfusion.

Syncope

- Syncope is frightening for the individual, witnesses, family, and health care providers.
- Syncope is very common, quiet alarming, disabling and there are possible risk of sudden death but the causes are usually difficult to diagnose.
- Finding underlying cause of syncope is the most critical part of dealing with syncope.
- "The only difference between syncope and sudden death is that in one you wake up." (Vive la difference)

Salient Points about Syncope

- Some of the important points to remember about Syncope are (Olshansky, 2005):
- Syncope can be the premonitory sign of a serious cardiac problem including sudden cardiac arrest
- Syncope can have a major impact on lifestyle
- Syncope can cause injuries
- Syncope is expensive
- This presentation will focus on appropriate initial approaches towards the evaluation & management of Syncope.
Syncope & Mortality Risk

<table>
<thead>
<tr>
<th>Vasovagal Syncope</th>
<th>Cardiac syncope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low mortality risk</td>
<td>High mortality risk</td>
</tr>
<tr>
<td>Frequent recurrences – guiding key</td>
<td>Mortality depends on the severity or extent of cardiac disease</td>
</tr>
</tbody>
</table>

Types of Syncope

- Neurally Mediated Syncope (60%)
  - VVS
  - CSS
  - Situational
    1. Cough
    2. Post Micturition
    3. Deglutition
- Orthostatic Syncope (15%)
- Cardiovascular Syncope (15%)
- Unexplained Syncope (10%)

Causes and Types of Syncope

- Different Types of Syncope: Has the etiology been determined?
- Neurocardiogenic or Neurally Mediated or Reflex Syncope (60–75%): Neurocardiogenic syncope can be caused by several inciting, often noxious stimuli like perception of danger, fear or anxiety.
  1. VVS (Vasovagal Syncope): A VVS episode is the most common cause of Syncope.
  2. CSS (Carotid Sinus Syncope): A CSS is due to carotid sinus hypersensitivity. Common situations are – Micturation Syncope, Deglutition Syncope, Post-Tussive Syncope
  3. Situational (Post-Micturition, drinking cold beverages, sudden strong cough, etc.).
  4. Orthostatic Syncope: More on next slide
**Causes and Types of Syncope**

**Orthostatic Syncope (15%)**
- Dehydration – Volume loss
- Common medications:
  - Vasoldilators: Hydralazine, nitrates, ACE-Inhibitors,
  - Diuretics: Lasix, Torsemide
- $\alpha_1$ and $\beta_1$ adrenergic blockers – Flomax, Doxazosin, Metoprolol, Atenolol.

**Cardiovascular Syncope (10-15%)**
- Structural heart diseases: Cardiopulmonary-Aortic Stenosis, HCM, Pulmonary HTN, Pulmonary Embolism, Aortic Dissection
- Arrhythmias: Brady arrhythmias like Bradycardia, Sinus pauses, Sinus arrest, AV block, etc.
- Tachyarrhythmia: VT, SVT, LQTS, Brugada, etc.
- Syncope can be a premonitory sign of cardiac arrest, especially in patients with organic heart disease.

**Neurological or Psychogenic Syncope (1%)**
- Common neurological diseases responsible are:
  - Brain diseases: Multisystem Atrophy (MSA), Parkinson’s Disease, Wernicke-Korsakoff Syndrome
  - Autonomic Neuropathies: Guillain Barre Syndrome, Amyloid, Diabetic Neuropathy
  - Intracranial: Mechanical obstruction-Third Ventricle Cyst, Arnold-Chairi Malformation, Brainstem Ischemia
Causes and Types of Syncope

Syncope of Unknown Origin or Unexplained Syncope (10%)

- Patients in this population are the most challenging, even with an extensive history, physical examination, and various diagnostic tests - no cause can be identified.

Evaluation Guidelines

- Strategies for the Evaluation of Syncope were outlined in guidelines published in a 2006 Scientific Statement from the American Heart Association/American College of Cardiology and by the European Society of Cardiology (ESC) in 2009.
- Per 2009 ESC Guidelines, initial evaluation of the patient presenting with transient loss of consciousness should include careful history, physical examination (including orthostatic blood pressure measurement), and ECG.

Is it a Syncope Episode or Other type of event?

- The first key point is to differentiate Syncope from Nonsyncope Conditions that produce apparent or real transient loss of consciousness (e.g., falls, epilepsy, severe anemia, metabolic disorders - hypoglycemia, alcohol/drug intoxication, transient ischemic attacks).
- The second key point is to differentiate Syncope from Cardiac Arrest. Patient requiring cardiopulmonary resuscitation are to be diagnosed as Cardiac Arrest not as Syncope. However, these two are closely related to each other.
A good history and physical examination are vital tools for a proper diagnostic approach.

- Type of episode? Is it Syncope or TLOC or Cardiac Arrest or seizures?
- Characteristics and length of episode
- Patient’s and witnesses’ accounts
- Age
- Concomitant diseases - Cardiac.

### History

- Associated symptoms
- Prodromal symptoms
- Circumstances/situations
- Body position/posture/exercise/emotional status
- Number, frequency and timing of previous Syncopal episodes
- Medications
- Family history
- Injuries

### Seizure or Not?

<table>
<thead>
<tr>
<th>Seizure</th>
<th>Not seizure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frothing at mouth</td>
<td>Sweating prior to episode</td>
</tr>
<tr>
<td>Tongue biting</td>
<td>Nausea prior to episode</td>
</tr>
<tr>
<td>Disorientation after episode</td>
<td>Oriented after episode</td>
</tr>
</tbody>
</table>

Frothing at mouth
Sweating prior to episode
Tongue biting
Nausea prior to episode
Disorientation after episode
Oriented after episode
### History: Symptoms Related to Syncopal Spell

<table>
<thead>
<tr>
<th>Symptoms, diaphoresis, fear</th>
<th>Probable Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nausea, diaphoresis, fear</td>
<td>Neurocardiogenic</td>
</tr>
<tr>
<td>Aura</td>
<td>Seizure</td>
</tr>
<tr>
<td>Palpitations</td>
<td>Tachycardia</td>
</tr>
<tr>
<td>Tachycardia, exercise, coughing</td>
<td>Orthostatic hypotension, volume depletion, dysrhythmia</td>
</tr>
<tr>
<td>Vertigo, exercise, coughing</td>
<td>Vagal induced hypotension, bradycardia</td>
</tr>
<tr>
<td>Headache</td>
<td>Hyperventilation</td>
</tr>
<tr>
<td>Dizziness</td>
<td>Vagal induced hypotension, bradycardia</td>
</tr>
<tr>
<td>Back pain</td>
<td>Orthostatic hypotension, volume depletion, dysrhythmia</td>
</tr>
<tr>
<td>Urination, defecation, eating, coughing</td>
<td>Vagal induced hypotension, bradycardia</td>
</tr>
<tr>
<td>Diarrhea, vomiting</td>
<td>Hypovolemia, hypokalemic induced arrhythmia, vagal induced hypotension, bradycardia</td>
</tr>
<tr>
<td>Melena</td>
<td>Gastrointestinal bleed</td>
</tr>
<tr>
<td>Dyspnea</td>
<td>Pulmonary embolus, pneumothorax, hyperventilation (hysteria)</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>Aortic aneurysm, gastrointestinal bleed, peritonitis acute abdomen, trauma</td>
</tr>
<tr>
<td>Chest pain</td>
<td>Ischemia-induced arrhythmia</td>
</tr>
<tr>
<td>Headache</td>
<td>Migraine</td>
</tr>
<tr>
<td>Flushing</td>
<td>Carcinoid syndrome</td>
</tr>
<tr>
<td>Confusion</td>
<td>Stroke, transient ischemic attack, intoxication, hypoglycemia</td>
</tr>
<tr>
<td>Prolonged weakness</td>
<td>Neurocardiogenic syncope</td>
</tr>
</tbody>
</table>

### History: Important Data to Obtain

<table>
<thead>
<tr>
<th>Witnesses</th>
<th>The entire event from multiple viewpoints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Situation</td>
<td>Was there a &quot;trigger&quot;?</td>
</tr>
<tr>
<td>Age elderly (&lt;65 years)</td>
<td>Multifactorial - rule out heart disease. Consider medications</td>
</tr>
<tr>
<td>Age young (&lt;40 years)</td>
<td>Neurogenic; most likely cause</td>
</tr>
<tr>
<td>Heart disease</td>
<td>Consider: Did the patient have a &quot;trigger&quot;?</td>
</tr>
<tr>
<td>Family history of sudden death</td>
<td>Increased predisposition for malignant arrhythmia or cardiac causes</td>
</tr>
<tr>
<td>Number of episodes</td>
<td>&lt;3, possibly malignant and life-threatening; &gt;3, more likely to be benign and a continued problem</td>
</tr>
<tr>
<td>Previous evaluation</td>
<td>Obtain results from previous evaluation</td>
</tr>
<tr>
<td>Medications</td>
<td>Possible pro-arrhythmia, bradycardia, hypotension</td>
</tr>
</tbody>
</table>

### Physical Examination

- Abnormal vital signs
- Presence of abnormal heart sounds - murmurs,
- Abnormal Heart Rhythm,
- Neurological findings.
EKG Findings
- Atrioventricular block
- Asymptomatic sinus Bradycardia (50 beats/min or less), sinoatrial block, or sinus pause ≥3 seconds in the absence of negatively chronotropic medications
- Pre-excited QRS complexes, Wolff-Parkinson-White Syndrome
- Long or Short QT intervals
- Right bundle branch block pattern with ST-elevation in leads V1-V3 (Brugada Syndrome)
- Bifascicular block - LBBB or RBBB combined with left anterior or left posterior fascicular block).
- QRS duration ≥0.12 sec
- Q waves suggesting Myocardial Infarction

Has the Etiology been Determined?
Neurally Mediated Syncope
- Absence of heart disease
- Long history of recurrent Syncope
- After sudden unexpected unpleasant sight, sound, smell or pain
- Prolonged standing or crowded, hot places
- Nausea, vomiting associated with Syncope
- During a meal or post-prandial
- With head rotation or pressure on carotid sinus (as in tumors, shaving, tight collars)
- After exertion

Has the Etiology been Determined?
Syncope due to OH
- After standing up
- Temporal relationship with start or changes of dosage of vasodepressive drugs leading to hypotension
- Prolonged standing especially in crowded, hot places
- Presence of autonomic neuropathy or Parkinsonism
- Standing after exertion
### Treatment Approach for Syncope - OH

**Rx - Syncope due to OH**
- Patient education – Avoiding injuries
- Hydration - Adequate fluids, salt, electrolytes, small frequent meals, avoid large one time meals, reduce caffeine/alcohol
- Tilt training - leg crossing, arm tensing
- Sleeping c head of bed elevated (≈25 cm)
- Daily exercises – Isometric Exercises
- Waist high support hose, abdominal binders
- Midodrine therapy

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### Has the Etiology been Determined?

#### Cardiovascular Syncope
- Presence of definite structural heart disease
- Family history of unexplained sudden death or channelopathies
- During exertion or supine
- Abnormal ECG
- Sudden onset of palpitation immediately followed by Syncope
- Concerning ECG findings suggesting Arrhythmic Syncope

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### Has the Etiology been Determined?

#### Cardiovascular Syncope - Life threatening
- Acute MI/Ischemic changes
- Hypertrophic Cardiomyopathy (HCM)
- Arrhythmogenic RV dysplasia (ARVD)
- Acute aortic dissection
- Acute pulmonary embolus
- Valvular abnormalities-Aortic/Mitral stenosis
- Atrial Myxoma
Cardiac Syncope – Arrhythmias

- Bradyarrhythmias:
  - Sinus arrest
  - Acute complete heart block
  - Post tachycardia pause

- Tachyarrhythmias:
  - Atrial fibrillation/flutter with RVR
  - Paroxysmal SVT or VT
  - Torsades de pointes (Long QT syndrome)

Has the Etiology been Determined?

- Bradyarrhythmia
  - An 82 yo pt with Syncope due to Bradycardia - PPM implanted

- Tachyarrhythmia
  - A 34 yo pt with Syncope due to VT, EP consulted, ablated, medicated

Cardiac Arrhythmias

Syncope Risk Stratification

Does Patient Need Hospitalization?

- More patients are admitted unnecessarily
- How to determine if patient needs admission or can safely be discharged to home?
- Short term risk stratification
- Long term risk stratification
### Short-Term Risk Stratification

<table>
<thead>
<tr>
<th>Study</th>
<th>Clinical Markers</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Francisco</td>
<td>• Abnormal EKG&lt;br&gt;• Low Blood Pressure&lt;br&gt;• CHF, SOB&lt;br&gt;• Hematocrit &lt;30%</td>
</tr>
<tr>
<td>Rose Rule</td>
<td>• Abnormal EKG&lt;br&gt;• Elevated BNP&lt;br&gt;• Chest Pain&lt;br&gt;• Fecal Blood</td>
</tr>
</tbody>
</table>

### Long-Term Risk Stratification

<table>
<thead>
<tr>
<th>Study</th>
<th>Clinical Markers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Martin, et al</td>
<td>• Abnormal EKG&lt;br&gt;• CHF, SOB&lt;br&gt;• Ventricular arrhythmia&lt;br&gt;• Age&gt;45</td>
</tr>
<tr>
<td>OESIL Score</td>
<td>• Abnormal EKG&lt;br&gt;• Age&gt;65&lt;br&gt;• H/o Cardiovascular disease&lt;br&gt;• No warning</td>
</tr>
</tbody>
</table>

### Short-Term Risk Stratification

**Canadian Cardiovascular Society Recommendations**

<table>
<thead>
<tr>
<th>Major Risk Factors</th>
<th>Minor Risk Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abnormal EKG</td>
<td>Age &gt; 60</td>
</tr>
<tr>
<td>H/o CV diseases</td>
<td>Dyspnea</td>
</tr>
<tr>
<td>Hypotension</td>
<td>Anemia</td>
</tr>
<tr>
<td>Heart Failure</td>
<td>CV disease</td>
</tr>
<tr>
<td></td>
<td>Family H/o SCD</td>
</tr>
<tr>
<td></td>
<td>Specific Situations - Syncope during exercise/supine, or with no prodromal symptoms</td>
</tr>
</tbody>
</table>
Evidence Suggestive of high-risk of Cardiovascular event or death?

- If Yes; Risk Assessment – Life threatening
- Criteria for Hospitalization:
  - Malignant arrhythmia or cardiovascular cause is suspected
  - New neurologic abnormality present
  - Severe injury is present
  - Multiple frequent episodes
  - Severe orthostatic hypotension
  - Uncontrolled "malignant" vasovagal syncope
  - Elderly patient
  - Treatment options not possible as an outpatient

2009 European Society of Cardiology Guidelines

- Carotid sinus massage in patients >40 years old
- Echocardiogram – with heart disease
- Immediate electrocardiogram (ECG) monitoring when there is a suspicion of Arrhythmic Syncope
- Orthostatic challenge (lying to standing orthostatic test or head-up tilt testing) when Syncope is related to the standing position or there is suspicion of a reflex mechanism.
  - Tilt testing
  - Holter monitoring
  - Implantable loop recorder
  - Electrophysiology study

An Algorithm to Manage Syncope

Source: Olshansky (2005), p. 36
Syncope & Older Population

- Older adults syncope is often multifactorial in origin.
- More prone to syncope due to age related changes in CV system, as well as concurrent multiple illnesses, polypharmacy.
- Morbidity associated with syncope is greater in elderly population compared to younger population.
- Syncope is involved with more complications – Falls, fractures, subdural hematomas, hospitalization etc.

Education

**Tilt training:** Stand for 10 -30 min each day against a wall, to decrease the effects of posture changes/fainting spells.

**Counter pressure maneuvers:** Isometric arm counter-pressure maneuvers, leg crossing with muscle tensing, stay fidgety by flexing your leg muscles and shifting your weight when you are standing still, or better still, walk around.

**Diet:** Avoid eat large meals, avoid alcohol consumption it dilates the blood vessels, steals blood away from the central circulation, reduce caffeine intake.

**Exercise:** is important, regains the vagal tone in lower extremities. Vagal tone will promote circulation in body.


Driving Restrictions

- For patients at risk for recurrent Syncope to guard the safety of themselves and others.
- Recommendations for driving in patients with Arrhythmias and Syncope are included in the 1996 Statement from the American Heart Association (AHA) and North American Society of Pacing and Electrophysiology (NASPE, now Heart Rhythm Society (HRS)) on personal and public safety issues related to Arrhythmias and amended in the 2007 addendum.
- Similar driving restriction recommendations are included in the 2009 ESC Syncope update.
- Driving restrictions are governed by state law.
It is essential to know local laws and provider responsibilities.

In the State of Texas it is not mandatory for a provider to report to DPS but physician/provider is responsible to warn patients. Once reported, is reviewed by Texas Medical Advisory Board.

UNEXPLAINED SYCONE: A single episode of unexplained Syncope will preclude all driving for a period of 6 months. If the cause of Syncope is found and corrected, driving may resume with permission from the physician.

NEUROCARDIOGENIC SYCONE (VASOVAGAL SYCONE) which is uncontrollable or frequent, or which occurs while driving precludes licensure of cargo and passenger transport vehicles in classes A, B & C until it is controlled for a period of 6 months.

RECURRENT UNCONTROLLED SYCONE DUE TO ANYTHING OTHER THAN VASOVAGAL ATTACKS precludes the operation of private, cargo transport and passenger transport vehicles in classes A, B & C until effective treatment and control has been established for 1 year. Recurrent means 2 or more episodes in 6 months.

SYCONE-BRADYARRHYTHMIA. Untreated Bradycardia induced syncope precludes the operation of private, cargo transport and passenger transport vehicles in classes A, B & C. After successful treatment is accomplished either by removal of the medication causing bradycardic syncope or establishment of appropriate pacemaker function, patients may be re-evaluated for driver’s license. Patients with pacemaker implantation should be restricted from the operation of cargo transport and passenger transport vehicles in classes A, B for 1 month after the demonstration of appropriate pacemaker function. Persons with a class C license may return to driving when cleared by their attending cardiologist.
SYNCOPE–TACHYARRHYTHMIAS: Untreated supraventricular tachyarrhythmia causing syncope precludes the operation of private, cargo transport and passenger transport vehicles in classes A, B and C license. Supraventricular tachyarrhythmia successfully treated with an ablative therapy procedure does not preclude the operation of private, cargo transport and passenger transport vehicles in class C with a "P" restriction when cleared by their cardiovascular physician. Classes A and B can drive after a 3 month driving restriction period to establish the long-term success of therapy.

Summary & Recommendations

- Treatment is based on underlying etiology. So, finding the cause of etiology is the key issue.
- The prognosis is related to its etiology as well as any underlying cardiovascular disease.
- Driving restrictions for patients at risk for recurrent Syncope to guard the safety of themselves and others.
- U.S. Federal Motor Carrier Safety Administration rules – 3 months symptom free observation of reflex Syncope.
- Specialized Syncope Clinics and Syncope Management Units.

References


Thank You All!

...those who hope in the LORD will renew their strength.
They will soar on wings like eagles;
they will run and not grow weary,
they will walk and not be faint.

Rose Paul Bagh