An 82-year-old male was found unresponsive by his son. EMS found the patient with a pulse of 70 and BP was 160/98. The patient had a history of HTN and HCTZ.

Upon his arrival at the Emergency Department, physical exam revealed a facial contusion and that the patient is unable to move his left wrist. ECG indicated SR, LBBB, and PVCs. X-ray confirmed a left wrist fracture. What are the next Rx. steps?

**Key Learning Points:**

1. Less than 50% of patients will have a clear etiology for a syncope spell.

2. While many causes of syncope are benign, potential life threats including cardiac causes must be considered.

3. Risk stratification aids in disposition of patient can be effectively stratified based on age, medical history, physical examination and ECG.

4. ACEP Clinical Policy on Syncope discusses workup, risk stratification and disposition.

5. When to admit:
   a) History CHF, ventricular arrhythmias
   b) Scenario consistent with ACS
   c) Evidence of CHF or valvular heart disease
   d) Abnormal ECG

6. Consider admission if:
   a) Age > 60
   b) Hx CAD, congenital heart disease
   c) Family history of sudden death
   d) Exertional syncope
Definition
♦ Transient loss of consciousness
♦ Loss of postural tone
♦ Spontaneous and full recovery
♦ Absence of prolonged confusion

Epidemiology
♦ 6% of hospital admits
♦ Up to 3% of ED visits
♦ Experienced by 12-40% of young adults (less than 40)
♦ 6% annual incidence in those over 75 years old

Natural History

Etiology of Syncope
♦ Noncardiac Causes
  ▪ Vasodepressor (vasovagal, neurocardiogenic) (10-29%)
  ▪ Situational (e.g., micturition)
  ▪ Psychogenic
  ▪ Orthostatic (4-12%)
  ▪ Drug induced (2-9%)
  ▪ Carotid sinus sensitivity
  ▪ Seizure (exclude by most syncope studies)
  ▪ Neuralgias – trigeminal, glossopharyngeal
  ▪ Neurologic – TIA, strokes, migraines (rare)
Cardiac Causes - Obstruction to flow (3-11%)
- Subaortic stenosis
- Aortic valve stenosis
- Mitral valve stenosis
- Myxoma (rare)
- Pulmonic valve stenosis
- Pulmonary emboli
- Pulmonary hypertension
- AMI
- Pericardial tamponade
- Aortic dissection

Cardiac Causes – Arrhythmias (5-30%)
- Tachyarrhythmias
  - Supraventricular tachycardia
  - Ventricular tachycardia
- Bradyarrhythmias
  - Atrial ventricular block
  - Sick sinus syndrome
  - Pacemaker malfunction

Age-Dependent Causes of Syncope – Mayo Clinic data

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Cardiogenic</th>
<th>Vasovagal</th>
<th>CHS</th>
<th>Undetermined</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;65 years</td>
<td>43%</td>
<td>17%</td>
<td>13%</td>
<td>24%</td>
<td>3%</td>
</tr>
<tr>
<td>≥65 years</td>
<td>23%</td>
<td>18%</td>
<td>19%</td>
<td>30%</td>
<td>10%</td>
</tr>
</tbody>
</table>

Cardiac etiology becomes more frequent as the patient ages.
Syncope In Children

- Syncope in children is generally a benign event.
- There are a few rare, but serious, causes of syncope in children. These include:
  - Hypertrophic cardiomyopathy
  - Anomalous origin of left coronary artery
  - Myocarditis
  - Long QT Syndrome
  - Cystic medial necrosis
  - Wolff-Parkinson-White Syndrome
- The only population-based study of syncope in children looked at 151 patients age 1-22 years with syncope, with the following findings:

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple faint</td>
<td>44</td>
<td>29</td>
</tr>
<tr>
<td>Vasodepressor/vasovagal</td>
<td>61</td>
<td>40</td>
</tr>
<tr>
<td>Hysteria/psychogenic</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Breatholding</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Concurrent infectious disease</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Possible epilepsy</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Syncope</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Orthostatic</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Hyperventilation</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Hypoglycemia</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Unknown</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>22</td>
<td>15</td>
</tr>
</tbody>
</table>

Driscoll DJ, et al: J Am Coll Cardiol 29; 1997

Of these patients, one ultimately was found to have long QT Syndrome.

- Based on the above data and a number of case reports of sudden death:
  - Obtain a family history for sudden death/syncope
  - Beware of exercise-induced syncope in children
  - Consider obtaining an ECG even in pediatric patients with syncope
♦ **Drug-Induced Syncope**
  - Appears relatively common – felt to be responsible for 13% of 70 syncope cases referred to Duke University’s Syncope Clinic.

♦ **Drug to be considered:**
  - Beta-blockers
  - Nitrates
  - Calcium –channel blockers
  - Ace inhibitors
  - Phenothiazines
  - Antiarrhythmics
  - Diuretics
  - Digoxin
  - Insulin
  - Drugs of abuse

**The Economic Burden of Syncope:**
- The overall cost per hospital admission was estimated to be about $5,300 in 1996
- One study found to be $17,000 of “unnecessary” testing to diagnose vasodepressor syncope
- Overall, cost in United States estimated to be in excess of $1 billion

**Signs and Symptoms:**
Seizure versus syncope
- Though often not an issue, there are many cases when it is difficult to be sure whether a “spell” was syncope or a seizure.
- One study compared 41 seizure patients with 53 “non seizure” patients. They found the following associations:

<table>
<thead>
<tr>
<th>Seizure</th>
<th>Not a 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 (postictal)</td>
<td>Orientated after event</td>
</tr>
<tr>
<td>Age &lt; 45 years</td>
<td>Age &gt; 45 years</td>
</tr>
<tr>
<td>LOC over 5 minutes</td>
<td></td>
</tr>
</tbody>
</table>

In a separate study on tongue biting, this was found only in the seizure patients (99% specifically), but its absence did not exclude the possibility of a seizure (24% sensitivity).
Features of Major Causes of Syncope are Outlined Below:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Suggested Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Postexercise on standing &lt; 2 min.</td>
<td>Structural heart disease</td>
</tr>
<tr>
<td>Stress related</td>
<td>Vasodepressor</td>
</tr>
<tr>
<td>Situational</td>
<td>Micturition syncope</td>
</tr>
<tr>
<td>No prodrome</td>
<td>Cardiac – esp. arrhythmia</td>
</tr>
</tbody>
</table>

Congestive Heart Failure:
An ominous finding in syncope patients.
In a study of 491 patients with severe congestive heart failure, 12% had syncope over a one-year period. Of those diagnosed with a cardiac etiology, 49% were dead within a year of the event. Likewise, 39% of those with noncardiac syncope died within 12 months, compared to 12% of the nonsyncope group.\(^\text{10}\)

Orthostatic Hypotension

♦ Generally defined as a drop in blood pressure of > 20 mmHg on standing
♦ Beware! Orthostatic hypotension is present in about 40% of patients over 70 years old.
♦ Up to 23% of patients younger than 60 have orthostatic blood pressure drops.
♦ If you are able to reproduce the patient’s symptoms on standing, this is helpful (regardless of the measurements).\(^\text{11}\)

Diagnostic Testing

ECG
♦ The ECG will be diagnostic in 2-12% of syncope cases.\(^\text{2}\)
♦ What to look for:\(^\text{12}\)
  ▪ VT (3 or more beats)
  ▪ Sinus pulse (> 2 seconds)
  ▪ Bradycardia – with symptoms
  ▪ SVT with symptoms or hypotension
  ▪ Atrial fibrillation – especially slow ventricular response
  ▪ Second or third degree heart block
  ▪ Pacemaker malfunction

Blood Work:
♦ Generally not helpful.
♦ One study found no abnormal lab findings other than those which would be readily identified on physical exam (hypoglycemia, profound anemia).\(^\text{7}\)

Testing beyond the ED:
♦ Holter monitor
  ▪ Helpful in a small minority of patients.
  ▪ In one series (of 1500 patients), 2% had an arrhythmia associated with near syncope while wearing the monitor.\(^\text{13}\)
♦ Tilt Table Testing
  - A test for autonomic instability.
  - A positive test indicates a predisposition for vasodepressor syncope.
  - Isoproterenol, a sympathomimetic can be used in low doses to increase the sensitivity of the test.
  - Patients can have false positive results from 25-80% of the time.

♦ Electrophysiologic Studies (EPS)
  - An invasive procedure that involves meticulous mapping of the heart’s conduction system, studies of conduction times, and can test the heart’s susceptibility to ventricular arrhythmias.
  - EPS is abnormal in 18-68% of patients with syncope of unknown cause. However, abnormal finding on EPS does not guarantee that that was what causes a patient’s syncope!

The Dilemma of Syncope

♦ Who needs admission for inpatient testing?
♦ Who can be safely discharged for an outpatient workup?

The key may be shifting from searching to establish a diagnosis, which we will only find in 50% of our ED patients at best\(^\text{12}\) to risk stratifying patients for likelihood of an adverse event.

  - Identify low-risk patients who need minimal testing and have a low likelihood of an adverse event.
  - Identify high-risk patients in whom a more aggressive approach is indicated.

♦ Risk Stratification in Syncope\(^\text{12}\)

  Syncope Patients in ED
  Derivation cohort N = 252
  Validation cohort N = 374

Outcome arrhythmias and mortality at 1 year.

Factors Associated with Mortality
1) Abnormal ECG
2) Ventricular arrhythmias
3) Presence of CHF
4) Age over 45 years
Mortality at one year based on number of risk factors:

**Risk Stratification Mortality at 1 Year**

- At 72º, zero patients with no risk factors had events.
- At one year:
  - 3 risk factors: 57% mortality
  - 4 risk factors: 80% mortality

**Management**

ACEP Syncope Clinical Policy\(^{14}\)

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