The Kid Who Passes Out Out
When Should We Worry?

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Syncope

- Sudden loss of consciousness and postural tone with spontaneous recovery
- Results from inadequate cerebral perfusion
- In Children and adolescents syncope RARELY indicates serious cardiovascular disease and is mostly due to “common faint”
- Causes great anxiety in parents, teachers, school officials and other children
- Causes large number of visits to pediatricians, family physicians, EDs, and cardiologists
Incidence: 1/3 population (25-50%) have at least one episode of syncope, most typically during adolescence.

Has various causes, some transient and inconsequential, and others life-threatening.

It is important to identify the etiology of syncope and to differentiate benign “simple faint” from other serious and potentially life-threatening causes.

In many cases no therapy is necessary. At the other end of the spectrum, therapy maybe complex.
Presyncope

- Is the feeling that one is “about to pass out”
- May or may not reflect the same pathophysiology as syncope
- Approach, however, is same as syncope
Syncope

- Neurocardiogenic
- Neuropsychiatric
- Cardiac
Neurocardiogenic syncope

- Synonyms:
  Vasovagal syncope, vasodepressor syncope, simple faint, common faint, “Church” syncope, “hair grooming” syncope, and benign syncope
- The most common type of syncope (up to 80%)
- Typically benign, even without therapy
- Caused by sudden decrease in blood pressure
Neurocardiogenic syncope

- Three mechanisms of hypotensive syncope:
  - Cardioinhibitory
    - primary bradycardia with subsequent hypotension
  - Vasodepressor
    - Hypotension with relative preservation of HR
  - Mixed (most common)
    - Mixed response with simultaneous hypotension and bradycardia

- Bezold-Jarish reflex
Standing for prolonged period of time

Venous pooling in the legs
   Accentuated if person is dehydrated: sweating, decreased fluid intake...etc

Carotid sinus baroreceptors sense hypotension and trigger sympathetic response: Increase HR and contractility

Receptors in the left ventricle sense increase in contractility and trigger parasympathetic response

Bradycardia and vasodilatation: hypotension

syncope
Nausea
Pallor
Sweating
Dizziness
Syncope
Presyncope

C fibers

Brainstem

Vagal efferents

Hypotension

Nausea
Pallor
Sweating
Dizziness

Syncope
Presyncope

Vigorous contraction of a poorly filled ventricle
Sympathetic activation
Venous pooling

Bradycardia
Neurocardiogenic syncope
clinical presentation

- History is key to making proper diagnosis
- Syncope vs. presyncope
- Episodes are usually brief
- Typically there is a prodrome of symptoms
- Symptoms are relieved by supine position
- My recur if patients are “helped up” too quickly
- Seizures, loss of bladder control, tonic-clonic jerks may occur in more extreme cases
Neurocardiogenic Syncope
Clinical Presentation

• Common signs and symptoms:
  ○ Weakness
  ○ Warm feeling, flushed feeling
  ○ Sweating
  ○ Dizziness and lightheadedness
  ○ Visual disturbances, decreased acuity, “spots”
  ○ Headache
  ○ “Hard heart beat”, fast or slow, pounding
  ○ Pallor
  ○ Nausea, abdominal pain
Provocative factors
Triggers

- Upright posture
- Emotional stress (fear, anxiety, pain, sight of blood)
- Hair brushing
- Stretching
- Cessation of prolonged exercise
- Cough
- Orthodontic maneuvers, dental trauma
- Swallowing
- Micturation or defecation
Cardiac Syncope

- Uncommon but serious
- Caused by several structural and arrhythmogenic conditions
- Maybe predictor of sudden cardiac death
- Dysrhythmias are the most common cause of cardiac syncope, the most lethal and the most silent
- Typically occurs without warning or during exercise
Cardiac causes of syncope

- **Arrhythmia**
  - Tachyarrhythmias (V-Tach and V-fib)
    - WPW, Long QT syndrome, CPVT
  - Bradyarrhythmias
    - Heart block
    - Sick sinus syndrome
    - Lyme disease

- **Structural heart disease**
  - Hypertrophic cardiomyopathy
  - Aortic Stenosis
  - Congenital coronary artery anomalies
  - Primary pulmonary hypertension
Neuropsychiatric

- Epilepsy/seizures
  - No prodromal symptoms
  - Tonic-clonic activity
  - Postictal period of lethargy and confusion
  - Supine position at onset
  - Incontinence, tongue biting, frothing at the mouth
  - Warm flushed skin
- Panic disorder
- Anxiety and hyperventilation
- Conversion disorder
- Atypical migraines
Breath Holding Spells

- Child usually 6-18 months of age but maybe older
- 2-5% of children
- Triggered by pain, fight, anger
- Child holds breath, or cries with prolonged expiration
- Loses consciousness for few seconds
- Wakes up with deep breaths
- Maybe cyanotic or pale
Evaluation of Patient with Syncope

- History of the episode is critical in the diagnosis
  - Time of day
  - Time of last meal
  - Activities leading up to event
  - Associated symptoms:
    - palpitation, chest pain, headache, dyspnea, nausea, diaphoresis
    - visual changes, auditory changes
  - Patient’s position when became symptomatic
  - Duration of episode
Family History

- Sudden death or “myocardial infarctions” in young family members <30 years
- Family history of structural heart disease
- Family members with pacemakers or ICDs
- Drowning of a family member
- Family history of sensorineural deafness
- Family history of fainting is common in patients with neurocardiogenic syncope
Physical examination

- Most patients have entirely normal exam long after the event, therefore, **HISTORY** becomes the most important piece of data for developing the differential diagnosis, workup and management plan.

- Vital signs (BP and HR supine and standing)

- Cardiac examination:
  - Irregular rhythm
  - Ejection systolic murmur
  - Loud second heart sound
Cardiology Workup

- ECG (for all patients)
- 24 Holter monitoring
- Event monitors and Loop recorders
- Echocardiogram
  - Heart murmur
  - Suspicious ECG
  - Family history of sudden death or cardiomyopathy
- Exercise stress test
- Tilt table test
## “Red Flags”

| During exercise or exertion | Hypertrophic cardiomyopathy (HCM)  
Aortic stenosis (AS)  
Long QT syndrome  
Pulmonary hypertension |
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>While swimming</td>
<td>Long QT syndrome (until proven otherwise)</td>
</tr>
<tr>
<td>Associated with intense emotion (fright, anger, pain)</td>
<td>Long QT syndrome</td>
</tr>
</tbody>
</table>
| Family history of early sudden death, drowning, deafness, cardiomyopathy | Long QT syndrome  
Hypertrophic cardiomyopathy |
| Cardiopulmonary resuscitation | Arrhythmia  
Hypertrophic cardiomyopathy  
Pulmonary hypertension |
| Preceded by palpitations or chest pain | Arrhythmia  
Hypertrophic cardiomyopathy, AS, PPH |
| Surgery for CHD             | Arrhythmia                                                           |
| Murmurs on cardiac examination | HCM, AS                                                                |
## Possible ECG findings

<table>
<thead>
<tr>
<th>Condition</th>
<th>Diagnosis</th>
</tr>
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<tbody>
<tr>
<td>Delta waves, short PR interval, wide QRS</td>
<td>Wolf-Parkinson White syndrome</td>
</tr>
<tr>
<td>Corrected QT interval (QTC) &gt;0.45 sec</td>
<td>Long QT syndrome</td>
</tr>
<tr>
<td>LVH, ST-segment abnormalities, abnormal T waves (inverted T waves), deep q waves</td>
<td>Hypertrophic cardiomyopathy</td>
</tr>
<tr>
<td>Increased ventricular voltages and diffuse T wave abnormalities</td>
<td>Dilated cardiomyopathy</td>
</tr>
<tr>
<td>Right axis deviation, right atrial enlargement, RVH</td>
<td>Primary pulmonary hypertension</td>
</tr>
<tr>
<td>2nd or 3rd degree heart block</td>
<td>Myocarditis, Lyme disease</td>
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<tr>
<td></td>
<td>Congenital heart block (lupus)</td>
</tr>
<tr>
<td></td>
<td>CHD</td>
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<tr>
<td>ST elevation in anterior leads (V1, V2), RBBB</td>
<td>Brugada syndrome</td>
</tr>
</tbody>
</table>
Tilt Table Testing

- To provoke syncope under close monitoring
  - Cardiac rate and rhythm
  - Blood pressure
- Excellent sensitivity
- Poor specificity
- Helps in selecting therapy
- Positive responses include:
  - Lightheadedness, dizziness, nausea, visual changes, syncope
  - Sinus bradycardia, junctional brady, and asystole
  - Hypotension (sys BP <70)
- Returning to supine position resolves symptoms
Management of Neurocardiogenic Syncope

• Identify potential triggers
• Educate the patient
• Avoid prolonged standing or rising quickly to stand
• Oral fluid guidelines:
  ○ Target daily fluid intake of 1oz/kg
  ○ Additional fluid (water or sports drinks) recommended with vigorous exercise
  ○ Increase water intake especially in the morning
  ○ Avoid caffeinated drinks
• Increase dietary salt intake (salty snacks)
• If symptoms, lie down horizontally to avoid syncope
Pharmacological therapy

*Should be considered in patients with recurrent syncope despite behavioral modifications*

- **Mineralocorticoids (Fludrocortisone) Florinef**
  - Enhance sodium reabsorption in the kidney
  - Expand plasma volume

- **Beta Blockers (propranolol, atenolol, nadolol)**
  - Prevent peripheral venous pooling and cardiac hypercontractility

- **Alpha adrenergic agonists (Midodrine)**
  - Improve hemodynamic status and increased blood pressure by:
    - Increasing cardiac contractility and heart rate (increased cardiac output)
    - Increase peripheral resistance by causing vasoconstriction
Case 1

- 14 year old girl brought to the office for evaluation of fainting spell at choir practice. She describes feeling warm, nauseated, lightheaded, and noted that her vision changed “looking through a black tunnel” and then everything went black. LOC lasted 20-30 seconds.
- Witnesses described her as extremely pale before passing out.
- After waking up, she felt clammy, tired, but returned to normal shortly after.
- Normal PE and EKG.
Case 2

- A 16 year old was running laps at school for football practice, and after running two laps, he stopped to rest, felt nauseous, lightheaded, and fainted for < 1 min
- He regained consciousness and was back to normal
- He reports not having had anything to drink or eat prior to practice
- Denies history of exertional chest pain or palpitations
- Witnesses report that he looked “white as a ghost” before fainting
- Normal PE and EKG
Case 3

• A 16 year old brought to the office after having a fainting spell at the chiropractor while being put in traction for mild scoliosis. She was immediately laid down on the bed and regained consciousness shortly after.

• She reports fainting during blood draw in the lab approximately 1 week earlier

• Very active and has no symptoms with exercise

• Her mom has fainted a couple of times, once in church, and the other while waiting for a table in a restaurant

• Normal PE and EKG
Case 4

- 3 year old boy playing in his room, his mom heard a bang, went to see him, found him unconscious, with abnormal jerky movements, eyes deviated to one side. Woke up after ~3 minutes, but remained confused and “dazed” for ~15-20 minutes.
- PMH of febrile seizure at 2 yrs. Otherwise healthy
- Normal exam and EKG
Case 5

- A 17 year-old-boy “passed out” in the middle of a basketball game. He complained of chest pain and heart pounding during the game.
- Witnesses say he was running in the basketball court and suddenly fell to the ground landing on his face unconscious.
- He reports occasional episodes of exertional chest pain.
- Has family history of two men who died of “heart attacks” at 25 and 29 years of age.
- Has systolic murmur louder in standing position.
- EKG shows LVH and abnormal T waves.
Case 6

- A 16 year old boy brought to the office after feeling that he was “about to pass out”. He felt that his heart started racing and “beating strong” after which he felt lightheaded and dizzy. The “heart racing” episodes stopped suddenly and he was better.

- He reports several episodes of palpitations and “heart pounding and racing” in the past, mostly during exercise, occasionally associated with dizziness.

- Normal PE and EKG
Case 7

- A 12 year old lost consciousness as soon as she jumped in the pool. She was pulled out immediately by her mom. She woke up with no memory of the event.
- Since infancy she used to faint for a few seconds any time she is startled or scared. She also had couple of “very short” seizures when she was 3 years old
- She is deaf
- Her parents are cousins. Her maternal aunt was deaf and died suddenly at the age of 4
- The EKG showed: ???

Summary

- Syncope is fairly common in children and adolescents
- It is benign and transient in most cases (neurocardiogenic)
- Evaluation and diagnosis relies heavily on a thorough and detailed **history** of the event
- ECG is essential in the basic workup
- Other tests should be performed based on pertinent positives in the history or physical exam
- All syncope associated with exercise or exertion must be considered dangerous
Thank You

"Can I have a volunteer, please."

TEACHERS

Wish they could teach this way