Syncope: Distinguishing the Vanilla Faint From a Sudden Cardiac Death Warning Sign

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A Transient Loss of Consciousness

The primary purpose of the evaluation of the patient with syncope is to determine whether the patient is at increased risk for death.

If these diagnoses can be excluded, the goal then becomes identification of the cause of syncope in an attempt to improve the quality of the patient’s life and to prevent injury to the patient or others.
Prevalence and Impact
The Significance of Syncope

The only difference between syncope and sudden death is that in one you wake up.¹

The Significance of Syncope

1. National Disease and Therapeutic Index on Syncope and Collapse, ICD-9-CM 780.2, IMS America, 1997
Syncope Reported Frequency

- Individuals <18 yrs
  - 15%

- Individuals 17-46 yrs
  - 20-25%

- Individuals 40-59 yrs*
  - 16-19%

- Individuals >70 yrs*
  - 23%

*during a 10-year period

The Significance of Syncope

- 500,000 new syncope patients each year
- 170,000 have recurrent syncope
- 70,000 have recurrent, infrequent, unexplained syncope

explained: 53% to 62%

infrequent, unexplained: 38% to 47% 1-4

5 National Disease and Therapeutic Index, IMS America, Syncope and Collapse #780.2; Jan 1997-Dec 1997.
Some causes of syncope are potentially fatal
Cardiac causes of syncope have the highest mortality rates

Overall Due to Cardiac Causes

Impact of Syncope

Proportion of Patients

- Anxiety/Depression: 73% ¹
- Alter Daily Activities: 71% ²
- Restricted Driving: 60% ²
- Change Employment: 37% ²

Etiology
Not So Serious Causes

Fortunately One of The More Common Causes of Syncope
Serious Causes
Gathers Collapses, Then Dies

- 23 yo Loyola Marymount University NBA prospect
- Syncopal spell shooting free throw 12/9/89
- Workup includes thallium and cath → apical defect
- EPS induces PMVT
- Treated with beta-blocker: ICD refused
Unusual Causes of Syncope

While preparing dinner, Edna accidentally opens up a can of Whoopass.
**Syncope: Etiology**

- **Neurally-Mediated**
  - 1. Vasovagal
  - 2. Carotid Sinus
  - 3. Situational
    - Cough
    - Post-micturition
  - 24%

- **Orthostatic**
  - 2. Drug Induced
    - ANS Failure
    - Primary
    - Secondary
  - 11%

- **Cardiac Arrhythmia**
  - 3. Brady
    - Sick sinus
    - AV block
  - 14%
  - Tachy
    - VT/VF
    - SVT
  - 14%
  - Long QT Syndrome

- **Structural Cardio-Pulmonary**
  - 4. Aortic/Mitral Stenosis
  - 4%
  - HOCM
  - Pulmonary Hypertension

- **Non-Cardiovascular**
  - 5. Psychogenic
  - 12%
  - Metabolic e.g. hyper-ventilation
  - Neurological
  - Bleeding

**Unknown Cause = 34%**
Spectrum of “Malignant” Cardiac Syncope

Cardiomyopathies (54%)
- DCM
- HCM
- ARVD

1° ED (26%)
- IVF LQTS

Neuro-cardiogenic Syncope

CHD 18%
“...cardiac syncope can be a harbinger of sudden death.”

- Study of survival rates with and without syncope
- Cardiac syncope carried a 6-month mortality rate of greater than 10%
- Cardiac syncope doubled the risk of death

“People who’ve had a heart attack have a sudden death rate that’s 4-6 times that of the general population.”

700 post-MI patients; ~95% on beta blockers two years after discharge.

Arrhythmia events or SCDs did not concentrate early after the index event, but most of them occurred more than 18 months post-MI.

Diagnosis and Evaluation Options
AHA/ACC Scientific Statement on the Evaluation of Syncope:

“This approach (ILRs) is more likely to identify the mechanism of syncope than is a conventional approach that uses Holter or event monitors and EP testing and is cost-effective.”

A. Strickberger et al. Circulation 2006; 113: 316-327
Initial Evaluation
(Clinic/Emergency Dept.)

- Detailed history
- Physical examination
- Laboratory examination
- 12-lead ECG
- Echocardiogram – to determine if structural heart disease is present
**High School Activities Association**

**Athletic Preparticipation Health History Screening and Physical Examination**

Explain "Yes" answers below: (To be completed by student and parent/legal guardian)

1. Have you had a medical problem or injury since your last evaluation?
2. Have you ever been hospitalized?
3. Have you ever had surgery?
4. Are you presently taking any medications or pills? (Include vitamins, prescriptions, non-prescriptions)
5. Do you have any allergies (medicine, bees or other stinging insects)?
6. Have you ever passed out during or after exercise?
7. Have you ever been dizzy during or after exercise?
8. Have you ever had chest pain during or after exercise?
9. Do you tire more quickly than your friends during exercise?
10. Have you ever had high blood pressure?
11. Have you ever been told that you have a heart murmur?
12. Do you have any previous signs of your heart or blood vessels?
13. Has anyone in your family died of heart problems or a sudden death before age 50?
14. Do you have any skin problems (rashes, acne)?
15. Have you ever had a head injury or suffer from headaches?
16. Have you ever been knocked out or unconscious?
17. Have you ever had a seizure?
18. Have you ever had a stinger, burn, or pinched nerve?
19. Have you ever had heat or muscle cramps?
20. Have you ever been dizzy or passed out in the heat?
21. Do you have trouble breathing or do you cough during or after activity?
22. Do you use any special equipment (pads, braces, neck rolls, mouth guard, eye guards, etc.)?
23. Have you had any problem with your eyes or vision?
24. Do you wear glasses or contacts or protective eye wear?
25. Have you had any other medical problems (infectious mononucleosis, diabetes, etc.)?
26. Are there concerns you wish to discuss?
“Don’t Blow Off a Blackout”

EXERTIONAL/AUDITORY/
POSTPARTUM
SYNCOPE/SEIZURES
MAY BE POTENTIAL
SUDDEN DEATH
WARNING SIGNS!!
## Syncope: Diagnostic Methods and Yields

<table>
<thead>
<tr>
<th>Test/Procedure</th>
<th>Yield*</th>
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<tbody>
<tr>
<td>ECG</td>
<td>2-11%</td>
</tr>
<tr>
<td>Holter Monitoring</td>
<td>2%</td>
</tr>
<tr>
<td>External Loop Recorder</td>
<td>20%</td>
</tr>
<tr>
<td>Tilt Table</td>
<td>11-87%</td>
</tr>
<tr>
<td>EP Study without structural heart disease</td>
<td>11%</td>
</tr>
<tr>
<td>EP Study with structural heart disease</td>
<td>49%</td>
</tr>
<tr>
<td>Neurological (CT scan, carotid doppler)</td>
<td>0-4%</td>
</tr>
<tr>
<td>SQ Implantable Cardiac Monitor (ICM)</td>
<td>43-88%</td>
</tr>
</tbody>
</table>

*Based on mean diagnosis time of 5.1 mos.*

2 Krahn, Cardiol Clinics, 1997.
3 Kapoor, Medicine, 1990.
7 Krahn, Circ, 1999.
<table>
<thead>
<tr>
<th>Method</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Holter (24-48 hours)</td>
<td>Useful for frequent events (ie. Episodes every 24 - 48 hours.)</td>
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</table>
| Event Recorder (up to 4 weeks)    | • Useful for infrequent events (ie. Weekly – monthly episodes)  
|                                    | • Limited value in sudden LOC                      |
| Loop Recorder (up to 4 weeks)     | • Useful for infrequent events                     
|                                    | • Limited value in sudden LOC (auto detect better) |
| Implantable Cardiac Monitor (3 yrs)| • Implantable type (ICM) more convenient  
|                                    | • Useful for infrequent events                     |
Head-up Tilt Test (HUT)

- Unmasks VVS susceptibility
- Reproduces symptoms
- Patient learns VVS warning symptoms
- Physician is better able to give prognostic / treatment advice
- May be helpful in assessing effectiveness of treatment of neurocardiogenic syncope (ie repeat tilt testing)
Note that BP tends to fall in advance of the bradycardia component
IMPLANTABLE CARDIAC MONITORS (ICMs)

A Major Advance in the Evaluation of Syncope and Heart Rhythm Disorders

The “Black Box” for the Human Body
Rhythms During Recurrent Syncope

- Normal Sinus Rhythm: 58%
- Bradycardia: 36%
- Tachyarrhythmia: 6%

The GOLD Standard

Document
Heart Rhythm
at
Time of
Symptoms
Seems a Simple Task...But...
...NOT SO EASY:
Rhythm disorders are often

- Unpredictable/infrequent
- Brief duration, difficult to record
- Transiently disabling, fear, faint
- Not perceived
  - During sleep
  - Too brief
  - Misinterpreted by patient/bystander (e.g., “falls”)
  - Not severe, but “marker” of serious consequences
What is an Implantable Cardiac Monitor (ICM) ?

- Offers up to 3 years of continuous, leadless ECG monitoring
- Minimally invasive, outpatient procedure
- High diagnostic yield (65-88%) symptom-rhythm correlation
- High patient compliance
- Patient and auto triggered to capture ECG
- Programmable to store up to 49 minutes of ECG
How is an ICM Placed?

2 cm
Subcutaneous Electrodes

Front electrode

Back electrode

[Image of subcutaneous electrodes]
Symptom Rhythm Correlation: Automatic or Patient Triggered

Auto Activation Point

Patient Activation Point
56 yo woman with recurrent syncope accompanied with seizures. Infra-Hisian AV Block: Dual chamber pacemaker

65 yo man with recurrent syncope accompanied with brief retrograde amnesia. VT and VF: ICD and meds
83 yo woman
Bradycardia: Pacemaker implanted

28 yo man in the ER multiple times after falls resulting in trauma
VT: ablated and medicated
Indications for Implantable Cardiac Monitors

- Patients who experience transient symptoms that may suggest a cardiac arrhythmia
  - Syncope, Near Syncope
  - Lightheaded/dizzy
  - Palpitation
  - Falls/Refractory Seizures

- Patients with clinical syndromes or situations at increased risk of cardiac arrhythmias
A 65 year-old male suffered recurrent syncopal episodes since 1996;

- Seven short episodes (approx. 20 seconds) with loss of consciousness
- History of exertional dyspnea (NYHA II) due to reduced left ventricular function following myocarditis
- ACE inhibitor improved exertional dyspnea
- Ejection fraction was 40%
WORKUP AND TREATMENT

- Repeated neurological exploration, CT of cerebrum, sonography of carotid arteries, and echocardiogram all negative
- ECG showed AV conduction delay of 230 msec with sinus rhythm
- EP examination showed HB interval extended to 62 msec at 750 msec sinus cycle length; neither supraventricular nor ventricular arrhythmias could be induced
- An implantable cardiac monitor (ICM) was implanted
CONCLUSION

- 6 months after ICM implant, the patient experienced another episode; lost consciousness for approx 30 seconds
- Recordings showed VT at a rate of 206 bpm with spontaneous termination
- An additional event was recorded showing PAF
- An ICD was implanted and Medication based therapy was initiated using amiodarone
- Patient has had no recurrent events
A 16 year-old female experienced repeated loss of consciousness; including one three-day episode with numerous syncopal events at the time of a traumatic family event.

Family history included syncope and respiratory arrest.
WORKUP AND TREATMENT

- Workup included history, physical, 12-lead ECG, holter monitoring, tilt table, CSM, external event recorder, EP study, echocardiogram, MRI and psychiatric evaluation – all inconclusive

- An ICM was implanted
CONCLUSION

- The ICM captured episode three months after implantation
- ECG recordings showed Torsades des Pointes with spontaneous self-termination
- ICD was implanted
Conclusion

Syncope is a common symptom, often with dramatic consequences (injury or SCA), which deserves thorough investigation and appropriate treatment of its cause.

If History/Physical and initial evaluation are unremarkable consider an Implantable Cardiac Monitor (ICM) early in the work up of these patients.

In the post MI patient with preserved or reduced EF (above 35%) consider use of an ICM if Electrophysiology Study is unremarkable.