Efficient Syncope Work-up

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General David Petraeus faints during grilling over US in Afghanistan

About an hour into the hearing, as McCain questioned him about recent setbacks.....he turned pale, his eyes began to glaze over and his speech slowed down as if he had trouble gathering his thoughts.

Returned shortly afterwards to applause, shook hands with the senators and resumed his seat.

"I was feeling a bit light-headed there. It was not Senator McCain's questions. I just got dehydrated."
A Cautionary Tale

- One syncope during game
- ECG, Holter, Echo, Stress, Thallium, angiogram, MRI
- Cardiology “Dream Team”
  - Cardiomyopathy → VT
- 2nd opinion
  - Tilt-table test
  - Neurocardiogenic
- Died 3 months later while playing basketball
Incidence of Syncope According to Age and Sex

- 40% of population faints at least once
- ~5% of hosp adm.

Soteriades E et al. NEJM 2002
Etiology

Neurally-Mediated
- Vasovagal
- Carotid Sinus
- Situational
  20-40%

Orthostatic
- Drug Induced
- ANS Failure
  - 1\(^{\circ}\)
  - 2\(^{\circ}\)
  5-10%

Arrhythmia
- Brady
- Tachy
  10-30%

Structural Cardio-Pulmonary
- AS
- HOCM
- PE/PHTN
- Acute ischemia
- Tamponade
  4-10%

Non-CV
- Psych.
- Neuro.
  5-10%

Unknown Cause = 10-40%
Those who are subject to frequent and severe fainting attacks without obvious cause die suddenly.

Hippocrates, ~400 BC
## Causes of Syncope According to Sex & Presence / Absence of CV Disease at Baseline

Soteriades E et al. NEJM 2002;347:878-885

<table>
<thead>
<tr>
<th>Cause</th>
<th>Cardiovascular Disease Absent (N=599)</th>
<th>Cardiovascular Disease Present (N=223)</th>
<th>Total Sample (N=822)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MEN (N=232)</td>
<td>WOMEN (N=367)</td>
<td>MEN (N=116)</td>
</tr>
<tr>
<td>Cardiac</td>
<td>6.5</td>
<td>3.8</td>
<td>26.7</td>
</tr>
<tr>
<td>Unknown*</td>
<td>31.0</td>
<td>41.7</td>
<td>31.0</td>
</tr>
<tr>
<td>Stroke or transient ischemic attack</td>
<td>1.7</td>
<td>2.5</td>
<td>9.5</td>
</tr>
<tr>
<td>Seizure</td>
<td>7.3</td>
<td>3.3</td>
<td>6.9</td>
</tr>
<tr>
<td>Vasovagal</td>
<td>24.1</td>
<td>24.5</td>
<td>11.2</td>
</tr>
<tr>
<td>Orthostatic</td>
<td>9.5</td>
<td>10.9</td>
<td>6.9</td>
</tr>
<tr>
<td>Medication</td>
<td>7.3</td>
<td>6.5</td>
<td>4.3</td>
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<tr>
<td>Other†</td>
<td>13.0</td>
<td>6.8</td>
<td>3.5</td>
</tr>
</tbody>
</table>
Overall Survival by Cause

- Syncope in presence of CV disease often indicative of potentially life-threatening problem

Mortality at 6-12 mos.
- Cardiac: 19-33%
- Non-cardiac: 1-12%
- Unknown: 1-6%

Soteriades E et al. NEJM 2002
Goal of Initial Syncope Evaluation

History & Physical / ECG

• **Determine presence of heart disease**

• **Establish cause of syncope with sufficient certainty:**
  – Assess prognosis
  – **Initiate effective preventive treatment**

• **Determine which pts require further diagnostic evaluation**
How Not to Evaluate Syncope

Low Yield, High Cost Tests
- Unnecessary hospitalization
- Repeat examinations
Diagnostic tests before implantable monitor

- Median # of inconclusive tests: 13
- Average of 3 specialists

<table>
<thead>
<tr>
<th>Test</th>
<th>Total N</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total recruitment</td>
<td>570</td>
<td>100%</td>
</tr>
<tr>
<td>Standard ECG</td>
<td>556</td>
<td>98%</td>
</tr>
<tr>
<td>Echocardiography</td>
<td>490</td>
<td>86%</td>
</tr>
<tr>
<td>Basic laboratory tests</td>
<td>488</td>
<td>86%</td>
</tr>
<tr>
<td>Ambulatory ECG monitoring</td>
<td>382</td>
<td>67%</td>
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<tr>
<td>In-hospital ECG monitoring</td>
<td>311</td>
<td>55%</td>
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<tr>
<td>Exercise testing</td>
<td>297</td>
<td>52%</td>
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<tr>
<td>Orthostatic blood pressure measurements</td>
<td>275</td>
<td>48%</td>
</tr>
<tr>
<td>MRI / CT scan*</td>
<td>267</td>
<td>47%</td>
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<tr>
<td>Neurological or psychiatric evaluation</td>
<td>270</td>
<td>47%</td>
</tr>
<tr>
<td>EEG</td>
<td>222</td>
<td>39%</td>
</tr>
<tr>
<td>Carotid sinus massage</td>
<td>205</td>
<td>36%</td>
</tr>
<tr>
<td>Tilt test</td>
<td>201</td>
<td>35%</td>
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<tr>
<td>Electrophysiology testing</td>
<td>144</td>
<td>25%</td>
</tr>
<tr>
<td>Coronary angiography</td>
<td>133</td>
<td>23%</td>
</tr>
<tr>
<td>External loop recording</td>
<td>67</td>
<td>12%</td>
</tr>
<tr>
<td>ATP test</td>
<td>15</td>
<td>3%</td>
</tr>
<tr>
<td>Other tests</td>
<td>52</td>
<td>9%</td>
</tr>
<tr>
<td>No tests performed</td>
<td>1</td>
<td>0%</td>
</tr>
</tbody>
</table>

Edvardsson et al. Europace 2011
What happens when the pt meets a neurologist?

- Pts with LOC and convulsion often diagnosed with epilepsy despite normal EEG
- For all syncope, diagnostic yield of CT, Carotid Doppler, EEG = 0-4%

Evaluation recommended
- Hx suggestive of seizure/TIA
- Focal neurological signs
EEG negative “seizures”

- 55 pts aged 6–85 with fainty, falls, convulsions, and normal EEGs
- 35 (64%) taking anticonvulsants before entering study
- Presumptive dx of syncope found in 39 pts (71%)
  - 22 Vasovagal (40%)
  - 7 arrhythmias (13%)
  - 2 CHB, 1 VT, 1 VF, 3 SVT
  - 6 Carotid sinus hypersensitivity (11%)
  - 3 Orthostatic hypotension (5%)
  - 1 Aortic stenosis (2%)

Life-threatening arrhythmias may be present in pts with presumed epilepsy

Anticonvulsants should wait for CV assessment- especially if EEG equivocal
What can we do better?

24-Hour Holter

Event Recorder

Mobile Telemetry

Insertable Cardiac Monitor
Outcome in primary diagnostic strategy of ILR compared with conventional testing

Monitoring group more likely to be diagnosed (52% vs. 20%)

Krahn et al. Circulation 2001
Outcome of pts who agreed to cross over after remaining undiagnosed

Pts who crossed over more likely to be diagnosed (62% vs. 17%)
• 36% of patients experienced recurrence within 1 yr
  – Most after >30 days
• 218 events within the study
  – ILR-guided diagnosis in 170 cases (78%)
    – 128 were cardiac
• Proportion of pts with an ILR-guided dx increased over time
Conclusion

- A heterogeneous condition
- A disciplined approach is essential
- Most important questions
  - ECG
  - Known/ suspected SHD
- No substitute for recording rhythm during spontaneous syncope
  - ICM implant early rather than late
Thank you

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