Syncope: Identifying the real deal and what to do about it

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Division of General Internal Medicine
Hospital Medicine Section
Overview

I. Basics
II. Syncope Classification
III. H & P Red Flags
IV. Diagnostic Studies
V. Risk Stratification
Case Study

56 y/o man with h/o HTN brought to ED via ambulance after an event of passing out. Exact duration of the event is unknown, although family present for the event report patient was out “a couple minutes.”

Presently, he is tired, but otherwise asymptomatic.

His only medication is a “little white blood pressure pill.”
Questions

1. What additional history is needed to determine the cause of his syncope?

2. What diagnostic work-up has the highest yield in determining the cause?

3. What factors determine his need for hospital admission?
Basics

- Sudden, brief loss of consciousness → loss of postural tone due to cerebral under-perfusion
- 1-3% of emergency department visits
- 6% of medical admissions: 6th leading cause of hospitalization in patients > 65
- 10-15% have recurrent syncope < 1 year
- $2.4 billion annually

Sun et al, Am J Cardiol. 2005;95:668-671
Enigma

- Symptom, not a disease
- Cause identified in 50-66% of cases
  - usually benign and self-limited
  - can represent serious disease process
- No standard workup for all patients
- No gold standard for diagnostic tests
- Many low-risk patients are hospitalized
- Admitted patients receive little diagnostic care
"You’re sick of this? Just try to imagine how we feel."
Myths

- Most syncope patients require hospital admission
- Pulmonary Embolism and Stroke are common causes of syncope
- CT scans of the head and ECHO are helpful diagnostic tools in evaluating syncope
- Syncope occurs in places other than DIA
Differential diagnosis

- Etiologies:
  - Vasovagal (neurally-mediated)
  - Cardiac (structural, arrhythmia)
  - Orthostatic Hypotension
  - Neurologic (seizures, vascular)
  - Psychiatric
  - Multi-factorial (elderly)
  - No cause identified
<table>
<thead>
<tr>
<th>Cause</th>
<th>Mean Prevalence (Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neurally mediated syncope</td>
<td></td>
</tr>
<tr>
<td>Vasovagal attack</td>
<td>18 (8–37)</td>
</tr>
<tr>
<td>Situational syncope</td>
<td>5 (1–8)</td>
</tr>
<tr>
<td>Carotid-sinus syncope</td>
<td>1 (0–4)</td>
</tr>
<tr>
<td>Psychiatric disorders</td>
<td>2 (1–7)</td>
</tr>
<tr>
<td>Orthostatic hypotension</td>
<td>8 (4–10)</td>
</tr>
<tr>
<td>Medications†</td>
<td>3 (1–7)</td>
</tr>
<tr>
<td>Neurologic disease</td>
<td>10 (3–32)</td>
</tr>
<tr>
<td>Cardiac syncope</td>
<td></td>
</tr>
<tr>
<td>Organic heart disease§</td>
<td>4 (1–8)</td>
</tr>
<tr>
<td>Arrhythmias</td>
<td>14 (4–38)</td>
</tr>
<tr>
<td>Unknown</td>
<td>34 (13–41)</td>
</tr>
</tbody>
</table>

*Reproduced from Linzer et al. with the permission of the publisher. 8,9

†Percentages are of patients with syncope.

‡Some of the patients receiving medication may have had neurally mediated syncope but are classified in this category because the studies did not specify it.

§Organic heart disease refers to structural heart disease that causes syncope, such as aortic stenosis, pulmonary hypertension, pulmonary embolism, or myocardial infarction.
Vasovagal

- 20-35% of all syncope
- Neurally-mediated; neurocardiogenic; “fainting”
- Reflex-mediated changes in vascular tone or HR: inappropriate vasodilation or bradycardia (or both)

Examples:
- Situational: cough; micturition
- Emotional: fainting
- Carotid sinus hypersensitivity: shaving; head turning

Kapoor et al, NEJM;343:1856-1861
Vasovagal

- **Predictors:**
  - abdominal discomfort before LOC
  - nausea/vomiting during recovery
  - interval between syncopal episodes > 4 years

- No increase in mortality

- Variable diagnostic workup and treatment results

Alboni et al, J Am Coll 2001:37:1921
Cardiac

- 10-20% of all syncope
  - Arrhythmia: #1
  - CAD, Valvular heart disease (AS, HOCM)

- Patients with *heart disease* or an *abnormal EKG* have an increased risk of death at one year

- Risk of death doubled in patients with cardiac syncope

Linzer et al, Annals of Intern Med 1997;126:989-996
Kapoor et al, NEJM 2000; 343:1856-1862
Mortality

- No syncope
- Vasovagal and other causes
- Unknown cause
- Neurologic cause
- Cardiac cause

Probability of survival vs. Follow-up, year
Cardiac

- **Presence of structural heart disease** is the most important factor in predicting risk of death + arrhythmias (sensitivity: 95%)

- Most specific **predictors of a cardiac cause** (in patients *with* certain/suspected heart disease)
  - syncope in supine position or during effort
  - blurred vision
  - convulsive syncope

Alboni et al, J Am Coll Cadiol 2001: 37:1921
Soteriades et al, NEJM 2002;347:878-85
Absence of heart disease has high negative predictive value (97%).

Only predictor of cardiac cause (in patients without heart disease)
- palpitations
Orthostatic

- 24% of all syncope, up to 30% in elderly

- **Etiologies:**
  - volume depletion (22%)
  - autonomic dysfunction (DM; Shy-Drager)
  - meds. altering vascular tone +/- HR rate (38%)

- Syncope + ↓ SBP > 20mm Hg after standing
  - 90% of pts. have within 2 minutes of standing
  - Δ HR > 30 points: specific for hypovolemia

Linzer et al, Annals of Int Med; 126:989-996
Neurologic

- 10% of all syncope
- Migraines, seizures, vertebral-basilar insufficiency

- Neurologic testing unhelpful in patients lacking neurologic signs or symptoms
  - **CT of head:** only helpful if *focal neurological exam* present or *seizure* is witnessed → new diagnostic information in only 4% of cases
  - **EEG:** only helpful with (+) seizure activity
  - **Carotid ultrasound** unhelpful

- Combined diagnostic yield of 2-6%

Kapoor et al, NEJM 2000; 343:1856-1862
Elderly

- Multi-factorial due to an inability to compensate for common situational stresses in setting of:
  - multiple medical problems
  - medications (polypharmacy)
  - physiologic impairments - abnormal physiologic responses to daily events $2^\circ$ to $\downarrow$ baroreceptor sensitivity
  - volume depletion
“In a perfect world, you wouldn’t suffer from depression and I wouldn’t profit from it. But we don’t live in a perfect world. OK, well, maybe I do.”
Psychiatric

- 10-20% of syncope

- Panic, generalized anxiety, somatization disorders, depression, and alcohol/substance abuse

- Patients:
  - young
  - heart disease absent
  - recurrent syncope
What helps determine the cause?

- History, history, history
  - HPI, PMH, meds.
- Exam
- EKG - recommended in nearly all patients

*** History, exam and EKG: answer ½ the time

- Routine labs not recommended: helpful <3%
- CT of head, EEG, ECHO, other directed workup based on initial H & P

Kapoor et al, NEJM 2000;343:1856-1862
History of Present Illness

- Loss of consciousness?
- Witnesses?
- Past history of similar event?
- History *prior to* event?
- What was patient doing *at time of* event?
- Accompanying symptoms?
- What was patient like *after* event?
History *prior to* event?

**Preceding features**
- Emotional stressors
- Symptoms since starting medication X
- Recent GI illness $\rightarrow$ dehydration

**Prodrome**
- Pale, sweaty and warm
- Auras
- *Long* prodrome
- *No* prodrome
  - (sudden LOC, $\varnothing$ warning)

**Etiology**
- *Vasovagal*
- *Seizure*
- *Vasovagal*
- *Arrhythmia*

Fenton et al, Annals 2000;133:714-724
**History at time of event?**

<table>
<thead>
<tr>
<th><strong>Trigger</strong></th>
<th><strong>Etiology</strong></th>
</tr>
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<tbody>
<tr>
<td>Exertion</td>
<td>Cardiac</td>
</tr>
<tr>
<td>Stress</td>
<td>Vasovagal</td>
</tr>
<tr>
<td>Shaving, head rotation</td>
<td>Vasovagal</td>
</tr>
<tr>
<td>Standing</td>
<td>Orthostatic</td>
</tr>
</tbody>
</table>

**Accompanying symptoms**

<p>| | |</p>
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<tr>
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<tbody>
<tr>
<td>Chest pain, palpitations</td>
<td>Cardiac</td>
</tr>
<tr>
<td>Nausea, diaphoresis</td>
<td>Vasovagal</td>
</tr>
<tr>
<td>Headaches</td>
<td>Migraines/seizures</td>
</tr>
</tbody>
</table>

Kapoor et al, NEJM 2000;343:1856-1862
History *after* event?

- Disorientation + slow return to consciousness = *seizures*
- LOC > 5 minutes = *seizures*
- *Presence of trauma* not predictive of underlying pathology or severity of pathology

*result* of fall may be > *cause* of fall
Past Medical History

- DM
- Psychiatric
- Cardiac (CAD, CHF, HOCM/AS)
- Neurologic (Seizures, Parkinson’s)

- (+) Family history of sudden cardiac death
  - Long QTc syndrome
  - Brugada syndrome
  - Pre-excitation syndrome

Medications

- Frequent culprit (esp. elderly)
- Document side effects: ↓ HR and ↓ BP
- **Antihypertensive** and **antidepressant** agents: #1
  - other: anti-anginals, analgesics, CNS depressants
- Cumulative: diuretic + anti-psychotic + CNS agent + β-Blocker
- May predispose to malignant arrhythmias (via ↑QTc): Quinidine, Amiodarone, Procainamide, psychotropics

Hanlon et al, Arch Intern Med 1990;150:2309
When all else fails
Exam

- **Vital signs**
  - orthostatic; “relative” hypotension?
  - * persistent hypotension a concern

- **HEENT**
  - tongue biting highly specific for seizures

- **Cardiac**
  - pulses, murmurs

- **Neurologic**
  - focal findings (CVA)
  - Δ mental status (post-ictal, meds.)
Case

The ED provider is unable to obtain further history and asks you what workup you would like performed.

You suggest...
What diagnostic work-up has the highest yield in determining the cause?

- **H & P = 45% of cases**

- **Most frequently obtained tests:**
  - EKG (99%), telemetry (95%), cardiac enzymes (95%), head CT (63%)

- **Cardiac enzymes, CT, ECHO, carotid U/S and EEG affect diagnosis or management in <5% of cases**

Mendu et al, Arch Intern Med 2009;169(14):1299-1305
Orthostatic vital signs

- Performed 38% of time

- Highest yield in affecting/determining:
  - diagnosis (18-26%)
  - management (25-30%)
  - cause of syncope (15-21%)

Mendu et al, Arch Intern Med 2009;169(14):1299-1305
## Yield of Diagnostic Studies

### Table 2. Diagnostic Tests Obtained in Evaluation of Syncopal Episodes in Older Patients\(^a\)

<table>
<thead>
<tr>
<th>Test</th>
<th>Obtained</th>
<th>Abnormal Findings(^b)</th>
<th>Affected Diagnosis(^c)</th>
<th>Helped Determine Etiology(^c)</th>
<th>Affected Management(^c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrocardiogram</td>
<td>2081 (99)</td>
<td>438 (21)</td>
<td>147 (7)</td>
<td>72 (3)</td>
<td>153 (7)</td>
</tr>
<tr>
<td>Telemetry</td>
<td>2001 (95)</td>
<td>314 (16)</td>
<td>212 (11)</td>
<td>95 (5)</td>
<td>245 (12)</td>
</tr>
<tr>
<td>Cardiac enzymes test</td>
<td>1991 (95)</td>
<td>108 (5)</td>
<td>31 (2)</td>
<td>9 (0.5)</td>
<td>29 (1)</td>
</tr>
<tr>
<td>Head CT</td>
<td>1327 (63)</td>
<td>138 (10)</td>
<td>28 (2)</td>
<td>7 (0.5)</td>
<td>28 (2)</td>
</tr>
<tr>
<td>Echocardiogram</td>
<td>821 (39)</td>
<td>516 (63)</td>
<td>35 (4)</td>
<td>13 (2)</td>
<td>36 (4)</td>
</tr>
<tr>
<td>Postural BP recording</td>
<td>808 (38)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strict criteria(^d)</td>
<td>230 (28)</td>
<td>142 (18)</td>
<td>122 (15)</td>
<td>202 (25)</td>
<td></td>
</tr>
<tr>
<td>Loose criteria(^d)</td>
<td>445 (55)</td>
<td>212 (26)</td>
<td>173 (21)</td>
<td></td>
<td>241 (30)</td>
</tr>
<tr>
<td>Carotid US</td>
<td>267 (13)</td>
<td>122 (46)</td>
<td>2 (1)</td>
<td>2 (0.8)</td>
<td>6 (2)</td>
</tr>
<tr>
<td>EEG</td>
<td>174 (8)</td>
<td>68 (39)</td>
<td>2 (1)</td>
<td>1 (0.6)</td>
<td>2 (1)</td>
</tr>
<tr>
<td>Head MRI</td>
<td>154 (7)</td>
<td>46 (30)</td>
<td>20 (13)</td>
<td>3 (2)</td>
<td>19 (12)</td>
</tr>
<tr>
<td>Cardiac stress test</td>
<td>129 (6)</td>
<td>53 (41)</td>
<td>13 (10)</td>
<td>2 (2)</td>
<td>12 (9)</td>
</tr>
</tbody>
</table>

\(^a\) Data from a prospective study of older patients with syncopal episodes.

\(^b\) Numbers in parentheses indicate percentages.

\(^c\) Numbers in parentheses indicate percentages of abnormal findings.

\(^d\) Criteria for the test are modified to increase the yield of diagnostic studies.
## Cost Analysis of Diagnostic Studies

### Table 3. Costs of Diagnostic Tests in the Evaluation of Syncopal Episodes

<table>
<thead>
<tr>
<th>Tests Obtained</th>
<th>Cost Per Test, $^b$</th>
<th>Total Cost, $^c$</th>
<th>Cost per Test Affecting Diagnosis or Management, $^d$</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEG</td>
<td>1115 × 0.34 = 379</td>
<td>65,946 = (379 × 174)</td>
<td>65,946/2 = 32,973</td>
</tr>
<tr>
<td>Head CT scan</td>
<td>1545 × 0.34 = 525</td>
<td>696,675 = (525 × 1327)</td>
<td>696,675/28 = 24,881</td>
</tr>
<tr>
<td>Cardiac enzymes test</td>
<td>357 × 0.34 = 121</td>
<td>694,298 = (121 × 5738 sets)</td>
<td>694,298/31 = 22,937</td>
</tr>
<tr>
<td>Troponin I alone</td>
<td>78 × 0.34 = 26</td>
<td>149,188 = (26 × 5738 sets)</td>
<td>149,188/31 = 4813</td>
</tr>
<tr>
<td>Carotid US</td>
<td>1294 × 0.34 = 440</td>
<td>117,480 = (440 × 267)</td>
<td>117,480/6 = 19,580</td>
</tr>
<tr>
<td>Head MRI</td>
<td>3316 × 0.34 = 1127</td>
<td>173,558 = (1127 × 154)</td>
<td>173,558/20 = 8678</td>
</tr>
<tr>
<td>Cardiac stress test</td>
<td>2492 × 0.34 = 848</td>
<td>109,392 = (848 × 129)</td>
<td>109,392/13 = 8415</td>
</tr>
<tr>
<td>Echocardiogram</td>
<td>809 × 0.34 = 275</td>
<td>225,775 = (275 × 821)</td>
<td>225,775/36 = 6,272</td>
</tr>
<tr>
<td>Electrocardiogram</td>
<td>221 × 0.34 = 75</td>
<td>156,075 = (75 × 2081)</td>
<td>156,075/153 = 1,020</td>
</tr>
<tr>
<td>Telemetry</td>
<td>255 × 0.34 = 87</td>
<td>174,087 = (87 × 2001)</td>
<td>174,087/245 = 710</td>
</tr>
<tr>
<td>Postural BP</td>
<td>5</td>
<td>4040 = (5 × 808)</td>
<td>4040/241 = 17</td>
</tr>
</tbody>
</table>

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^a Costs are estimated based on average charges.

^b Costs per test are in dollars.

^c Total cost is calculated by multiplying the cost per test by the number of tests.

^d Cost per test affecting diagnosis or management is calculated as the total cost divided by the number of tests.
Identifies (with rhythm strip) only 5% of syncope

Noninvasive and cheap

Bradycardia suggested by findings of first-degree heart block, bundle-branch block and sinus bradycardia

Ventricular tachycardia more likely with h/o previous MI or pronounced LVH (HCM)
EKG

- Prolonged QTc (meds, lytes) → Torsades de Pointes
- Wolff-Parkinson-White syndrome → Ventricular pre-excitation (usu. SVT)
- Brugada syndrome → Sudden death

* Patients with normal EKG have low likely of dysrhythmia as cause of syncope
Abnormal EKG

- Non-sinus rhythm or rhythm abnormalities
- New changes from old EKG
- Intra-ventricular conduction disorders
- LVH/RVH
- Evidence of prior MI
- ST-T wave changes c/w myocardial ischemia
Cardiac Workup

If:
1- structural heart disease can’t be confirmed clinically
2- syncope associated with exercise
3- structural heart disease of unknown significance

...then: ECHO and stress testing are recommended

- **ECHO** not useful in pts. with normal EKG and no cardiac history
- **Telemetry** > 24 hrs: rarely increases yield in detecting *symptomatic* arrhythmias
- BNP? D-dimer?

Linzer et al, Annals of Intern Med 1997; 127:76-84
Kapoor et al, NEJM 2000; 343:1856-1862
Good Advice

"Surgery is scheduled six weeks from today. Don’t eat anything before then."
Case

The ED provider asks your opinion on whether this patient is appropriate to be admitted to the hospital.

You point out...
What factors determine need for hospital admission?

**Table 3. Reasons for Hospitalization of Patients with Syncope.**

<table>
<thead>
<tr>
<th>Admission for diagnostic evaluation</th>
<th>Medium risk (consider discharge with early outpatient review)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural heart disease</td>
<td></td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td></td>
</tr>
<tr>
<td>Hypertension related to syncope</td>
<td></td>
</tr>
<tr>
<td>Associated chest pain</td>
<td></td>
</tr>
<tr>
<td>Associated headache</td>
<td></td>
</tr>
<tr>
<td>Family history of sudden death &lt;50 years</td>
<td></td>
</tr>
<tr>
<td>Previous history of VT/VF/cardiomyopathy</td>
<td></td>
</tr>
<tr>
<td>Examination findings</td>
<td></td>
</tr>
<tr>
<td>Electrocardiographic abnormalities</td>
<td></td>
</tr>
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<td>Ischemia</td>
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<tr>
<td>Conduction system defect (e.g., bundle-branch block and first-degree atrioventricular block)</td>
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</tr>
<tr>
<td>Uncommon ventricular or supraventricular tachycardia</td>
<td></td>
</tr>
<tr>
<td>Prolonged QT interval</td>
<td></td>
</tr>
<tr>
<td>Accessory pathway</td>
<td></td>
</tr>
<tr>
<td>Right bundle-branch block with ST-segment elevation in leads V1, V2, and V3</td>
<td></td>
</tr>
<tr>
<td>Pacemaker malfunction</td>
<td></td>
</tr>
<tr>
<td>Neurologic disease</td>
<td></td>
</tr>
<tr>
<td>New stroke or focal neurologic findings</td>
<td></td>
</tr>
</tbody>
</table>

**Admission for treatment**

| Structural heart disease            | Medium risk (consider discharge with early outpatient review) |
| Acute myocardial infarction         |                                                               |
| Pulmonary embolism                  |                                                               |
| Other cardiac diseases diagnosed as causing syncope | |
| Orthostatic hypotension             |                                                               |
| Acute, severe volume loss (e.g., dehydration and gastrointestinal bleeding) | |
| Moderate-to-severe chronic orthostatic hypotension | |
| Other age                           |                                                               |
| Treatment of multiple coexisting abnormalities | |
| Discontinuation of offending drug or modification of dose | |
| Drugs causing torsade de pointes and a long QT interval | |

**ECG findings**

| Mobitz type II heart block          |                                                               |
| Wolf-Parkinson-White block          |                                                               |
| Bifascicular block                  |                                                               |
| Complete heart block               | Medium risk (consider discharge with early outpatient review) |
| Sinus tachycardia >100              |                                                               |
| Sinus tachycardia <150              | Medium risk (consider discharge with early outpatient review) |
| Sinus bradycardia <50               | Medium risk (consider discharge with early outpatient review) |
| Sinus arrest                         | Medium risk (consider discharge with early outpatient review) |
| QRS >450 ms                         | Medium risk (consider discharge with early outpatient review) |

**Table 1. Our emergency department’s existing syncope guidelines based on the European Society of Cardiology, the American College of Physicians and American College of Emergency Physicians’ guidelines.**

<table>
<thead>
<tr>
<th>High risk (admit)</th>
<th>Medium risk (consider discharge with early outpatient review)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulmonary embolism</td>
<td></td>
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<td>Associated chest pain</td>
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</tr>
<tr>
<td>Sinus tachycardia &gt;100</td>
<td></td>
</tr>
<tr>
<td>Sinus tachycardia &lt;150</td>
<td></td>
</tr>
<tr>
<td>Sinus bradycardia &lt;50</td>
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<tr>
<td>Discontinuation of offending drug or modification of dose</td>
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<tr>
<td>Drugs causing torsade de pointes and a long QT interval</td>
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</tr>
</tbody>
</table>

| AHA, American Heart Association; BP, blood pressure; CVA, cerebrovascular accident; FDR, family history; GI, gastrointestinal; MRI, magnetic resonance imaging; MRA, magnetic resonance angiography; PTH, parathyroid hormone; VT, ventricular tachycardia; VT, ventricular fibrillation; VT, ventricular tachycardia. |
ED Risk Stratification

- Outcome: arrhythmia or mortality at 1 year
- Predictors:
  - Age > 45
  - Abnormal EKG
  - h/o Ventricular Arrhythmia
  - h/o CHF
- With each individual predictor, patients 3-5x more likely to have an event at 1 year
- Event rate:
  - 0% if none of four risk factors
  - 27% with 3 or 4 risk factors

Who to Admit: OESIL

- 270 consecutive European syncope patients
- 1° Endpoint (**12 month mortality**): 11.5% of pts.
- 4 predictors of **increased** risk of 1-year mortality:
  - Age > 65
  - Abnormal EKG
  - Syncope without a prodrome
  - Cardiovascular disease on history

Colivicchi et al Eur Heart J. 2003; 24:811-819
Fig. 1  Rates of 12-month all-cause mortality according to the OESIL score in the derivation cohort.
OESIL risk score 0-1

OESIL risk score 2-4

log rank p<0.00001
San Francisco Syncope Rule (SFSR)

**Objective:** compare clinical decision rule to physician decision-making to predict **serious outcomes within 7 days** of ED visit

(Serious outcome = MI, arrhythmia, PE, CVA, SAH, sig. hemorrhage, any condition requiring return ED visit/hospitalization)

- Identify low risk syncope patient who can be discharged with <2% chance of a serious outcome by day 7

SFSR

- 55% of all patients (n=684) admitted
- 52% of patients = high risk
- 11.5% (79 pts.) = serious outcome
- Increase in adverse events with any of the following:
  - Initial SBP < 90mmHg (ED triage)
  - (+) SOB
  - h/o CHF
  - Abnormal EKG
  - Hematocrit <30

→ Admission warranted
At the time of triage does the patient have a systolic blood pressure less than 90 mmHg?

No

Does the patient complain of Shortness of Breath?

No

Does the patient have a history of congestive heart failure?

No

EKG

1) Does the patient have a rhythm that is not sinus? OK
2) Does the patient have new changes on their EKG?

No

Does the patient have a hematocrit less than 30?

No

Low Risk for Serious Outcome Requiring Admission

Yes

Yes

High Risk for Serious Outcome Requiring Admission
### Table 2  Classification of performance of physician judgment to predict a 2% or less chance of a serious outcome by day 7

<table>
<thead>
<tr>
<th>Physician judgment</th>
<th>Serious outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>&gt;2%</td>
<td>74</td>
</tr>
<tr>
<td>&lt;2%</td>
<td>5</td>
</tr>
</tbody>
</table>

Sensitivity = 94% (95% CI, 86%-94%); specificity = 52% (95% CI, 51%-53%); $\kappa = 0.44$ (95% CI, 0.34-0.54).

### Table 3  Overall performance of the SFSR to predict patients with serious outcomes

<table>
<thead>
<tr>
<th>Decision rule</th>
<th>Serious outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Yes</td>
<td>76</td>
</tr>
<tr>
<td>No</td>
<td>3</td>
</tr>
</tbody>
</table>

Bootstrap estimates for CIs: sensitivity = 96.2% (95% CI, 92%-100%); specificity = 61.9% (95% CI, 58%-66%).
If *none* of the SFSR are present, patient at *low risk* of serious outcome → lower admission rates by 10% and still predict all serious outcomes

**Conclusions:**

1- physician judgment good at predicting which patients develop serious outcomes
2- physicians still admit a large # of low-risk pts.
ED Risk Stratification: ROSE

- **Risk Stratification of Syncope in the ED (pilot)**
- Comparison of ROSE with SFSR & OESIL to predict serious outcomes @ 1 wk, 1 mo. & 3 mos.
- 44 admitted, 55 discharged

- 11 of 99 syncope patients over 3 months with **serious outcome:**
  - **OESIL:** 0=0%, 1=3%, 2=8%, 3=23%, 4=38%
  - **SFSR factors:** none (n=40)=0%; 1+ (n=59)=19%

Reed et al, Emerg Med J 2007;24:270-275
ROSE

- Risk of serious outcome at 1 wk, 1 mo., and 3 mos. = 8%, 8% and 11%

- ROSE, OESIL and SFSR identify syncope patients with ↑ probability of medium-term serious outcome

- SFSR: good sensitivity, but ↑ hospital admissions
Syncope Red Flags

- Advanced Age
- Abnormal EKG
- Lack of prodrome
- History of cardiovascular disease- CHF, ventricular arrhythmia, symptoms (palpitations or chest pain)
- SBP < 90
- (+) SOB
- Hematocrit < 30
- Other: presence of serious injury, acute/severe volume loss, adverse drug reaction
Case

Patient was admitted to the hospital overnight for observation given his h/o CHF and an EKG revealing old Q waves inferiorly.

He had no further symptoms.

ECHO in the am was unremarkable and he was discharged back to DIA.
Syncope Pearls

- History, exam and EKG provide most answers
- Orthostatic VS are high-yield, low-cost
- EKG identifies highest risk patients
- Patients without cardiac disease + a normal EKG are at low risk of a (−) outcome
- Risk Stratification:
  - Identify and admit patients at high risk of bad outcomes and initiate appropriate testing
  - Identify low risk patients to avoid unnecessary admissions and workups