Outline

- Definition
- Background
- Pathophysiology
- Evaluation and Risk Stratification
  - Goals of Evaluation
  - Hx and PE
  - ACEP Clinical Policy
  - Decision Instruments
  - Electrocardiography

Syncope

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- Brief = not asleep/intoxicated, not post-ictal
  - Cannot survive prolonged cerebral hypoperfusion

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  - Cannot survive prolonged cerebral hypoperfusion
- Spontaneously = no intervention needed… therefore *rarely* hypoglycemia
- Completely = no neurological deficit, baseline mental status

Background

- Syncope also referred to as fainting, “passed out,” “blacked out,” “fell out,” “DFO,” etc.

Background

- Syncope also referred to as fainting, “passed out,” “blacked out,” “fell out,” “DFO,” etc.
- Syncope and pre-syncope are same disease along a continuum (with sudden death?)
  - Grossman, et al. Am J Emerg Med 2012
  - Thiruganasambandamoorthy , et al. Ann Emerg Med 2015
  - Bastani, Ann Emerg Med 2019
- 1-3% of all ED visits
- 1-6% of all hospital admissions

Pathophysiology

Loss of consciousness requires dysfunction of

- Bilateral cerebral hemispheres, or
- Reticular activating system

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  - Systemic hypoglycemia (unlikely)

Pathophysiology

Loss of consciousness requires dysfunction of
- Bilateral cerebral hemispheres, or
- Reticular activating system

- …caused by insufficient oxygen or glucose
  - Hypoperfusion (decreased oxygen or glucose)
  - Systemic hypoxia (unlikely)
  - Systemic hypoglycemia (unlikely)
- However, remember that this has to be transient to meet the definition of syncope

Goals of Evaluation

Question…

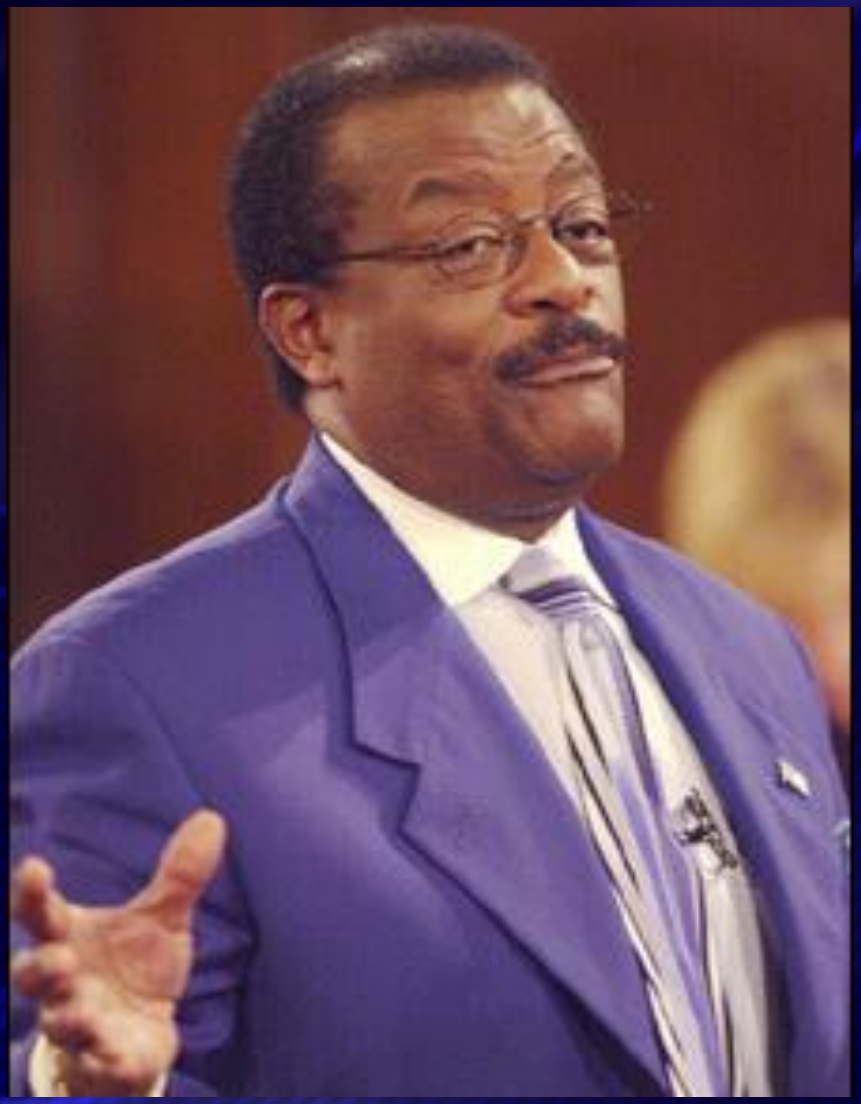
- In the patient presenting with syncope, what are your goals with regard to ED evaluation??

Goals of Evaluation

- Not necessarily in order…

Goals of Evaluation

1. Avoid litigation!



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   - Admit if high risk for early adverse event
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History

- Detailed history…no surprise questions
  - What were you doing before the syncope?
  - What symptoms do you remember before and after the syncope?
  - Witnesses? Their history
  - Feeling ill lately/recent illnesses?
  - Medications? Drugs? Alchohol?
  - Prior history of syncope? Workup?
  - Family history of sudden death?
  - Associated symptoms? (e.g CP, SOB, AP, etc.)

Physical Exam

- Detailed examination…no surprises here either
  - Appearance and VS
  - HEENT
  - Cardiac (esp. murmurs)
  - Pulmonary
  - Etc. etc. etc.

Differential Diagnosis

- Huge!
- Critical to distinguish vs. seizure

Differential Diagnosis

- Factors favoring syncope
  - Preceding nausea or diaphoresis
  - Oriented (not confused) upon waking
  - Age > 45yo
  - Preceding prolonged sitting or standing
  - History of CHF or CAD

Differential Diagnosis

- Factors favoring seizure
  - History of seizure disorder
  - Tongue biting
  - Confusion upon waking
  - LOC > 5 minutes
  - Age < 45yo
  - Preceding aura
  - Observed unusual posturing, jerking, or head turning during episode

Differential Diagnosis

- “Rule of 15s”

Differential Diagnosis

- "Rule of 15s"
  - Subarachnoid hemorrhage
  - Acute coronary syndrome
  - Thoracic aortic dissection
  - Pulmonary embolism
  - AAA rupture/leak
  - Ruptured ectopic pregnancy

Evaluate these with history/exam, test as needed

Evaluation

- Most of this is basic…
- We need to diagnose and treat simple causes
- We need to diagnose deadly causes and initiate workup/Tx

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- We need to diagnose and treat simple causes
- We need to diagnose deadly causes and initiate workup/Tx
- Note → 80% of diagnoses made during hospital admission are made in the ED!

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Evaluation

- Most of this is basic…
- We need to diagnose and treat simple causes
- We need to diagnose deadly causes and initiate workup/Tx
- If we cannot diagnose, we need to risk stratify
  - High risk for early complications…admit
  - Low risk for early complications…discharge for outpatient follow up

Syncope

Clinical Policy: Critical Issues in the Evaluation and Management of the Adult Patient Presenting to the ED with Syncope (Huff JS, et al, Ann Emerg Med 2007)

Syncope

Clinical Policy: Critical Issues in the Evaluation and Management of the Adult Patient Presenting to the ED with Syncope (Huff JS, et al, Ann Emerg Med 2007)

- Addressed three major clinical questions pertaining to *risk stratification*
- Many of the recommendations based on imperfect studies, consensus…but pretty reasonable recommendations

Syncope

Clinical Policy: The Adult Patient with Syncope (Huff JS, Ann Emerg Med 2007)

- Question 1: What history and physical exam data help in risk stratification?

Syncope

Clinical Policy: The Adult Patient with Syncope (Huff JS, Ann Emerg Med 2007)

- High-risk historical features…

Syncope

Clinical Policy: The Adult Patient with Syncope (Huff JS, Ann Emerg Med 2007)

- High-risk historical features → common sense!
  - Older age, history of CAD, structural heart disease (e.g. valvular problems, LVH)
  - Young patients with exertional syncope, SSx of ACS, FHx of sudden death

Syncope

Clinical Policy: The Adult Patient with Syncope (Huff JS, Ann Emerg Med 2007)

- High-risk exam features…

Syncope

Clinical Policy: The Adult Patient with Syncope (Huff JS, Ann Emerg Med 2007)

- High-risk exam features → common sense!
  - Murmurs (esp. if suggestive of HCM, AS)

Syncope

Clinical Policy: The Adult Patient with Syncope (Huff JS, Ann Emerg Med 2007)

- Other useful exam features to assess…

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Clinical Policy: The Adult Patient with Syncope (Huff JS, Ann Emerg Med 2007)

- Other useful exam features to assess…
  - Orthostatic changes to diagnose hypovolemia
    - Beware poor sensitivity and specificity
    - Positional symptoms → most reliable

Syncope

Clinical Policy: The Adult Patient with Syncope (Huff JS, Ann Emerg Med 2007)

- Other useful exam features to assess…
  - Orthostatic changes to diagnose hypovolemia
    - Beware poor sensitivity and specificity
    - Positional symptoms → most reliable
  - Evidence of tongue biting, loss of continence → sz.
  - Abdominal and rectal exam
  - Detailed neurological exam → structural lesion

Syncope

Diagnostic testing: key question

Are there tests that you have to order that have a positive yield which you couldn't have predicted based on a good history and physical exam?

Syncope

Diagnostic testing: key question

Are there tests that you have to order that have a positive yield which you couldn't have predicted based on a good history and physical exam? → NO! (with one exception…)

Syncope

Clinical Policy: The Adult Patient with Syncope (Huff JS, Ann Emerg Med 2007)

- Diagnostic testing
  - 12-lead ECG should be done ~ 100% (more later)
  - Routine CBC, chemistries, U/A, HCG, CXR, CT, etc.?

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Clinical Policy: The Adult Patient with Syncope (Huff JS, Ann Emerg Med 2007)

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  - 12-lead ECG should be done ~ 100% (more later)
  - Routine tests → literature indicates…
    - Rarely useful unless dictated by a good Hx/PE
    - CBC if Hx of blood loss, weakness, pallor on exam, etc.
    - Chems if Hx of N/V/D, use of diuretics, DM, renal disease, appears dehydrated, etc,
    - CT if severe HA, abnl. neuro. exam, trauma, etc.

Syncope

Clinical Policy: The Adult Patient with Syncope (Huff JS, Ann Emerg Med 2007)

- Diagnostic testing
  - Routine ED ECHO also has poor yield
    - Only if indicated by Hx/PE or ECG
      —Anderson KL, et al. Ann Emerg Med 2013
  - Outpatient Holter monitoring also has poor yield
  - Carotid Doppler studies have poor yield

Syncope

Clinical Policy: The Adult Patient with Syncope (Huff JS, Ann Emerg Med 2007)

- Diagnostic testing
  - Bottom line…
    - Get the ECG
    - No routine additional testing unless a good Hx and exam indicates these are needed

Syncope

Clinical Policy: The Adult Patient with Syncope (Huff JS, Ann Emerg Med 2007)

- Question 3: Who should be admitted after an episode of syncope of unclear cause?

Syncope

Clinical Policy: The Adult Patient with Syncope (Huff JS, Ann Emerg Med 2007)

- Who should be admitted?
  - Admit if "…treating physician suspects that the patient is at risk for significant dysrhythmia or sudden death and that *observation* might detect that event and enable an intervention."

Syncope

Clinical Policy: The Adult Patient with Syncope (Huff JS, Ann Emerg Med 2007)

- Who can be *discharged?*
  - Can probably discharge if there are no "high risk" criteria
  - Discharge for outpatient follow-up

Syncope

- Traditionally admission decisions have been based on predictors of long-term mortality
  - Abnormal ECG
  - Ventricular dysrhythmias
  - CHF
  - Age > 45yo

Syncope

- Traditionally admission decisions have been based on predictors of long-term mortality
  - Abnormal ECG
  - Ventricular dysrhythmias
  - CHF
  - Age > 45yo
- Is this relevant to EM? What are short-term predictors of serious adverse outcomes (SAOs)?

Syncope

Clinical Policy: The Adult Patient with Syncope (Huff JS, Ann Emerg Med 2007)

- San Francisco Syncope Rules (CHESS) predicts higher likelihood of 7-day SAOs
  - History of CHF
  - Hematocrit < 30%
  - ECG abnormality
  - Shortness of breath
  - SBP < 90 mm Hg at arrival

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  - ECG abnormality
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- Sensitivity at predicting 1-week adverse outcomes 96-98%, decreased admissions

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  - History of CHF
  - Hematocrit < 30%
  - ECG abnormality
  - Shortness of breath
  - SBP < 90 mm Hg at arrival
- Only to be used after "obvious admits" excluded

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  - History of CHF
  - Hematocrit < 30%
  - ECG abnormality
  - Shortness of breath
  - SBP < 90 mm Hg at arrival
- 7 Validation studies at other centers → lower accuracy (74-90%)

Syncope

Other decision rules for syncope

- Boston Syncope Rules (Grossman, et al, J Emerg Med 2007)
  - Evaluated patients at 30 days
  - Very broad set of rules
  - **25 criteria**
  - Not yet validated

Syncope

Other “decision rules” for syncope

- Short-Term Prognosis of Syncope (STePS) Study (Costantino, et al, JACC 2008)
  - Evaluated patients for risk of SAOs at 10 days
  - 4 independent predictors

Syncope

Other "decision rules" for syncope

- Short-Term Prognosis of Syncope (STePS) Study (Costantino, et al, JACC 2008)
  - Evaluated patients for risk of SAOs at 10 days
  - 4 independent predictors
    - Abnormal ECG (best predictor)
    - Concomitant trauma
    - Absence of prodrome
    - Male gender

Syncope

Other "decision rules" for syncope

- The ROSE (Risk Stratification of Syncope in the ED) Study (Reed, et al, JACC 2010)
  - Evaluated patients for risk of SAOs at 1 month
  - Admit if any of the following…

Syncope

Other "decision rules" for syncope

- The ROSE (Risk Stratification of Syncope in the ED) Study (Reed, et al, JACC 2010)
  - **BRACES**
    - **B**NP $\geq$ 300 pg/ml or **B**radycardia $\leq$ 50 in ED or prehospital
    - **R**ectal exam → fecal occult blood
    - **A**nemia → Hg $\leq$ 9.0 g/dL
    - **C**hest pain with syncope
    - **E**CG shows significant Q wave (excl. III)
    - **S**aturation $\leq$ 94% on room air

Syncope

Other "decision rules" for syncope

- The ROSE (Risk Stratification of Syncope in the ED) Study (Reed, et al, JACC 2010)
  - **BRACES**
    - Sensitivity only 87%

Shen W-K, et al.
2017 ACC/AHA/HRS Syncope Guideline

Circulation 2017

2017 ACC/AHA/HRS Guideline for the Evaluation and Management of Patients With Syncope

A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines, and the Heart Rhythm Society

Developed in Collaboration With the American College of Emergency Physicians and Society for Academic Emergency Medicine

Endorsed by the Pediatric and Congenital Electrophysiology Society

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Syncope

Shen, et al. Circulation

- Evaluation
  - Do a good hx and PE (Level I)

Syncope

Shen, et al. Circulation

- Evaluation
  - Do a good hx and PE (Level I)
    - They do recommend orthostatics
      - 9% of syncope due to orthostatic hypotension

Syncope

Shen, et al. Circulation

- Evaluation
  - Do a good hx and PE (Level I)
    - They do recommend orthostatics
      - 9% of syncope due to orthostatic hypotension
      - Immediate upon standing and after 3 minutes

Syncope

Shen, et al. Circulation

- Evaluation: historical factors associated short-term (≤ 30 d) risk of adverse outcome

Syncope

Shen, et al. Circulation

- Evaluation: historical factors associated short-term (≤ 30 d) risk of adverse outcome
  - Age > 60 yo
  - Male
  - Known CAD, reduced EF, hx/o arrhythmia
  - Brief or no prodrome
  - Syncope during exertion
  - Syncope while supine
  - Abnl CV exam (e.g. murmur)
  - FHx/o inheritable conditions or early SCD (< 50 yo)
  - Known congenital HD

Syncope

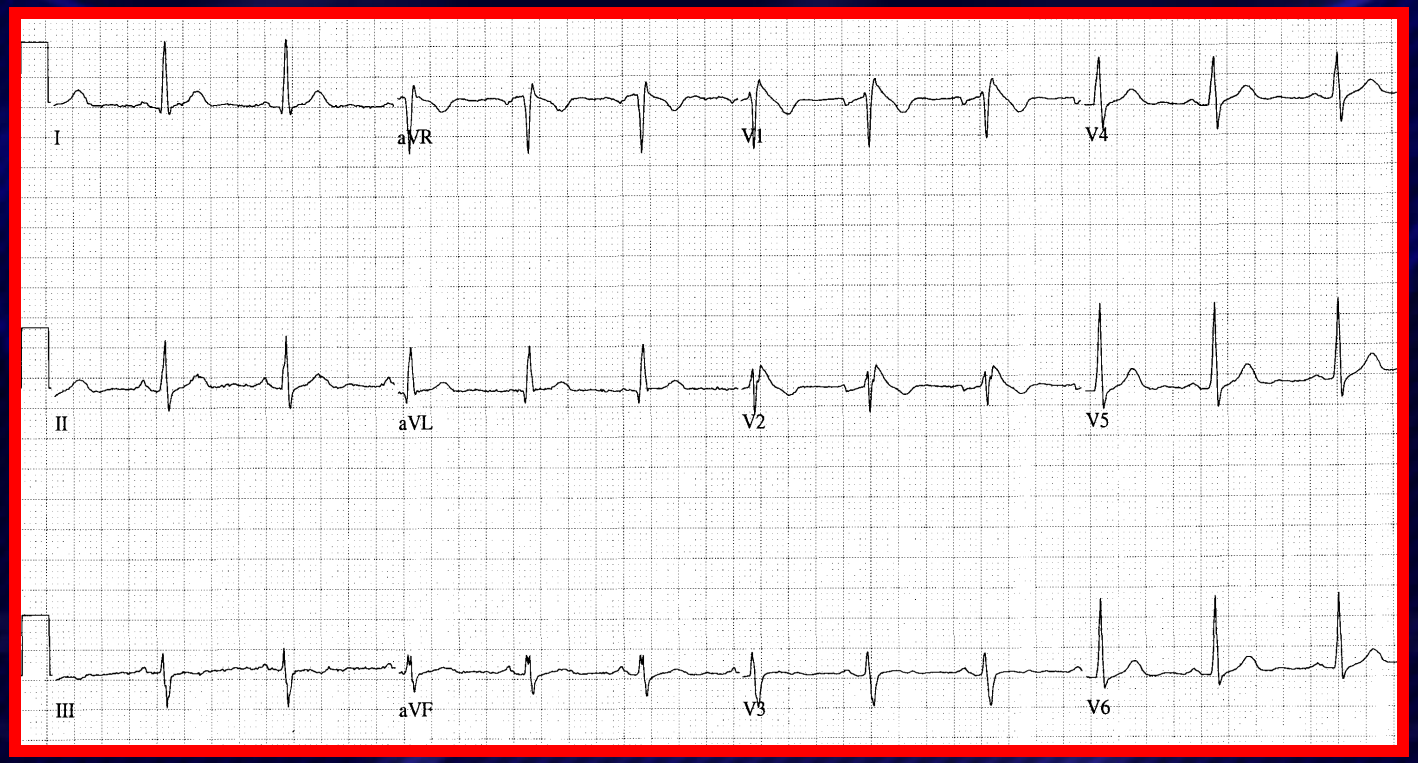
Shen, et al. Circulation

- Evaluation: PE/lab factors associated short-term (≤ 30 d) risk of adverse outcome
  - Evidence of bleeding
  - Persistent abnl VS
  - Abnormal ECG
  - Positive TN
  - [pathologic murmur]

Syncope

Shen, et al. Circulation

- Evaluation: scrutinize the ECG



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- Management
  - Treat any underlying condition
  - Dispo: admit vs. observe vs. discharge?

Syncope

Shen, et al. Circulation

- Management
  - Treat any underlying condition
  - Dispo: admit vs. observe vs. discharge?
    - No clear recommendation
    - Based on estimated risk of early adverse outcome
    - Can we predict this???

CMAJ 2016 RESEARCH

Development of the Canadian Syncope Risk Score to predict serious adverse events after emergency department assessment of syncope

Venkatesh Thiruganasambandamoorthy MBBS MSc, Kenneth Kwong MSc, George A. Wells PhD, Marco L.A. Sivilotti MD MSc, Muhammad Mukarram MBBS MPH, Brian H. Rowe MD MSc, Eddy Lang MD, Jeffrey J. Perry MD MSc, Robert Sheldon MD PhD, Ian G. Stiell MD MSc, Monica Taljaard PhD

JAMA Internal Medicine | Original Investigation 2020

Multicenter Emergency Department Validation of the Canadian Syncope Risk Score

Venkatesh Thiruganasambandamoorthy, MBBS, MSc; Marco L. A. Sivilotti, MD, MSc; Natalie Le Sage, MD, PhD; Justin W. Yan, MD, MSc; Paul Huang, MD; Mona Hegdekar, MD; Eric Mercier, MD, MSc; Muhammad Mukarram, MBBS, MPH; Marie-Joe Nemnom, MSc; Andrew D. McRae, MD, PhD; Brian H. Rowe, MD, MSc; Ian G. Stiell, MD, MSc; George A. Wells, PhD; Andrew D. Krahn, MD; Monica Taljaard, PhD

CSRS

EMA Emergency Medicine Australasia

Emergency Medicine Australasia (2020)

doi: 10.1111/1742-6723.13641

2020

ORIGINAL RESEARCH

External validation of the Canadian Syncope Risk Score for patients presenting with undifferentiated syncope to the emergency department

Jason CHAN [1,2] Emma BALLARD,[3] David BRAIN,[4] Julia HOCKING,[5] Alan YAN,[1,2] Douglas MOREL[1,2,4] and Jonathan HUNTER [1,2]

[1]Emergency Department, Redcliffe Hospital, Brisbane, Queensland, Australia, [2]Faculty of Medicine, The University of Queensland, Brisbane, Queensland, Australia, [3]Statistics Unit, QIMR Berghofer Medical Research Institute, Brisbane, Queensland, Australia, [4]Queensland University of Technology, Brisbane, Queensland, Australia, and [5]Griffith University, Brisbane, Queensland, Australia

CSRS

- Predictor of 30-day rate of SAOs after syncope
  - 8 items, each get points (or negative points)
  - Total score -3 to +11

Formula

Addition of the selected points:

Category		Points
Clinical evaluation		
Predisposition to vasovagal symptoms*		-1
History of heart disease		1
Any systolic pressure reading <90 or >180 mmHg		2
Investigations		
Elevated troponin level (>99th percentile of normal population)		2
Abnormal QRS axis (<-30° or >100°)		1
QRS duration >130 ms		1
Corrected QT interval >480 ms		2
Diagnosis in emergency department		
ED diagnosis (based on ED evaluation)	Vasovagal syncope	-2
	Cardiac syncope	2
	Neither	0

*Triggered by being in a warm crowded place, prolonged standing, fear, emotion or pain.

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Facts & Figures

Interpretation:

Score	Estimated risk of serious adverse event**	Risk category
-3	0.4%	Very low
-2	0.7%	
-1	1.2%	Low
0	1.9%	
1	3.1%	Medium
2	5.1%	
3	8.1%	
4	12.9%	High
5	19.7%	
6	28.9%	Very high
7	40.3%	
8	52.8%	
9	65.0%	
10	75.5%	
11	83.6%	

**Death, arrhythmia, myocardial infarction, serious structural heart disease, aortic dissection, pulmonary embolism, severe pulmonary hypertension, severe hemorrhage, subarachnoid hemorrhage, or any other serious condition causing syncope and procedural interventions for the treatment of syncope.

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8	52.8%	
9	65.0%	Very high
10	75.5%	
11	83.6%	

< 1 point: Consider d/c

≥ 1 point: Undergo further investigation

**Death, arrhythmia, myocardial infarction, serious structural heart disease, aortic dissection, pulmonary embolism, severe pulmonary hypertension, severe hemorrhage, subarachnoid hemorrhage, or any other serious condition causing syncope and procedural interventions for the treatment of syncope.

Syncope

General problems with decision rules for syncope

- Most don't evaluate short-term risk (what we are concerned about in EM!)
- Very broad

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Syncope

General problems with decision rules for syncope

- Most don't evaluate short-term risk (what we are concerned about in EM!)
- Very broad
- They don't increase the sensitivity of experienced clinicians at predicting SAOs
  - Most useful for those in training?
- Specificity is only slightly better than clinicians
- Perhaps best used to support your decision to admit or discharge (but not to overturn!)

Summary

- Emergency Department evaluation is key
- Good history and PE will determine need for further workup and help to risk stratify for inpatient vs. outpatient workup
- Canadian Syncope Risk Score is the best tool

Thanks

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