Approach to Syncope in the ED

Vukiet Tran, CCFP(EM), FCFP, MHSc, MBA

Staff, Emergency Physician University Health Network

- ✤ 75 yo female presents with syncope
 - Multiple previous episodes
 - PMH: CAD, CABG, DM
 - Physical exam normal
 - ECG: LBBB
 - She is well in your ED
- What will be management?

- ✤ 35 yo male was at the Maple Leafs game.
- ✤ He suddenly passed out.
- He regained consciousness almost immediately
- No post-syncopal symptoms
- * No seizure-like activity noted.
- No PMH, FHX, Meds.
- Denies drugs and alcohol
- Wants to know what happened to him



- ✤ Young female of 28 yo.
- ✤ Felt weak in the subway station.
- Then passed out as she tried to get up from her seat
- Now in your RAZ
- What work-up would you like?

Objectives

By the end of this session, you will be able to...

- 1) Understand the importance of clinical assessment in the evaluation of syncope
- 2) Appreciate the importance of cardiac etiologies
- 3) Focus your approach to the diagnosis of syncope
- 4) Make decisions on management (disposition) based on prognosis

Definition

- Greek origin "synkoptein" meaning "to cut short", pause
- Sudden transient loss of consciousness with concurrent diminution in postural tone followed by <u>spontaneous recovery, and</u> <u>absence of neurological sequelae</u>.

vs pre-syncope (near-syncope)

What is not Syncope!!!

- * TIA
- Stroke (ischemic or hemorrhagic)
- * Hypoglycemia

Syncope and...

Syncope	Symptom	Conditions
Syncope	Chest pain	Aortic dissection Ruptured AAA STEMI Acute PE
Syncope	Headache	SAH Intra-parenchymal hemorrhage
Syncope	Shortness of breath	Pneumothorax PE
Syncope	Abdo pain	Ruptured AAA Ruptured viscous
Syncope	Bleeding	UGIB LGIB
Syncope	Rash	Anaphylaxis Sepsis

Syncope mimics

- Seizures
- Drop-attacks
- Conversion syndromes
- Psychogenic syncope
- * Malingering

Sudden cardiac death

Syncope/Presyncope

- Chest pain (exertional)
- Dyspnea (exertional)
- Heart murmur
- ✤ Family history

My Definition of Syncope

A *given opportunity* to diagnose a potentially fatal disease and prevent *sure death* in a patient who is currently feeling well and *unaware of his fate*.

Epidemiology

- ✤ 1-6% of hospital admissions
- ✤ Diagnosis in only up to 70-80%
- No cause on initial evaluation 34%
- Most causes are benign
- Mortality low
 - Cardiac origin: 18-33%

Europace (2009) 11, 937-943

Incidence

- * 6.2/1000 person-years
- ✤ Bimodal distribution (10-30yo and > 65yo)
- ✤ Rates increase with age (sharp rise at 70 yo)
- Lifetime cumulative incidence (subjects > 65yo): 35-39%
- ✤ 80% have their first episode before age of 30y
- ✤ 10-year incidence:
 - 11% for pt 70-79%
 - 17-19% for pt > 80%

Am J Emerg 2009; 27: 271-279 NEJM 2002; 347: 878-885

Incidence



NEJM 2002; 347: 878-885

Mortality according to etiology



In General Practice

- Prevalence is 2-9 per 1000 encounters
- Peak ages
 - 10-30yo (women)
 - Age > 65 (both men and women)
- Only a subgroup presents to a medical doctor
 - 44% did not seek medical advice
 - Event rate is 2⁴ tfmes Migher⁷ if the general population than the presentation rate

In General Practice

- ✤ 9.3 visits at the GP per 1000 person-years
- 0.7 visits at the ED per 1000 person years
- * More frequent in women
- * Young men tend not to visit their GP
 - Trend disappear with higher age
- Elderly tend to visit their GP in relation to the younger patient (22 vs 2 visits/1000pt-years)

Am J Emerg Med 2009. 27; 271-279

13.3 times more

Etiologies

*	Vasovagal		20%
*	Cardiac		13%
*	 Orthostatic hypotension 		9%
*	Medications		7%
*	Stroke		4%
*	TIA		4%
*	Other		10%
*	Unknown	NEJM 2002; 347: 878-885	31%

My classification

Non-fatal	Fatal
Vasovagal	Cardiac arrhythmias (and medications)
Orthostatic hypotension (and medications)	Hemorrhage
Psychogenic	Sepsis/shock

Syncope is a symptom, not a disease

- Multiple causes
- Sporadic
- ✤ Causes range from benign to lethal
- ✤ Occur in the young and old

"Low-risk, high stake" Who is at high risk of death?

- Asymptomatic when they arrive to your ED
- 18% of patient have multiple etiologies
- No uniform strategy for evaluation
 - Extensive broad-based evaluations are performed and hospital admissions are frequent
- Failure to diagnose an arrhythmic cause can be fatal
- Difficulty in ascertaining which patient are at risk for an adverse event

Europace 2010: 12; 230-239 Mayo Clin Proc. 2003; 78(4): 414-420

- Difficulty establishing the diagnosis in the ED and concerns about arrhythmias have led to liberal policy towards hospital admission.
- Not known if these policies affects patient outcome
- No controlled trials studying outpatient vs inpatient work-up

Circulation. 2002; 106: 1606-1609

- In-patient evaluation can be
 - Expensive (\$2 billion annually)
 - Unfocused (4.6+/- 2.6 tests required, range 0-16)
 - Unrevealing and non-productive (16% have specific tests performed beyond monitoring)

Europace 2010: 12; 230-239

ACEP recommendation

TABLE 6. Recommendations of the American College of Emergency Physicians for Hospitalization of Patients With Syncope

Older age and associated comorbidities^a Abnormal electrocardiographic findings^b Hematocrit <30 (if obtained) History or presence of heart failure, coronary artery disease, or structural heart disease

A Emerg Med. 2007; 49(4): 431-444nn

Responsibility of the physician

Crucial	Secondary
 Define the apparent prognosis Identifying patients with life-threatening processes 	Identifying patients with non life-threatening processes that will benefit from intervention
*Determine which patient require further evaluation	
Which patient can be safely discharged for outpatient work-up	

Core work-up

History Physical exam ECG

First step

- History, physical exam, and ECG form the cornerstone of initial evaluation
- ✤ Diagnostic yield of 45-50%

Ann Int Med 1997; 126: 989-996

History

- * Did the patient have syncope?
 - Dizziness/vertigo?
 - Drop attack? (no LOC)
 - Seizure activity
 - Falls
- * Sequence of events:
 - Context
 - Prodrome (and duration of prodrome)
 - During the event
 - After the event
- Neurologic symptoms

History

- Plays a key role in the initial evaluation of syncope
 - Prodromal symptoms
 - Family history
 - Triggers and context
 - Medications

Europace (2009) 11, 937-943

History

- 20 symptoms were assessed
- Outcomes: recurrence of syncope or death
- Symptoms alone do not stratify risk in the unexplained syncope
- ✤ Factors that risk stratify:
 - Age
 - Previous syncopal episodes
 - Psychiatric history
 - Baseline heart disease
 - Abnormal ECG

Ann Intern Med. 1997; 126: 989-996

Historical independent predictors of an abnormal EPS

* Age

- ✤ LVEF < 0.40 (CHF)</p>
- Structural heart disease

Ann Noninvasive Electrocardiol 2009; 14(2): 119-127

Final word on History

Repeated findings of bad outcomes

Age over 65 Congestive heart failure Existing heart disease Family history of SCD Abnormal ECG

High risk features

- History of structural heart disease
- * Family history of SCD
- Absence of prodrome
- * Palpitations and chest pain
- Exertional syncope
- No recollection of falling
- Atient "white" vs "blue"

ECG

- Low diagnostic yield: 5%
- A normal ECG is highly predictive of benignity
 - In the absence of an abnormal ECG, further cardiovascular testing has little yield
- ECG are non-invasive, easy to perform, and inexpensive
- Abnormal ECG in 82% of patients who died in follow-up

Ann Intern Med, June 15 1997; 126 (12): 989-996 Am J Med 2001. 111: 177-84

ECC as an indamandant pradiator

Table 5. Independent Predictors of Abnormal EPS, after Logistic Regression

	OR	CI	P Value
ECG + Holter+	35.94	10.14–127.36	<0.001
ECG + Holter-	17.83	4.82–65.87	<0.001
ECG - Holter+	3.45	0.92–12.88	0.064
ECG - Holter-	0.07	0.02–0.23	<0.001
Age	1.02	1.007–1.033	0.002
LVEF	0.97	0.95–0.99	0.013
OHD	3.13	1.52–6.46	0.002

Ann Noninvasive Electrocardiol 2009; 14(2):119-127
Things to look for on ECG

- Arrhythmias/blocks
- Ischemias
- ✤ PE
- Short PR/LGL/WPW
- Long QT Syndrome
- Short QT Syndrome
- * ARVD
- Brugada Syndrome
- * HCOM
- Pulmonary hypertension

History and ECG

 ECG in addition to history and physical exam yielded a diagnosis in 76% of cases

Am J Med 2001; 111: 177-184

Basic laboratory testing

* RBW

- Diagnostic yield: 2-3%
- usually confirms a clinical suspicion
- not recommended, should be guided by clinical evaluation
- Pregnancy test is recommended in all women of child-bearing age

Ann Intern Med, June 15 1997; 126 (12):989-996

Not so useful labs

- * D-Dimer (Euro J Emerg Med 2009. 16: 256-260)
- Myoglobine and CK (Euro J Emerg Med 2009. 16: 84-86)

Cardiac testing

✤ Diagnostic yield 5-35%

- Echocardiography
- Stress testing
- Holter
- Loop recorder
- EPS

Ann Intern Med, June 15 1997; 126 (12): 989-996

Echocardiography

- ✤ Low yield 5-7%
- Routine Echo did not establish the cause of the syncope
- Normal Echo for ALL patients without a cardiac history and normal ECG
- Important if presence of structural heart disease or abnormal ECG
- No cost-effectiveness studies
 - But cost 7 times more than an ECG Ann Intern Med July 1 1997; 127 (1): 76-86 Heart 2002; 88: 363-367

Exercise stress testing

- * Low yield: < 1%
- Indicated in:
 - Ischemic heart disease
 - Exertional syncope*

Ann Inter Med July 1 1997; 127 (1): 76-86

24 Holter

- Yield of 19%
 - 4% correlation of symptoms with arrhythmia
 - 15% have symptoms without arrhythmia
 - 14% have asymptomatic arrhythmia
- Causal relation between most of these arrhythmias and syncope is uncertain
- A negative holter does not r/o arrhythmogenic etiology

External Loop recorder

Yield	24-47%		
	(highest in patients with palpitations)		
Indications	1) Frequent episodes with normal heart		
	2) Recurrent events		

Continuous Outpatient Mobile Telemetry (COMT)

- Only prospective study to date
- ✤ 17 centers
- Indications
 - Presyncope
 - Syncope
 - Severe palpitations
- ✤ End-point
 - Confirmation or exclusion of an arrhythmia as the cause

Number	266
МСОТ	89% diagnostic
Loop	69% diagnostic

J Cardiovasc Electrophysiol, vol 18, March 2007; 241-247

Implantable Loop Recorder

- & Used as an initial strategy (ILR-based strategy)
 - Correlation between syncope and ECG findings in 34% (54% were bradycardia and asystole)
 - In the unexplained syncope, ILR diagnosed an additional 52% (vs 20% by conventional strategy)
 - Overall, yield was 55% vs 19% by conventional strategy

Circulation. 2001. 104(1): 46-51



JACC 2012, 59; 1583-1591

Electrophysiology Study

Goals	VT, VF, SVT
Risks	PE Cardiac perforation MI
Drawbacks	A negative study does not exclude arrhythmogenic cause <i>Insensitive to detect</i> <i>bradyarrhythmias</i>
Overall	Invasive Expensive

Tilt Table Test

Indications:

- 1) Unremarkable history and physical, normal ECG, no structural heart disease
- 2) Non-diagnostic loop recorder Holter
- 3) Recurrent syncope of unexplained origin
- 4) Differentiate seizure from convulsive syncope





Tilt Table Test

- Yield 60%
- Sensitivity 63-83%
- Specificity 90% (0-100%)
- More false-positives in the young

Positive test does not exclude cardiac cause

Neurological testing

- ✤ Low yield 2-6%
- Useful if patients have neurological symptoms/signs or carotid bruits
 - Seizures
 - Focal neurological signs

Neurological testing

EEG	Studies showed little use in the unselected patient with syncope Not recommended as routine workup
CT and MRI	Yield of 4% No use if no neuro symptoms
Carotid doppler	Usefulness is unknown
Transcranial doppler	Usefulness in drop attack is unknown

Coloured-glasses

Cardiology	Echo, Holter, EPS, stress test	83%	
Internal medicine	Abdo ultrasound, CT/MRI, miscellaneous	69.5%	re
Neurology	EEG, CT/MRI, Tilt test	54.5%	

Europace (2003) 5, 283-291 European Heart J 2002 (23); 815-820

Risk stratification based on prognostic factors

Risk stratification 1

TABLE 3. Predictors of Cardiac Arrhythmias in Patients with Unexplained Syncope

	Univariate Analysis		Multivariate Analysis			
Variables	OR	95% CI	р	OR	95% CI	р
Abnormal ECG	11.6	4.6-29.5	< 0.001	8.1	3.0-22.7	< 0.001
Age ≥65 years	13.4	3.0-58.5	< 0.001	5.4	1.1-26.0	0.03
History of congestive heart failure	8.6	3.5-21.1	< 0.001	5.3	1.9-15.0	0.002
History of myocardial infarction	4.3	1.7-10.9	0.003			
History of cardiac disease (any type)	4.3	1.8-10.1	0.001			

Overall arrhythmogenic syncope 17-18%

Acad Emerg Med; Dec 2003; 10, 12: 1312-1317

San Francisco Syncope Rule

Figure.

Decision tree to derive the San Francisco Syncope Rule.



7-days outcome study

- Sensitivity 96.2%
- Specificity 62%
- * NPV 99.2%
- * PPV 24.8%
- Decrease admission
 rate by 10%

San Francisco – Validation

Internal

30-days outcome study

- Sensitivity 98%
- Specificity 56%
- Potentially decreasing admission by 7%
- "should use as a risk stratification...as opposed to traditional rules used to replace judgment"

External

7-days outcome study

- Sensitivity 89%
- Specificity 69%

Ann Emer Med. 2006: 47: 448-454 Ann Emer Med. 2007; 49: 420-427

San Francisco – Elderly patients

Application of the rule for pts > 65yo 7-days outcome study

- Sensitivity 76.5%
- Specificity 36.8%
- ✤ NPV 87%
- ✤ PPV 22.1%

Am J Emerg Med (2008) 26: 773-778

San Francisco vs clinical judgment

Clinical judgment

Sensitivity 94% Specificity 54% ROC (AUC) 0.83

San Francisco

Sensitivity 96% Specificity 62% ROC (AUC) 0.92

Am J Emerg Med (2005) 23, 782-786

Rule out vasovagal – Calgary Syncope

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Table 5 Diagnostic questions to determine whether syncope is due to vasovagal syncope or to another cause of syncope

Question	Points (if yes)
Is there a history of at least one of bifascicular block, asystole, supraventricular tachycardia, diabetes?	-5
At times have bystanders noted you to be blue during your faint?	-4
Did your syncope start when you were 35 years of age or older?	-3
Do you remember anything about being unconscious?	-2
Do you have lightheaded spells or faint with prolonged sitting or standing?	1
Do you sweat or feel warm before a faint?	2
Do you have lightheaded spells or faint with pain or in medical settings?	3

EHJ 2006, 27; 344-350

The patient has vasovagal syncope if the point score is ≥ -2 .

Calgary score

	Sheldon et al EHJ 2006	Romme et al EHJ 2009	Guzman et al Europace 2013
Population	Syncope with no structural disease	Consecutive transient LOC	Referred for tilt testing
Sample	418	380	180
Characteristic			Age 73.4+/-7.8
Sensitivity	89%	87%	51%
Specificity	91%	32%	73%

Calgary experience

- Mainly used to r/o Vasovagal syncope
- Not as useful for elderly and those with diabetes

OESIL risk score

Independent Predictors	Risk ratio
Age > 65	1.42
CVD on history	1.34
Abnormal ECG	1.29
Syncope without prodrome	1.13

European Heart Journal 2003; 24: 811-819

OESIL risk score

Derivation cohort Z Validation cohort



Fig. 2 Rates of 12-month all-cause mortality according to the OESIL score in the derivation and validation cohorts.



Fig. 4 Kaplan-Meier survival curves according to the score at presentation in patients included in the derivation cohort.

OESIL score > 1 is predictive of mortality

Prognosis

- Risk of death increased by 30% among all patients with syncope
- Risk doubles with cardiac syncope
- Vasovagal syncope is not associated with increased risk of major outcomes



Cardiac syncope: mortality rate > 10% at 6 months

Management should be...

Based on risk and prognosis

and not on diagnosis (if diagnosis is not possible and often difficult to make)

Summary of risk stratification

Sarasin et al.	San Francisco	OESIL	Miscellaneous
*Abnormal ECG *Age > 65 *Hx of CHF	*Abnormal ECG *SOB *SBP < 90 *Hct < 30% *CHF	 Abnormal ECG Age > 65 Cardiovascular disease on Hx Syncope without prodrome 	 Exertional syncope Family history of premature sudden death Drugs that prolong QT

Cases Revisited

Case 1

- ✤ 75 yo female presents with syncope
 - Multiple previous episodes
 - PMH: CAD, CABG, DM
 - Physical exam normal
 - ECG: LBBB

What will be your management?

Case 1

- Loop recorder placed for 1 month, but was asymptomatic
- ✤ Had EPS, normal
- Loop event monitoring again which showed complete AV dissociation
- A Pacemaker placement
 A
- No syncope after 2-year f/u


- Referred to cardiology and admission to CCU.
- A procainamide challenge test was done during EPS.
- Internal defibrillator inserted.

- ✤ Young female of 28 yo.
- ✤ Felt weak in the subway station.
- Then passed out as she tried to get up from her seat.
- * What work-up would you like?

- ✤ B-HCG was positive.
- Pelvic ultrasound showed rupture left ectopic pregnancy with free fluid in the pelvis.
- Transferred care to Gynecology

Summary

- History, physical examination, and ECG form the cornerstone of the syncope work-up
- Patients whom heart disease is known or those with exertional syncope should get cardiac testing

Summary

- EPS in patients with organic heart disease
- Holter for patients with heart disease
- Loop monitoring in patients with frequent events and normal hearts
- Tilt table in patients with infrequent or neurocardiogenic events

Take Homes

- Careful (and painful) history give you the diagnosis in almost all cases
- Diagnose benign causes
- * **IDENTIFY** high risk criteria
- Use clinical decision rules if initial risk is unclear (but know their limitations)
- Do an ECG on all patients
- High risk patients should receive cardiac consultation

Questions?



Vukiet.tran@rogers.com