

Syncope

Risk Stratification at ED

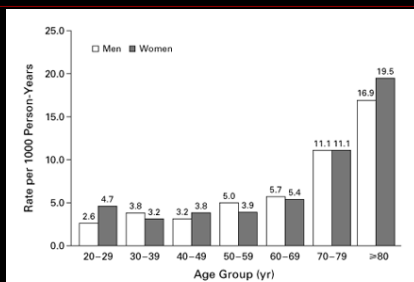
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990614

0845-0900 June 12, 2010

Overview

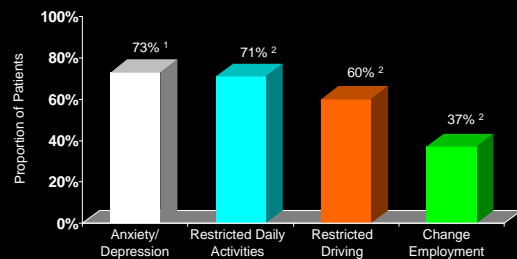
- Clinical Significance
- Etiology
- Evaluation
- Risk Stratification

Frequency



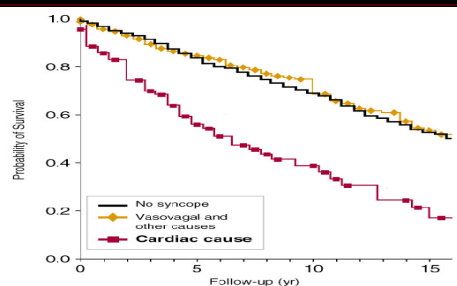
N Engl J Med. 2002;347(12):878-885

Impact of Syncope



¹Linzer, J Clin Epidemiol. 1991.
²Linzer, J Gen Int Med. 1994.

Mortality



¹ Day SC, et al. Am J of Med 1982;73:15-23.

² Kapoor W. Medicine 1990;69:160-175.

³ Silverstein M, Sager D, Mulvey A. JAMA. 1982;248:1185-1189. ⁴ Martin G, Adams S, Martin H. Ann Emerg Med. 1984;13:499-504.

Causes

Cause	Prevalence (Mean) %	Prevalence (Range) %
Reflex-mediated:		
■ Vasovagal	18	8-37
■ Situational	5	1-8
Carotid Sinus	1	0-4
Orthostatic hypotension	8	4-10
Medications	3	1-7
Psychiatric	2	1-7
Neurological	10	3-32
Organic Heart Disease	4	1-8
Cardiac Arrhythmias	14	4-38
Unknown	34	13-41

¹Kapoor W, in Grubb B, Olinovsky B (eds) Syncope: Mechanisms and Management. Armonk NY: Futura Publishing Co, Inc. 1988; 1-13.

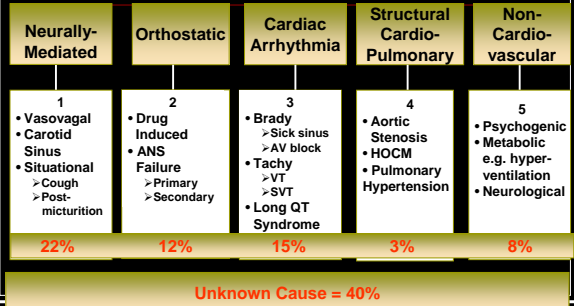
Causes based on Underlying Cardiovascular Status

CAUSE	CARDIOVASCULAR DISEASE ABSENT (N=599)		CARDIOVASCULAR DISEASE PRESENT (N=223)		TOTAL SAMPLE (N=822)
	MEN (N=232)	WOMEN (N=367)	MEN (N=116)	WOMEN (N=107)	
	percent of subjects				
Cardiac	6.5	3.8	26.7	16.8	9.5
Unknown*	31.0	41.7	31.0	37.4	36.6
Stroke or transient ischemic attack	1.7	2.5	9.5	9.4	4.1
Seizure	7.3	3.3	6.9	2.8	4.9
Vasovagal	24.1	24.5	11.2	14.0	21.2
Orthostatic	9.5	10.9	6.9	6.5	9.4
Medication	7.3	6.5	4.3	9.4	6.8
Other†	13.0	6.8	3.5	3.7	7.5

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Etiology

Etiology



DG Benditt, UM Cardiac Arrhythmia Center

D/D: Syncope Mimics

Etiology

- Hyperventilation*
- Acute hypoxemia*
- Migraine*
- Somatization disorder (psychogenic syncope)
- Acute Intoxication (e.g., alcohol)
- Seizures
- Hypoglycemia
- Sleep disorders

* may cause 'true' syncope

Differential Diagnosis

Evaluation

- **Primary objectives:**
 - Distinguish 'true syncope' from syncope mimics:
 - Seizures
 - Psychiatric disturbances
- **Secondary objectives:**
 - Assess prognosis
 - Effective prevention

Initial Evaluation

Evaluation

- **Detailed History & Physical Examination**
 - Details of events
 - Assess frequency, severity
 - Careful family history
- **Cardiac Origin?**
 - Physical exam
 - 12-Lead ECG: long QT, WPW, conduction system dz.
 - Echo: LV function, valve status, HOCM
- **Diagnostic Algorithm**

Emergency
physician

Event Details

Evaluation

- **Complete Description**
 - From patient and observers
- **Type of Onset**
- **Duration of Attacks**
- **Posture**
- **Associated Symptoms**
- **Sequelae**

12-Lead ECG

Evaluation

- Normal or Abnormal?
- Low or High Risk?
 - Acute MI
 - Severe Sinus Bradycardia/Pause
 - AV Block / BBB (?)
 - Tachyarrhythmia (SVT, VT)
 - Preexcitation (WPW), Long QT, Brugada
 - LVH (?)

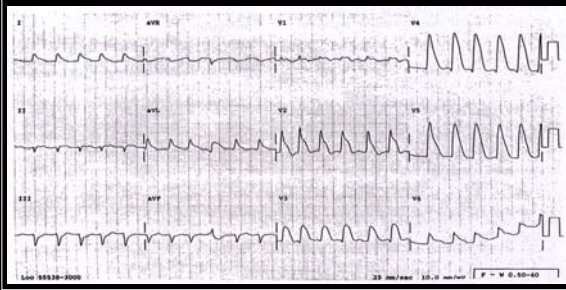
High Risk 12-Lead ECG

Evaluation



High Risk 12-Lead ECG

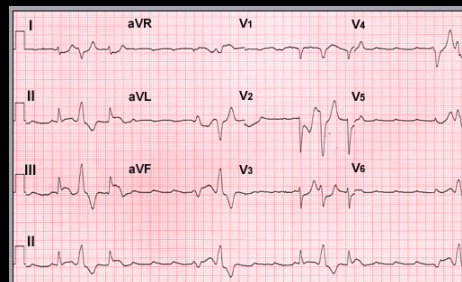
Evaluation



Extensive Antero-lateral MI

High Risk 12-Lead ECG

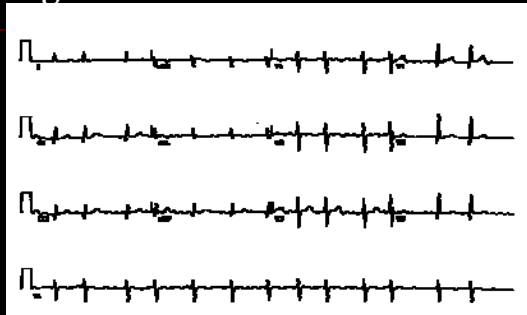
Evaluation



Inferior MI, high grade AV block and PVC

High Risk 12-Lead ECG

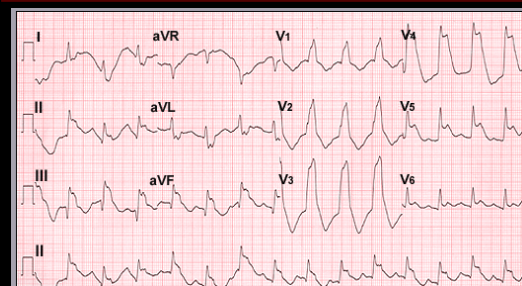
Evaluation



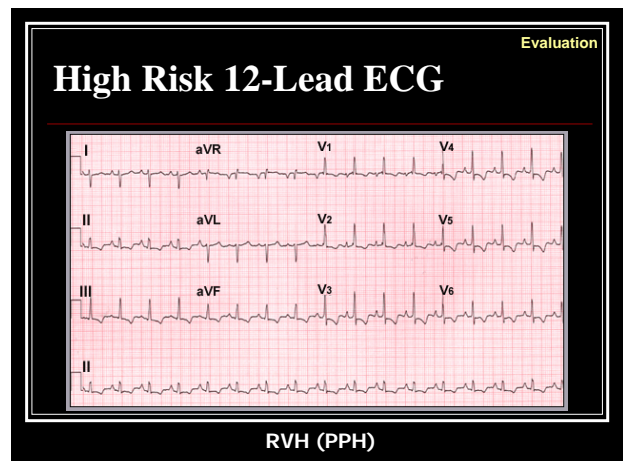
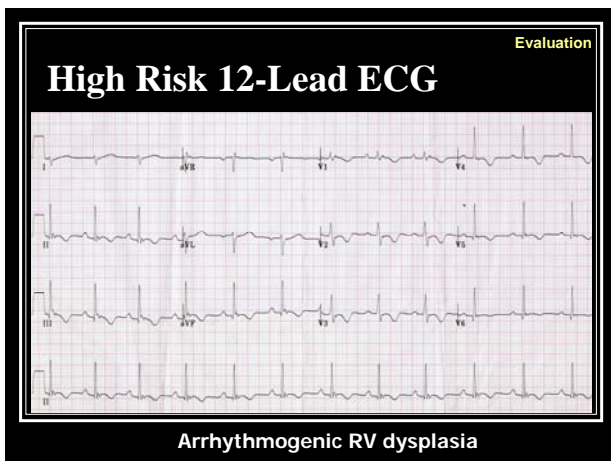
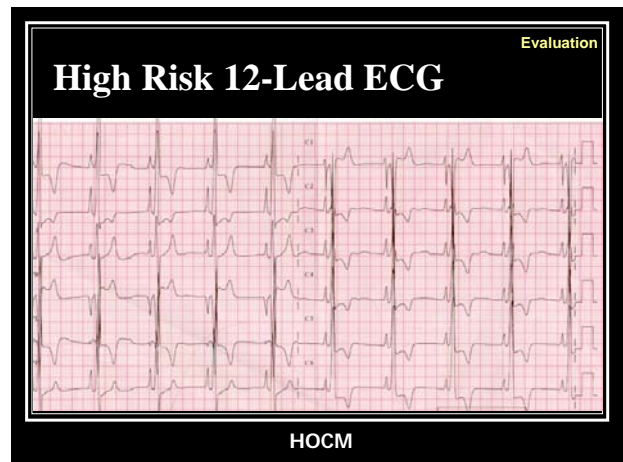
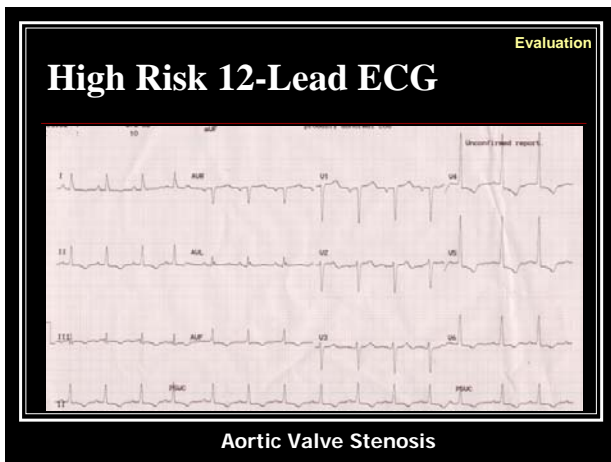
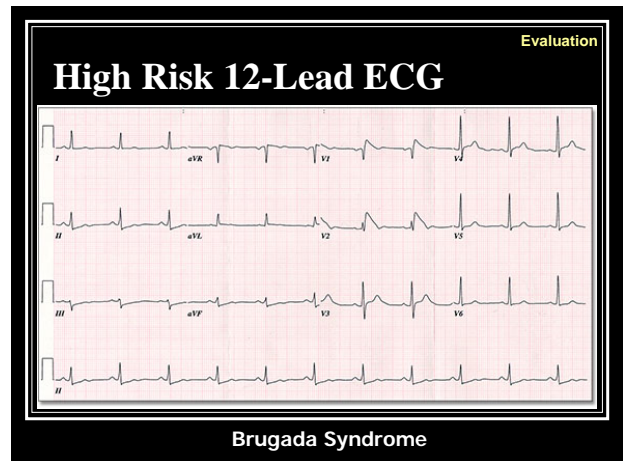
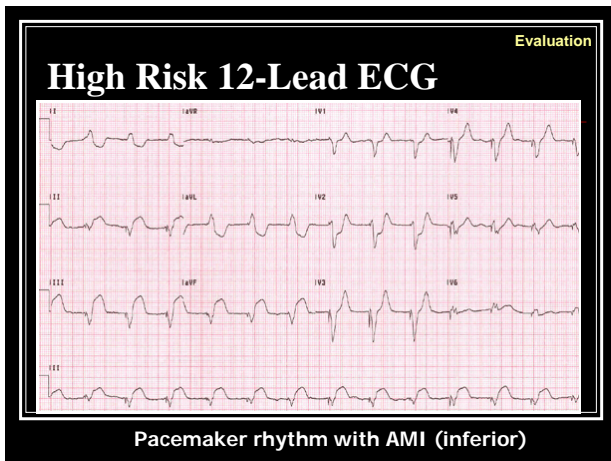
Acute Inferior MI

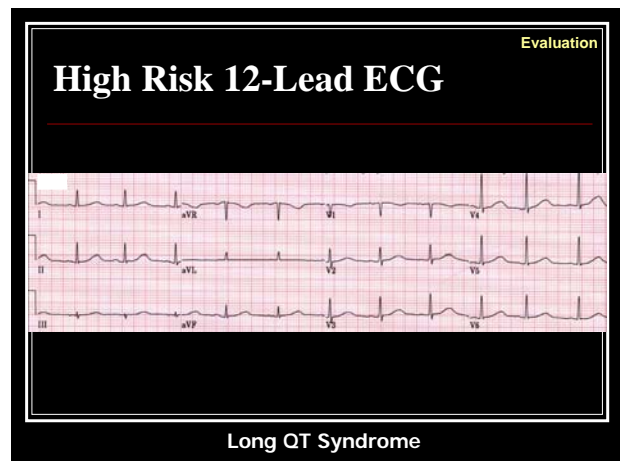
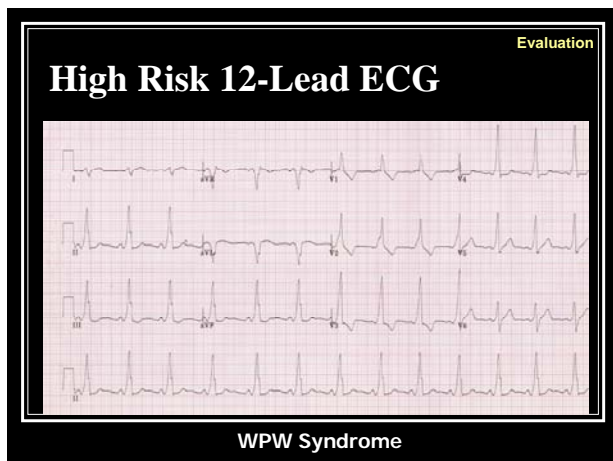
High Risk 12-Lead ECG

Evaluation



AMI (Latero-inferior?) With RBBB





Evaluation

Carotid Sinus Massage

- **Carotid Sinus Syndrome**
 - 3-sec pause and/or 50 mmHg fall in systolic blood pressure with (+) of symptoms
- **Contraindications**
 - carotid bruit / thrills, known significant carotid arterial disease, previous CVA, MI last 3 months
- **Risky and Low Yield**

Evaluation

Further Evaluation

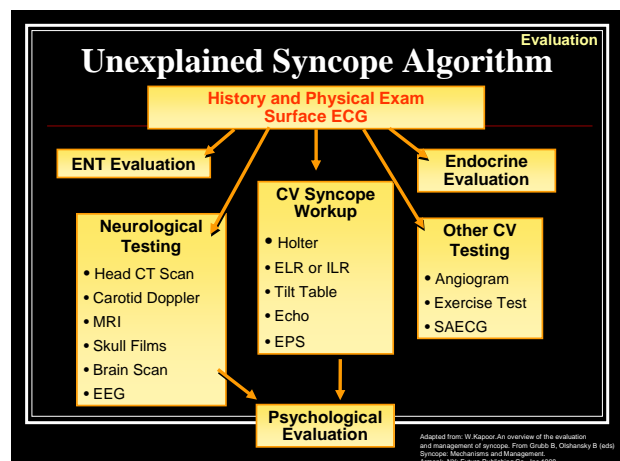
- **Holter / AECG**
- **Insertable loop recorder (ILR)**
- **Tilting-table test**
- **Electrophysiologic study (EPS)**

Cardiologist

Evaluation

Test/Procedure	Yield (based on mean time to diagnosis of 5.1 months ⁷)
History and Physical (including carotid sinus massage)	49-85% ^{1,2}
ECG	2-11% ²
Electrophysiology Study without SHD [*]	11% ³
Electrophysiology Study with SHD	49% ³
Tilt Table Test (without SHD)	11-87% ^{4,5}
Ambulatory ECG Monitors:	
■ Holter	2% ⁷
■ External Loop Recorder (2-3 weeks duration)	20% ⁷
■ Insertable Loop Recorder (up to 14 months duration)	65-88% ^{6,7}
Neurological [†] (Head CT Scan, Carotid Doppler)	0-4% ^{4,5,8,9,10}

¹ Kapoor, et al. *N Engl J Med*. 1983.
² Kapoor, *Am J Med*. 1991.
³ Lander, et al. *Ann Int Med*. 1997.
⁴ Kapoor, *Medicine*. 1990.
⁵ Kapoor, *JAMA*. 1992.
⁶ Kishin, *Circulation*. 1995.
⁷ Kishin, *Cardiology Clinics*. 1997.
⁸ Eagle, et al. *The Yale J Biol and Medicine*. 1983. 58: 1-6.
⁹ Day S, et al. *Am J Med*. 1985. 78: 15-23.
¹⁰ Sutton P, et al. *PACE*. 1999. 22 (part 1): 782.
^{*} Structural Heart Disease
[†] MRI not studied



Cardiac Syncope vs. Sudden Cardiac Death

Risk Stratification

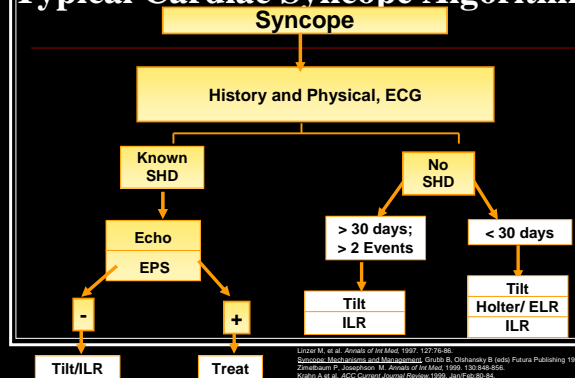
- 80-90% of SCD are due to ventricular arrhythmias.
- 85-90% are due to 1st event, 10-15% due to recurrent events.

Substrate

Cardiac Syncope or Aborted SCD

Typical Cardiac Syncope Algorithm

Risk Stratification



Hazard Ratio for the Outcomes of Interest

Risk Stratification

CAUSE OF SYNCOPES	HAZARD RATIO (95% CONFIDENCE INTERVAL)	
	ADJUSTED FOR AGE AND SEX	MULTIVARIABLE-ADJUSTED*
Any cause		
Death from any cause	1.43 (1.25-1.64)†	1.31 (1.14-1.51)†
Myocardial infarction or death from coronary heart disease	1.47 (1.15-1.88)‡	1.27 (0.99-1.64)
Fatal or nonfatal stroke	1.19 (0.87-1.62)	1.06 (0.77-1.45)
Cardiac		
Death from any cause	2.41 (1.78-3.26)†	2.01 (1.48-2.73)†
Myocardial infarction or death from coronary heart disease	3.56 (2.29-5.55)†	2.66 (1.69-4.19)†
Fatal or nonfatal stroke	2.67 (1.43-4.98)‡	2.01 (1.06-3.80)§
Unknown		
Death from any cause	1.36 (1.13-1.65)†	1.32 (1.09-1.60)†
Myocardial infarction or death from coronary heart disease	1.43 (1.09-2.03)§	1.31 (0.92-1.86)
Fatal or nonfatal stroke	0.72 (0.43-1.22)	0.66 (0.39-1.11)
Neurologic (including seizure)		
Death from any cause	1.98 (1.45-2.72)†	1.54 (1.12-2.12)†
Myocardial infarction or death from coronary heart disease	1.02 (0.48-2.17)	0.79 (0.37-1.69)
Fatal or nonfatal stroke	3.12 (1.82-5.26)†	2.96 (1.69-5.18)†
Vascular or other†		
Death from any cause	1.17 (0.95-1.44)	1.08 (0.88-1.34)
Myocardial infarction or death from coronary heart disease	1.16 (0.80-1.68)	1.03 (0.71-1.49)
Fatal or nonfatal stroke	0.93 (0.57-1.52)	0.87 (0.54-1.42)

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San Francisco Syncope Rule

Risk Stratification

- CHES**
 - Congestive Heart Failure History
 - Hematocrit < 30%
 - ECG abnormality
 - Short of Breath History
 - Systolic BP < 90 mmHg at Triage
- 74-98% sensitivity and 56-62% specificity for serious outcome
 - death, myocardial infarction, arrhythmia, pulmonary embolism, stroke, subarachnoid hemorrhage, significant hemorrhage, or any condition causing a return ED visit and hospitalization for a related event

Risk of SCD in Cardiac Syncope

Risk Stratification

- Individual**
 - Depend upon underlying cardiac conditions
 - E.g.: Aortic stenosis: 3-year survival
- Overall**
 - Depend upon prevalence of individual cardiac syncope **AND**
 - Overall performance of EP / Cardiologist / Others

ELSE Study: Our Series

Risk Stratification

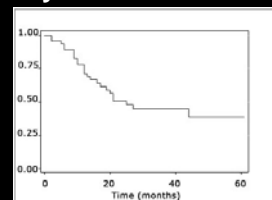
- ED Life-threatening Syncope Evaluation study**
 - 523 cases of true syncope in a 5-year retrospective analysis
 - 70% malignant arrhythmia
 - 10% CHF or LVEF <35%
 - 5% significant structural heart diseases
 - 15% combined
- cumulative incidence = $1 - e^{-1t}$**
- N Engl J Med. 2002;347(12):878-885

ELSE Study

- **ED Life-threatening Syncope Evaluation study**
 - 98% abnormal ECG
 - 56% high-risk ECG
 - Evidence of AMI, structural abnormality or substrate of malignant arrhythmia
 - 38% abnormal echocardiography
 - 15% recurrence

ELSE Study

- Overall 5-year survival: 48%



- Recurrence: 32% 5-year survival

ELSE Study: CLEARS

- **For True Syncope**
 - Conscious change for more than 3 minutes
 - LVEF<35% / CHF
 - ECG suggesting cardiac arrhythmia or structural abnormality
 - Adam-Stokes attack
 - Recurrence within 6 hours
 - Shock (Hypotension without Orthostatic Changes)
 - Any one suggests admission; two or more (except recurrence within 6h) suggest significant mortality

