

Syncope: Distinguishing the Vanilla Faint From a Sudden Cardiac Death Warning Sign

John Rogers, MD, FACC

Director, Cardiac Pacing and Tachyarrhythmia Device
Therapy

Scripps Clinic

April 4, 2012

SYNCOPE

- ❖ A Transient Loss of Consciousness
- ❖ The primary purpose of the evaluation of the patient with syncope is to determine whether the patient is at increased risk for death.
- ❖ If these diagnoses can be excluded, the goal then becomes identification of the cause of syncope in an attempt to improve the quality of the patient's life and to prevent injury to the patient or others.

Prevalence and Impact

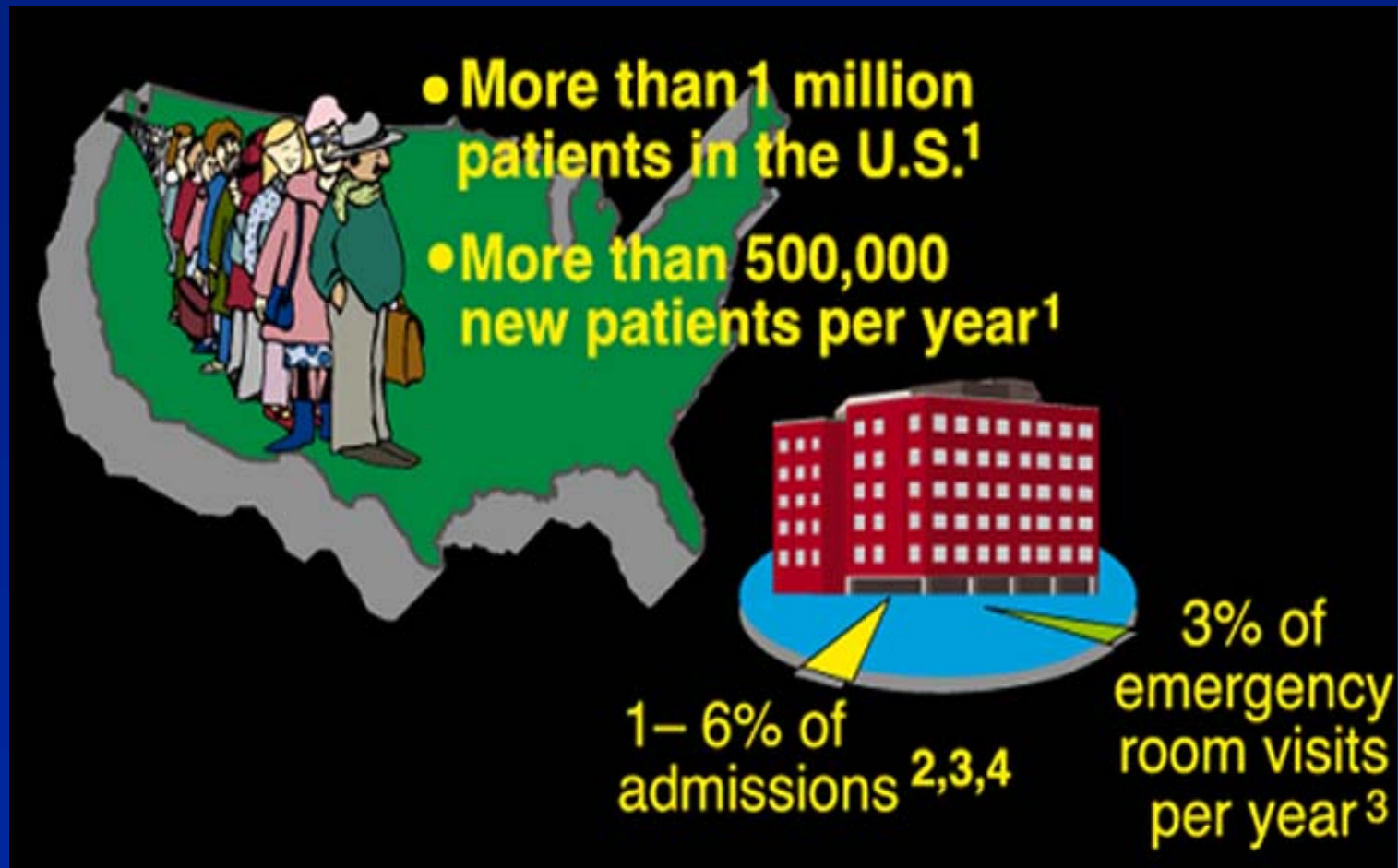


The Significance of Syncope

The only difference between
syncope and sudden death
is that in one you wake up.¹

¹ Engel GL. Psychologic stress, vasodepressor syncope, and sudden death. *Ann Intern Med* 1978; 89: 403-412.

The Significance of Syncope



¹ National Disease and Therapeutic Index on Syncope and Collapse, ICD-9-CM 780.2, IMS America, 1997

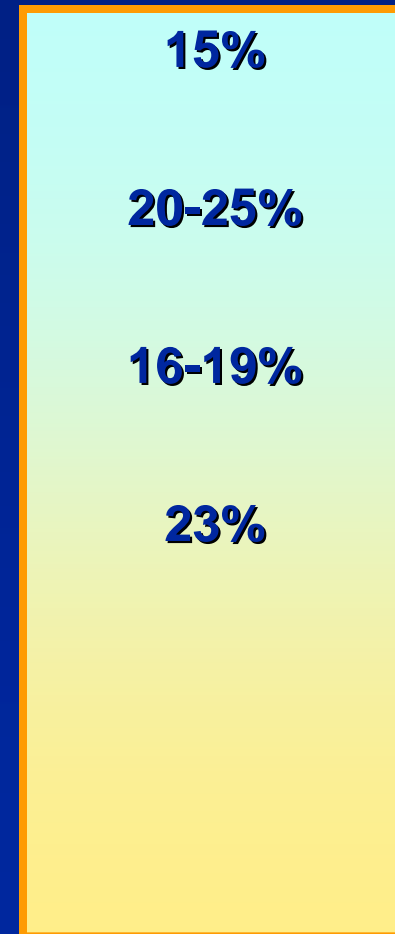
² Blanc J-J, L'her C, Touiza A, et al. Eur Heart J, 2002; 23: 815-820.

³ Day SC, et al, AM J of Med 1982

⁴ Kapoor W. Evaluation and outcome of patients with syncope. Medicine 1990;69:160-175

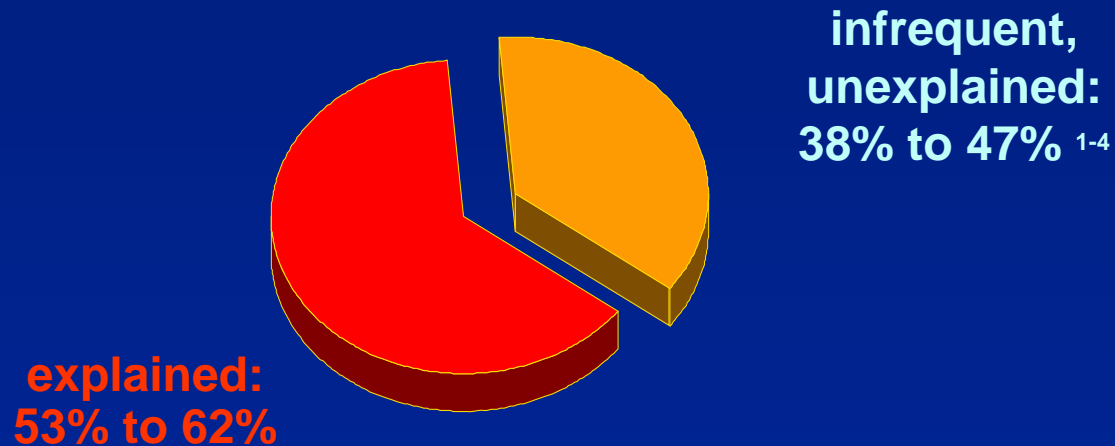
Syncope Reported Frequency

- ❖ Individuals <18 yrs
- ❖ Individuals 17- 46 yrs
- ❖ Individuals 40-59 yrs*
- ❖ Individuals >70 yrs*



*during a 10-year period

The Significance of Syncope



- ❖ 500,000 new syncope patients each year ⁵
- ❖ 170,000 have recurrent syncope ⁶
- ❖ 70,000 have recurrent, infrequent, unexplained syncope ¹⁻⁴

¹ Kapoor W, *Med.* 1990;69:160-175.

² Silverstein M, et al. *JAMA.* 1982;248:1185-1189.

³ Martin G, et al. *Ann Emerg. Med.* 1984;12:499-504.

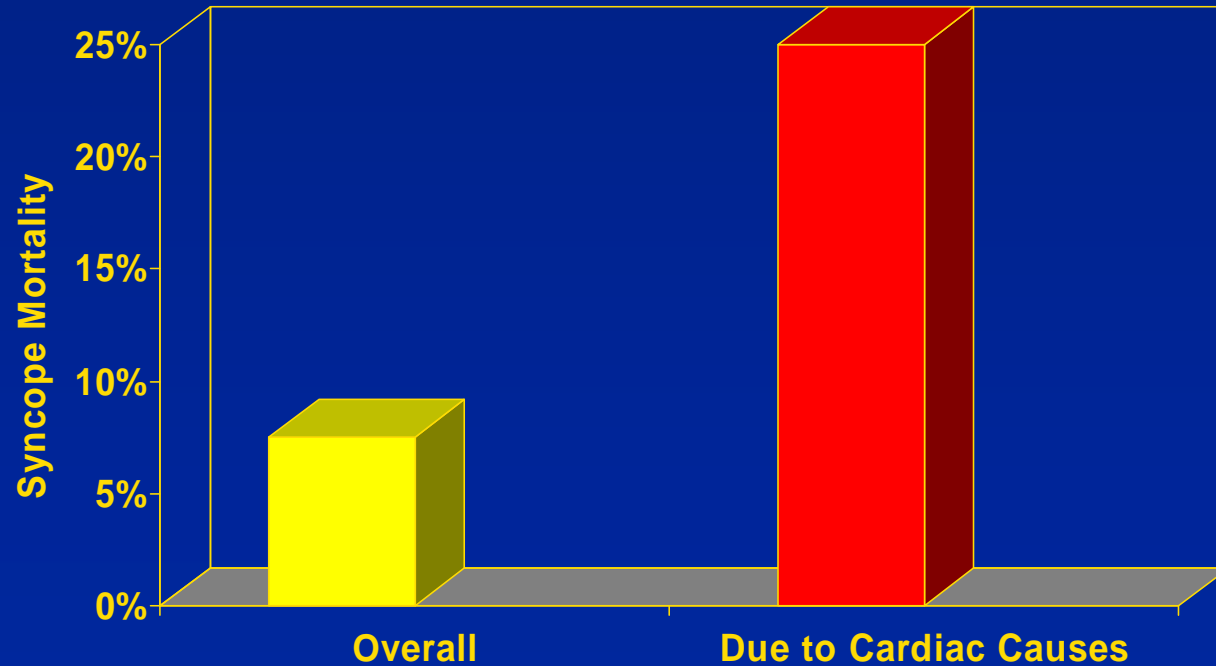
⁴ Kapoor W, et al. *N Eng J Med.* 1983;309:197-204.

⁵ National Disease and Therapeutic Index, IMS America, Syncope and Collapse #780.2; Jan 1997-Dec 1997.

⁶ Kapoor W, et al. *Am J Med.* 1987;83:700-708.

The Significance of Syncope

- ❖ Some causes of syncope are potentially fatal
- ❖ Cardiac causes of syncope have the highest mortality rates



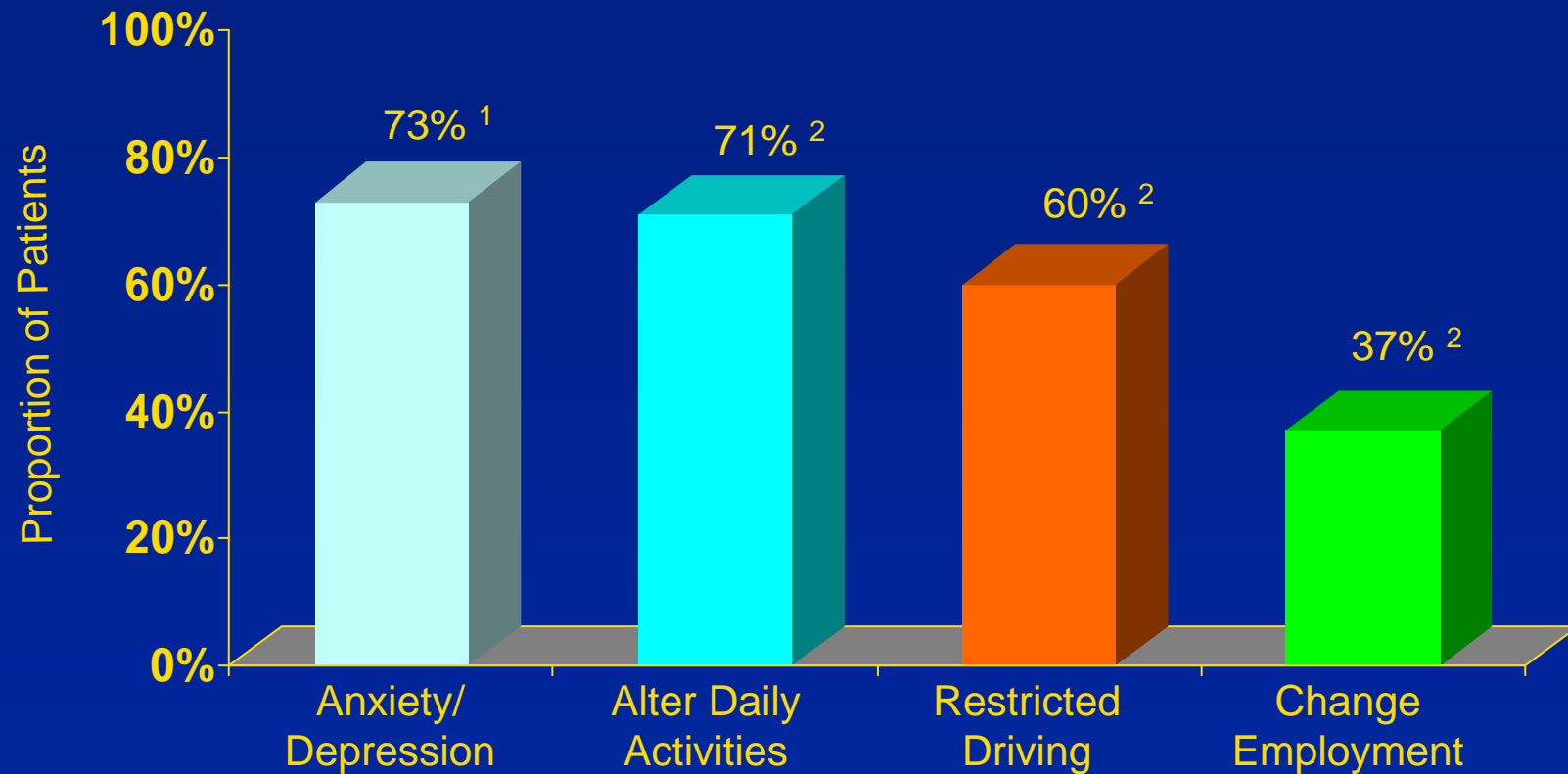
¹ Day SC, et al. *Am J of Med* 1982;73:15-23.

² Kapoor W. *Medicine* 1990;69:160-175.

³ Silverstein M, Sager D, Mulley A. *JAMA*. 1982;248:1185-1189.

⁴ Martin G, Adams S, Martin H. *Ann Emerg Med*. 1984;13:499-504.

Impact of Syncope



¹Linzer, *J Clin Epidemiol*, 1991.

²Linzer, *J Gen Int Med*, 1994.

Etiology



Not So Serious Causes



**Fortunately One of The More
Common Causes of Syncope**

Serious Causes



Gathers Collapses, Then Dies

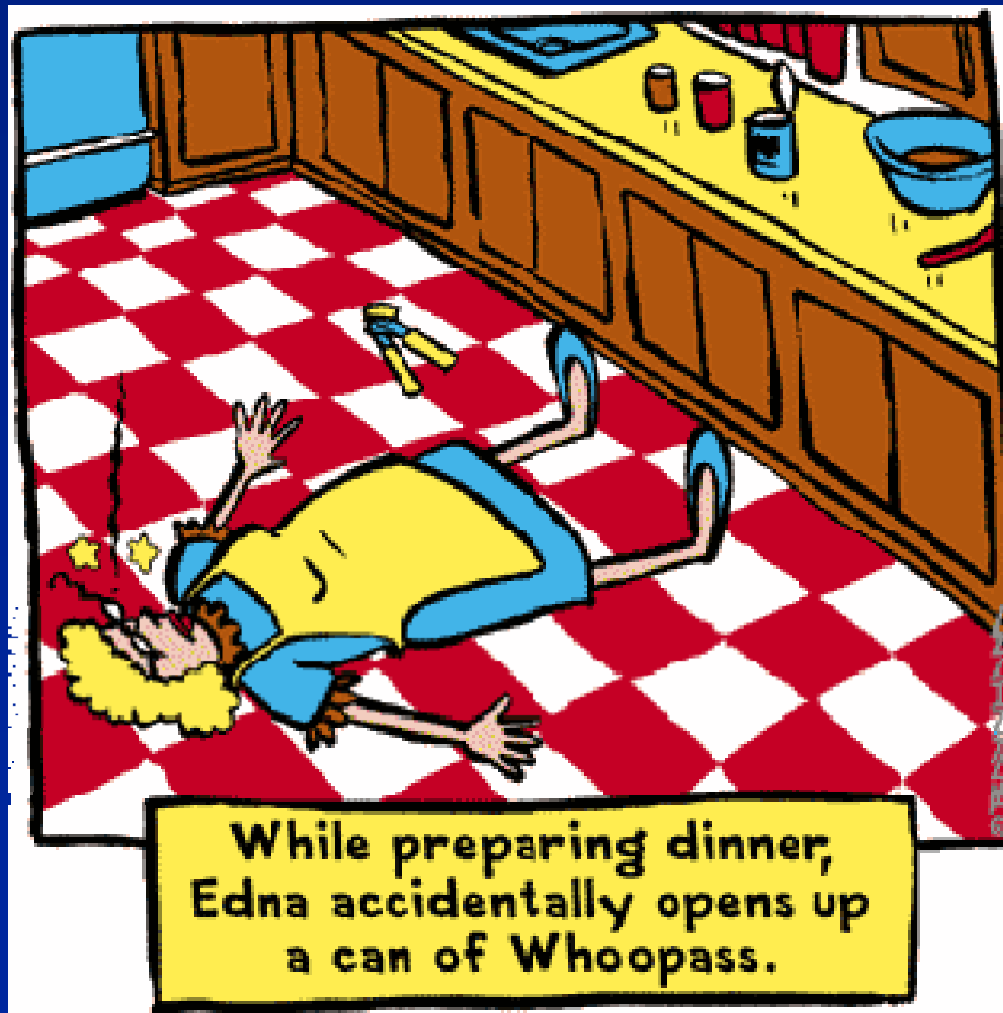


GARY FRIEDMAN / Los Angeles Times
Loyola Marymount forward Hank Gathers lies semi-conscious on court after collapsing during game against Portland Sunday. Gathers, 23, died after being hospitalized.

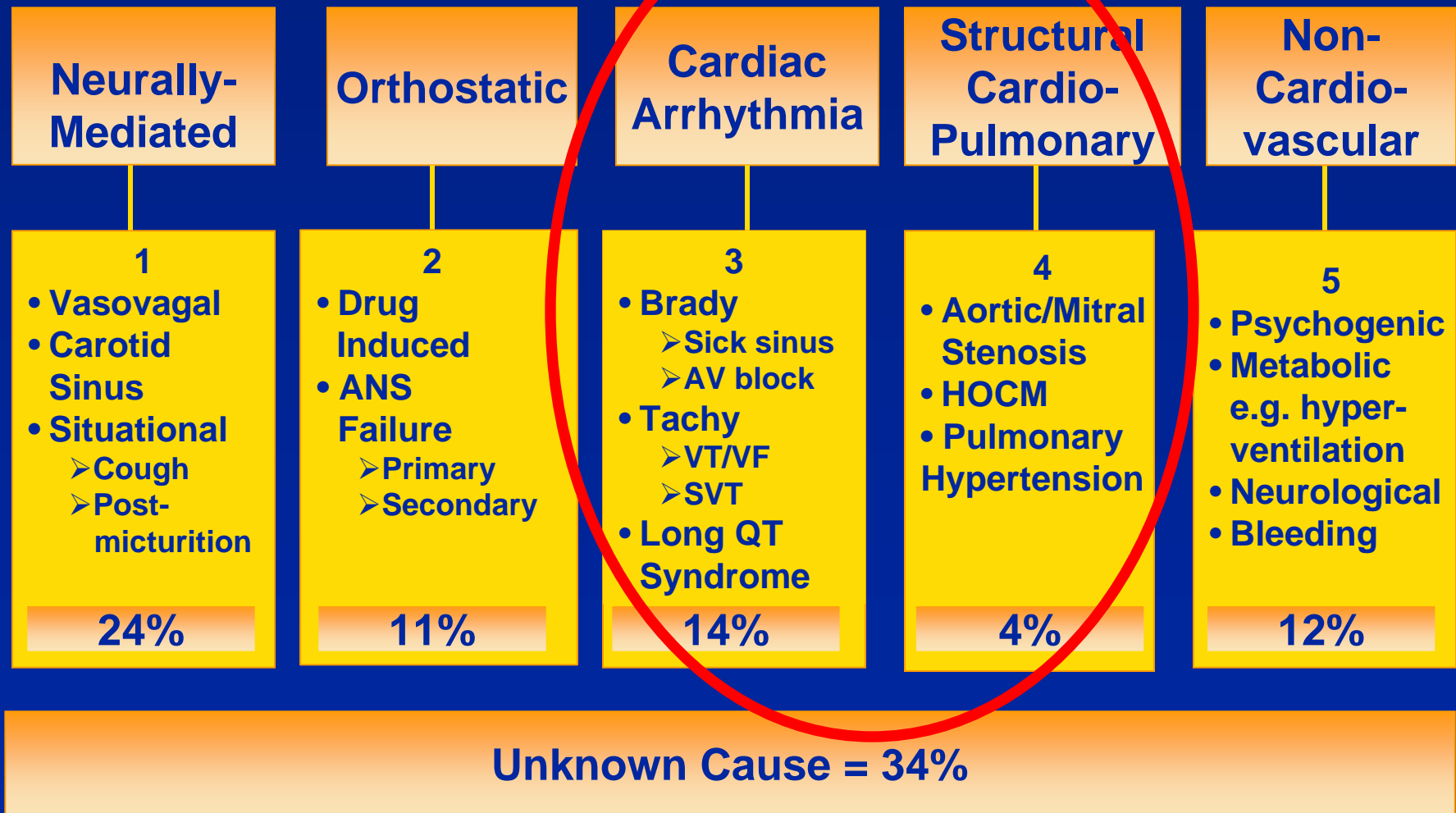
Hank Gathers

- ❖ 23 yo Loyola Marymount University NBA prospect
- ❖ Syncopal spell shooting free throw 12/9/89
- ❖ Workup includes thallium and cath → apical defect
- ❖ EPS induces PMVT
- ❖ Treated with beta-blocker: ICD refused

Unusual Causes of Syncope

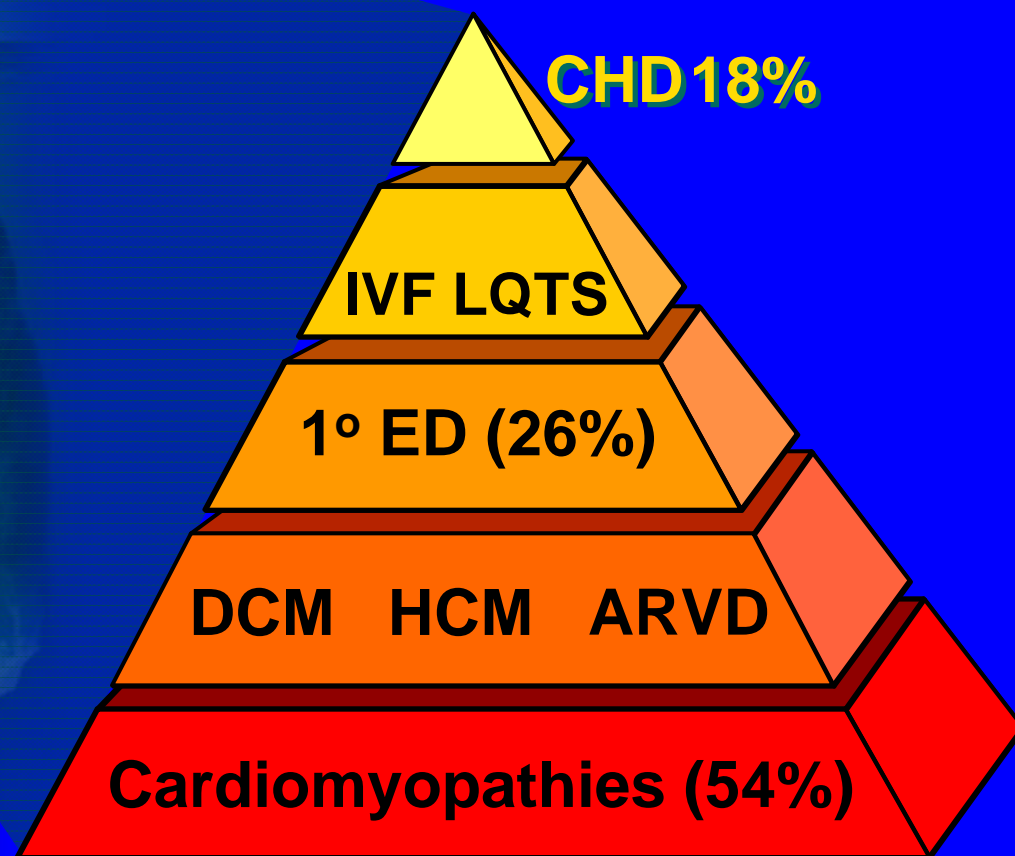


Syncope: Etiology



Spectrum of “Malignant” Cardiac Syncope

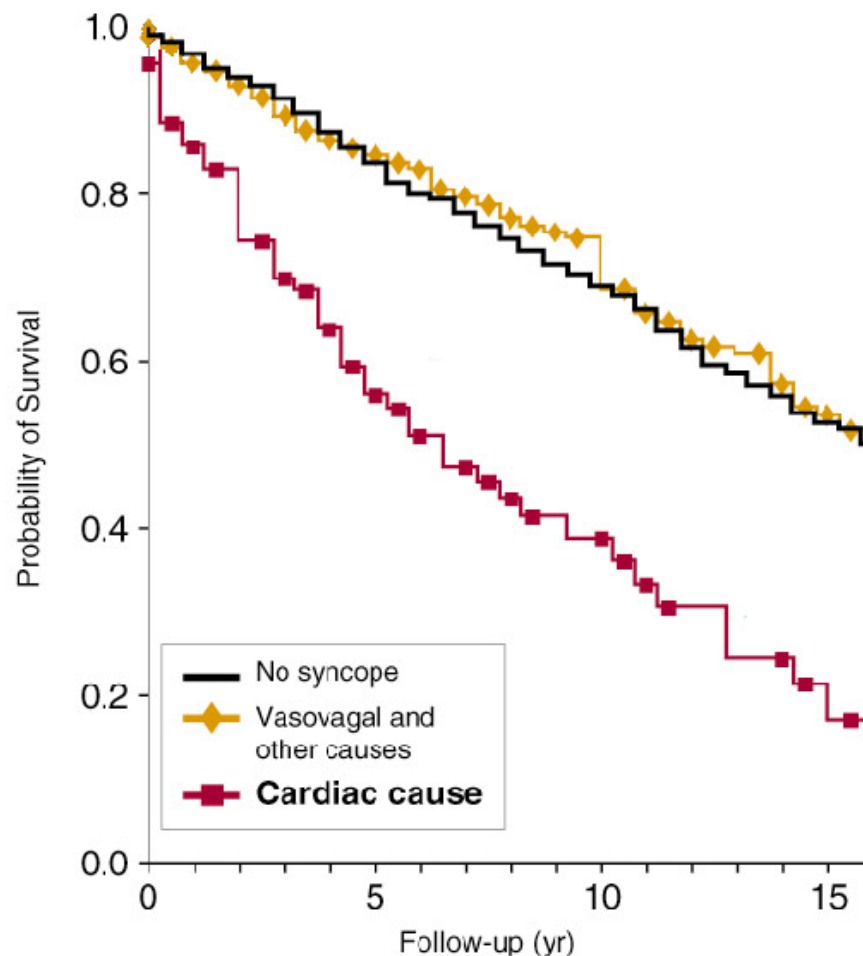
**Neuro-
cardiogenic
Syncope**



“...cardiac syncope can be a harbinger of sudden death.”

*New England
Journal of Medicine*

- ❖ Study of survival rates with and without syncope
- ❖ Cardiac syncope carried a 6-month mortality rate of greater than 10%
- ❖ Cardiac syncope doubled the risk of death



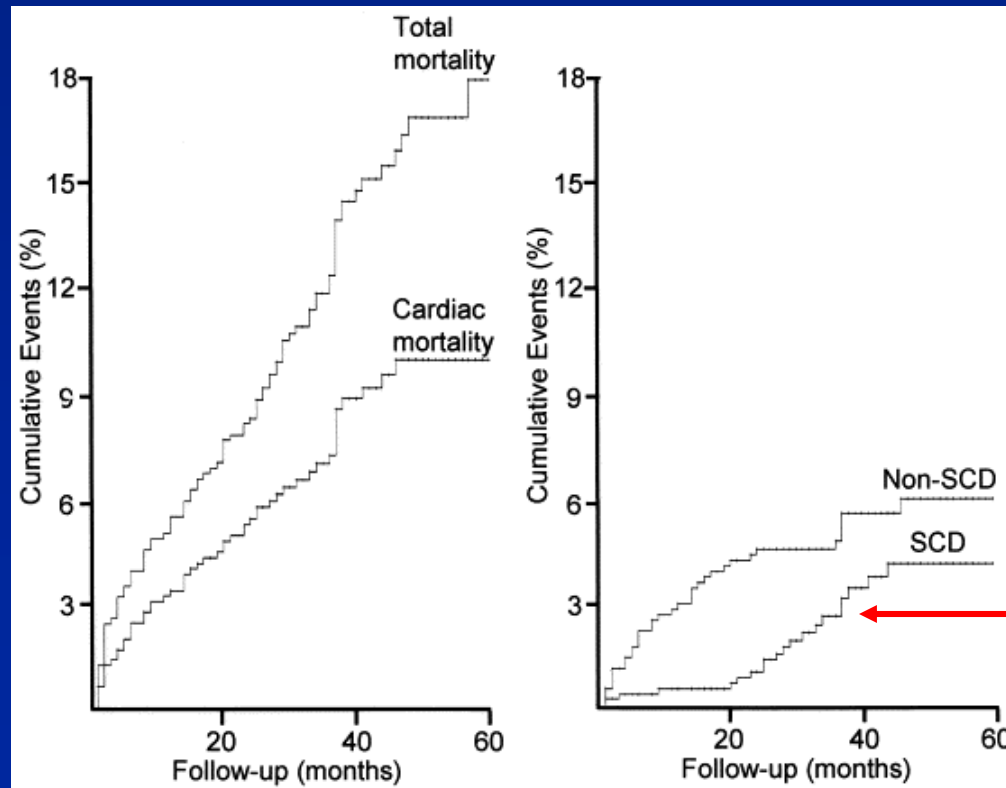
Soteriades ES, Evans JC, Larson MG, et al. Incidence and prognosis of syncope. *N Engl J Med*. 2002;347(12):878-885. [Framingham Study Population]

**“People who’ve had
a heart attack have a
sudden death rate that’s
4-6 times
that of the general population.”¹**

¹American Heart Association. *Heart Disease and Stroke Statistics—2003 Update*. Dallas, Tex.: American Heart Association; 2002.

Time Dependence of Mortality Risk Post-MI:

Prediction of Sudden Cardiac Death After Myocardial Infarction in the Beta-Blocking Era¹



➤ 700 post-MI patients; ~95% on beta blockers two years after discharge.

– Arrhythmia events or SCDs did not concentrate early after the index event, but most of them occurred more than 18 months post-MI.

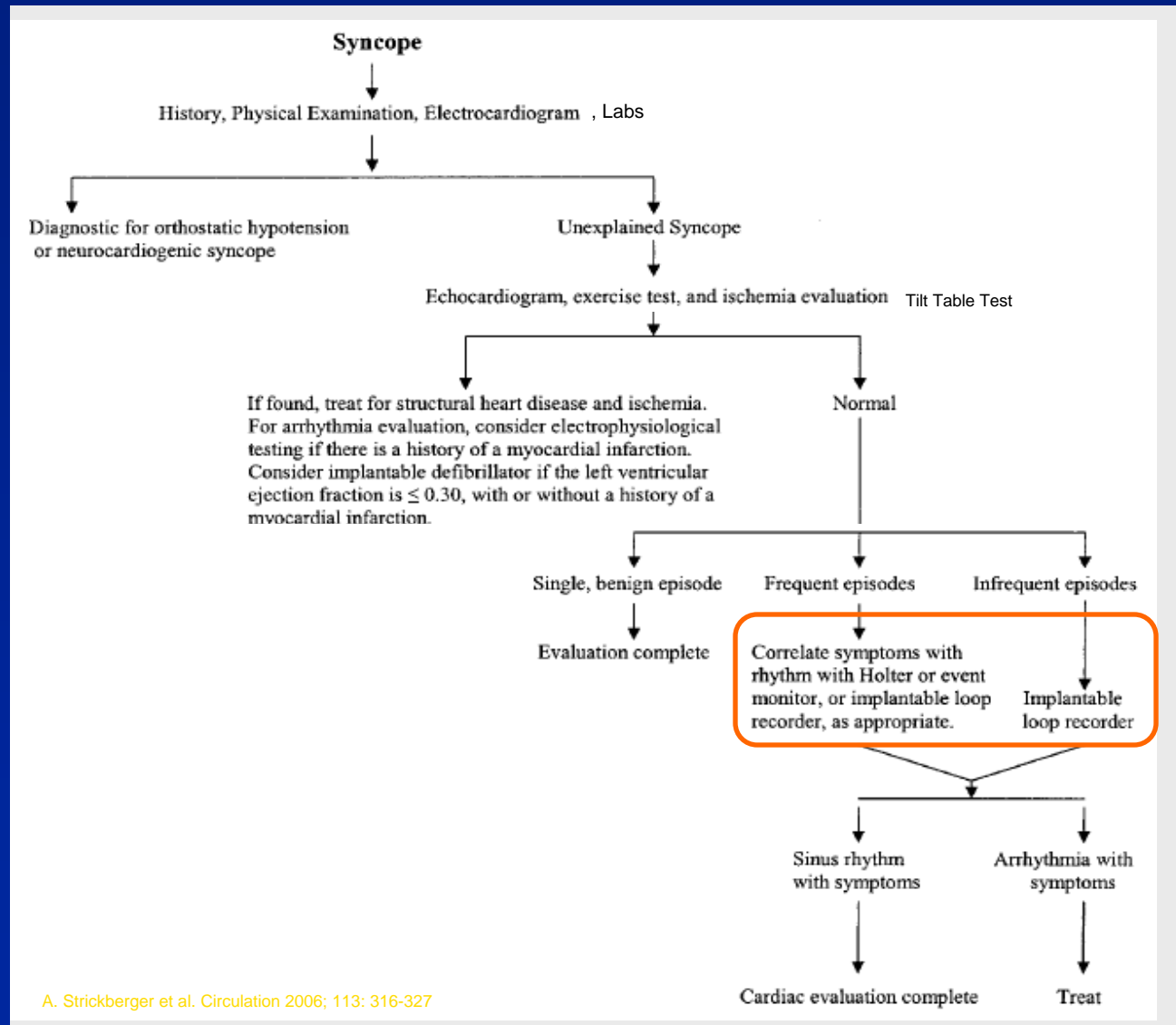
¹Huikuri H, et al. *J Am Coll Cardiol* 2003; 42: 652-8.

Diagnosis and Evaluation Options

Syncope Diagnosis

AHA/ACC Scientific Statement on the Evaluation of Syncope:

“This approach (ILRs) is more likely to identify the mechanism of syncope than is a conventional approach that uses Holter or event monitors and EP testing and is cost-effective.”



Initial Evaluation

(Clinic/Emergency Dept.)

- ❖ Detailed history
- ❖ Physical examination
- ❖ Laboratory examination
- ❖ 12-lead ECG
- ❖ Echocardiogram – to determine if structural heart disease is present

FORM A

High School Activities Association
Athletic Preparticipation
Health History Screening and Physical Examination

Date / /

Explain "Yes" answers below: (To be completed by student and parent/legal guardian)

- | | | | |
|-----|---|---|---|
| 1. | Have you had a medical problem or injury since your last evaluation? | Y | N |
| 2. | Have you ever been hospitalized? | Y | N |
| 3. | Have you ever had surgery? | Y | N |
| 4. | Are you presently taking any medications or pills? (Include vitamins, prescriptions, non-prescriptions) | Y | N |
| 5. | Do you have any allergies (medicine, bees or other stinging insects)? | Y | N |
| 6. | Have you ever passed out during or after exercise? | Y | N |
| 7. | Have you ever been dizzy during or after exercise? | Y | N |
| 8. | Have you ever had chest pain during or after exercise? | Y | N |
| 9. | Do you tire more quickly than your friends during exercise? | Y | N |
| 10. | Have you ever had high blood pressure? | Y | N |
| 11. | Have you ever been told that you have a heart murmur? | Y | N |
| 12. | Have you ever had racing of your heart or skipped heartbeats? | Y | N |
| 13. | Has anyone in your family died of heart problems or a sudden death before age 50? | Y | N |
| 14. | Do you have any skin problems (itching, rashes, acne)? | Y | N |
| 15. | Have you ever had a head injury or suffer from headaches? | Y | N |
| 16. | Have you ever been knocked out or unconscious? | Y | N |
| 17. | Have you ever had a seizure? | Y | N |
| 18. | Have you ever had a stinger, burner or pinched nerve? | Y | N |
| 19. | Have you had heat or muscle cramps? | Y | N |
| 20. | Have you ever been dizzy or passed out in the heat? | Y | N |
| 21. | Do you have trouble breathing or do you cough during or after activity? | Y | N |
| 22. | Do you use any special equipment (pads, braces, neck rolls, mouth guard, eye guards, etc.)? | Y | N |
| 23. | Have you had any problem with your eyes or vision? | Y | N |
| 24. | Do you wear glasses or contacts or protective eye wear? | Y | N |
| 25. | Have you had any other medical problems (infectious mononucleosis, diabetes, etc.)? | Y | N |
| 26. | Are there concerns you wish to discuss? | Y | N |

“Don’t Blow Off a Blackout”

**EXERTIONAL/AUDITORY/
POSTPARTUM
SYNCOPE/SEIZURES
MAY BE POTENTIAL
SUDDEN DEATH
WARNING SIGNS!!**

Syncope: Diagnostic Methods and Yields

Test/Procedure	Yield*
ECG	2-11% ¹
Holter Monitoring	2% ²
External Loop Recorder	20% ²
Tilt Table	11-87% ^{3,4}
EP Study without structural heart disease	11% ⁵
EP Study with structural heart disease	49% ³
Neurological (CT scan, carotid doppler)	0-4% ^{3,4}
SQ Implantable Cardiac Monitor (ICM)	43-88% ^{6,7,8}

*(Based on mean diagnosis time of 5.1 mos.) ²

¹ Kapoor, Am J Med, 1991.

² Krahn, Cardiol Clinics, 1997.

³ Kapoor, Medicine, 1990.

⁴ Kapoor, JAMA, 1992.

⁵ Linzer, Ann Intern Med, 1997.

⁶ Krahn, Am J Cardiol, 1998.

⁷ Krahn, Circ, 1999.

⁸ Krahn, JACC, 2003.

Ambulatory ECG

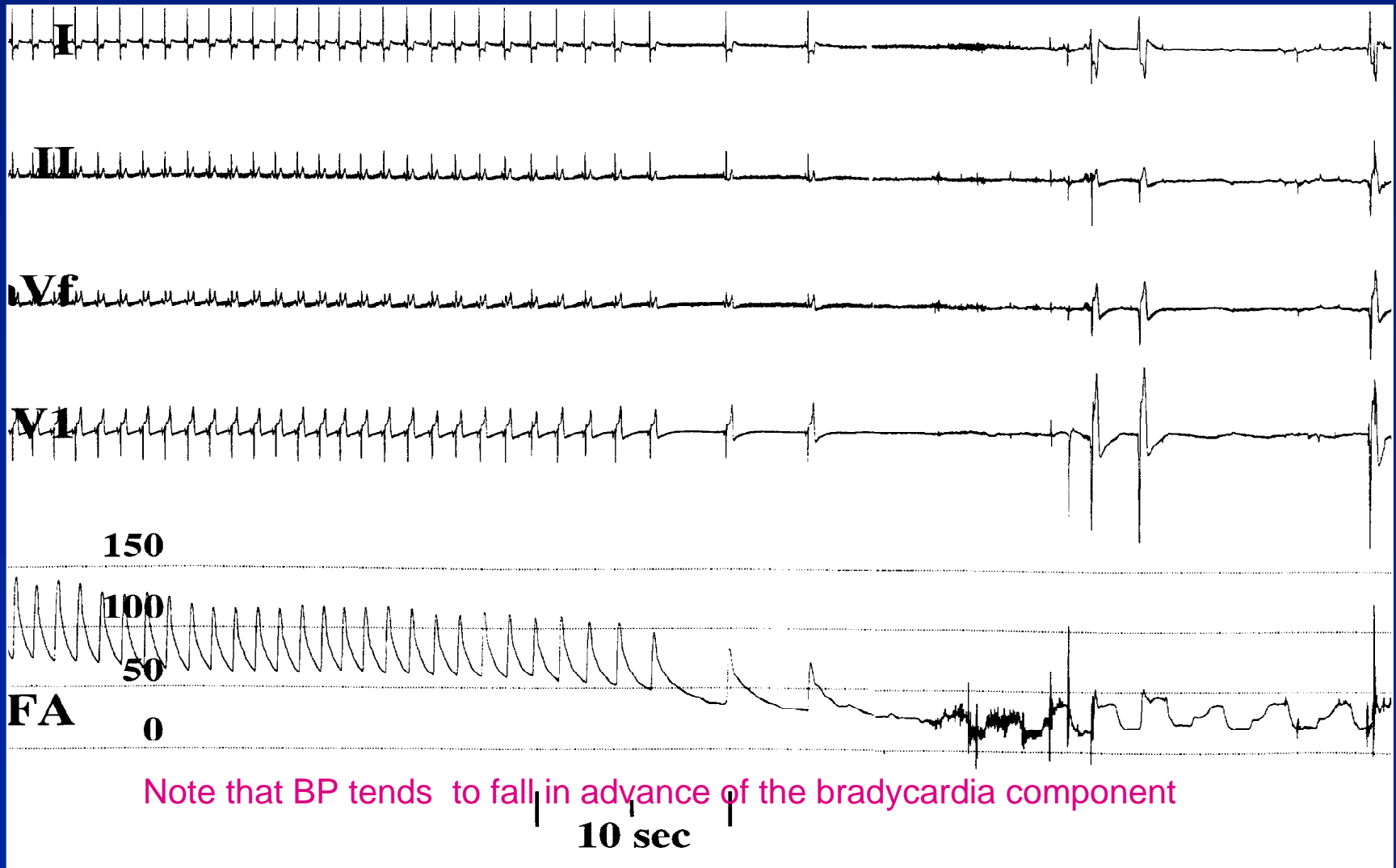
Method	Comments
Holter (24-48 hours)	Useful for frequent events (ie. Episodes every 24 - 48 hours.
Event Recorder (up to 4 weeks)	<ul style="list-style-type: none">❖ Useful for infrequent events (ie. Weekly – monthly episodes)❖ Limited value in sudden LOC
Loop Recorder (up to 4 weeks)	<ul style="list-style-type: none">❖ Useful for infrequent events❖ Limited value in sudden LOC (auto detect better)
Implantable Cardiac Monitor (3 yrs)	<ul style="list-style-type: none">❖ Implantable type (ICM) more convenient❖ Useful for infrequent events

Head-up Tilt Test (HUT)

- ❖ Unmasks VVS susceptibility
- ❖ Reproduces symptoms
- ❖ Patient learns VVS warning symptoms
- ❖ Physician is better able to give prognostic / treatment advice
- ❖ May be helpful in assessing effectiveness of treatment of neurocardiogenic syncope (ie repeat tilt testing)



Head-Up Tilt Test (HUT)

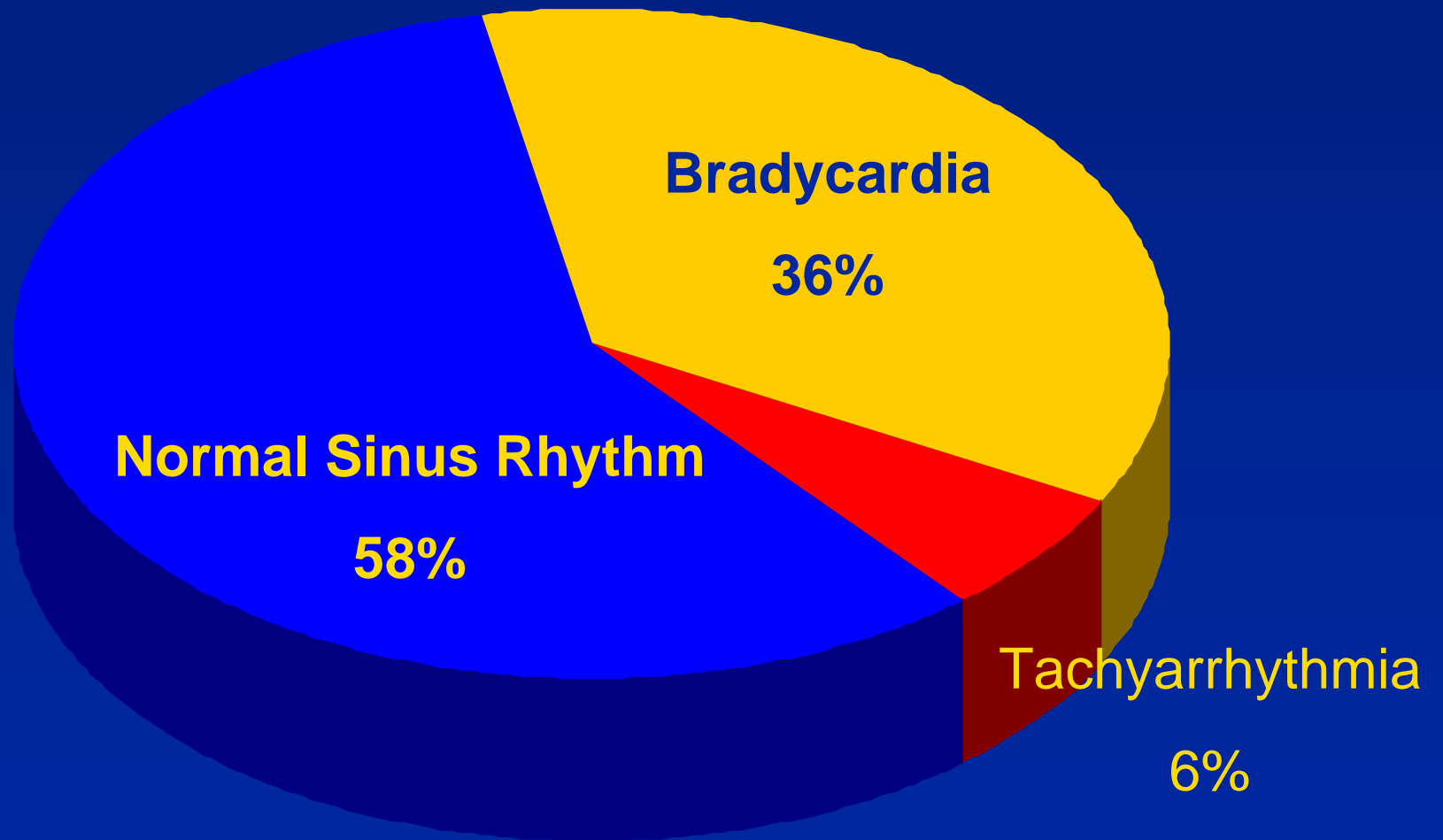


IMPLANTABLE CARDIAC MONITORS (ICMs)

**A Major Advance in the Evaluation of
Syncope and Heart Rhythm Disorders**

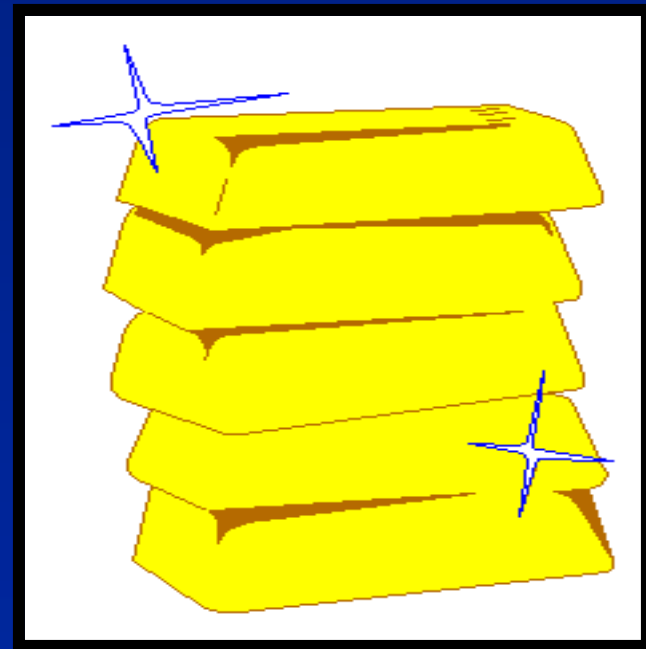
The “Black Box” for the Human Body

Rhythms During Recurrent Syncope



The GOLD Standard

Document
Heart Rhythm
at
Time of
Symptoms



Seems a Simple Task...But...

...NOT SO EASY:

Rhythm disorders are often

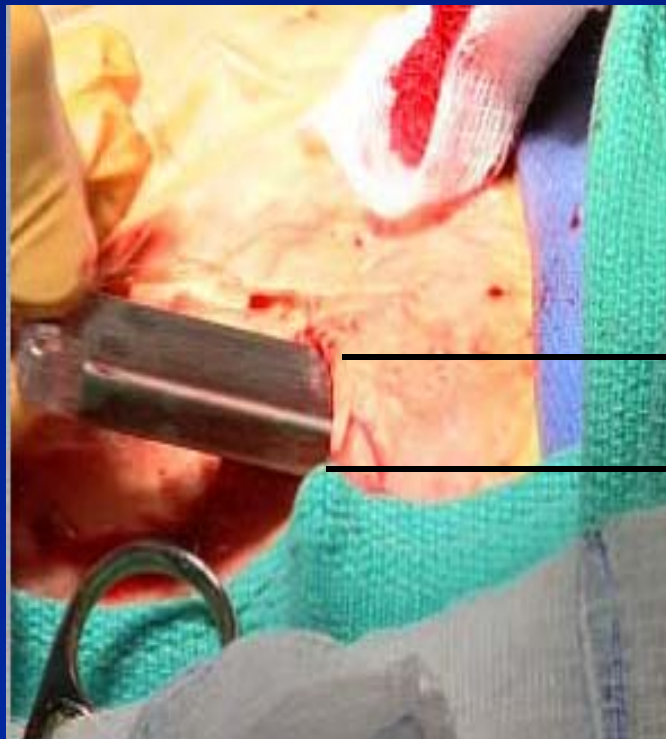
- **Unpredictable/infrequent**
- **Brief duration, difficult to record**
- **Transiently disabling, fear, faint**
- **Not perceived**
 - **During sleep**
 - **Too brief**
 - **Misinterpreted by patient/bystander (e.g., “falls”)**
 - **Not severe, but “marker” of serious consequences**

What is an Implantable Cardiac Monitor (ICM) ?



- ❖ Offers up to 3 years of continuous, leadless ECG monitoring
- ❖ Minimally invasive, outpatient procedure
- ❖ High diagnostic yield (65-88%) symptom-rhythm correlation
- ❖ High patient compliance
- ❖ Patient and auto triggered to capture ECG
- ❖ Programmable to store up to 49 minutes of ECG

How is an ICM Placed?



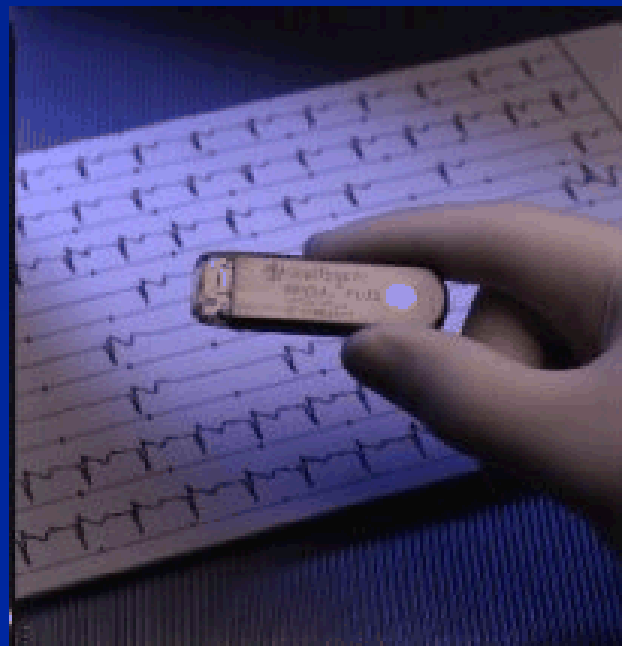
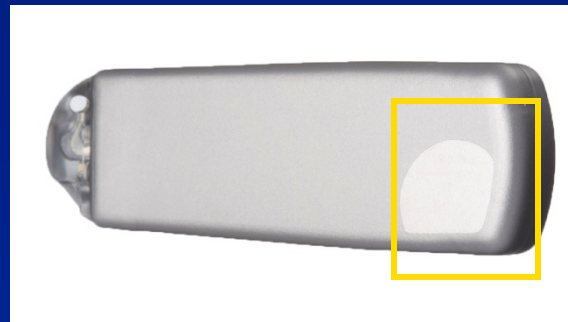
2 cm

Subcutaneous Electrodes

Front electrode

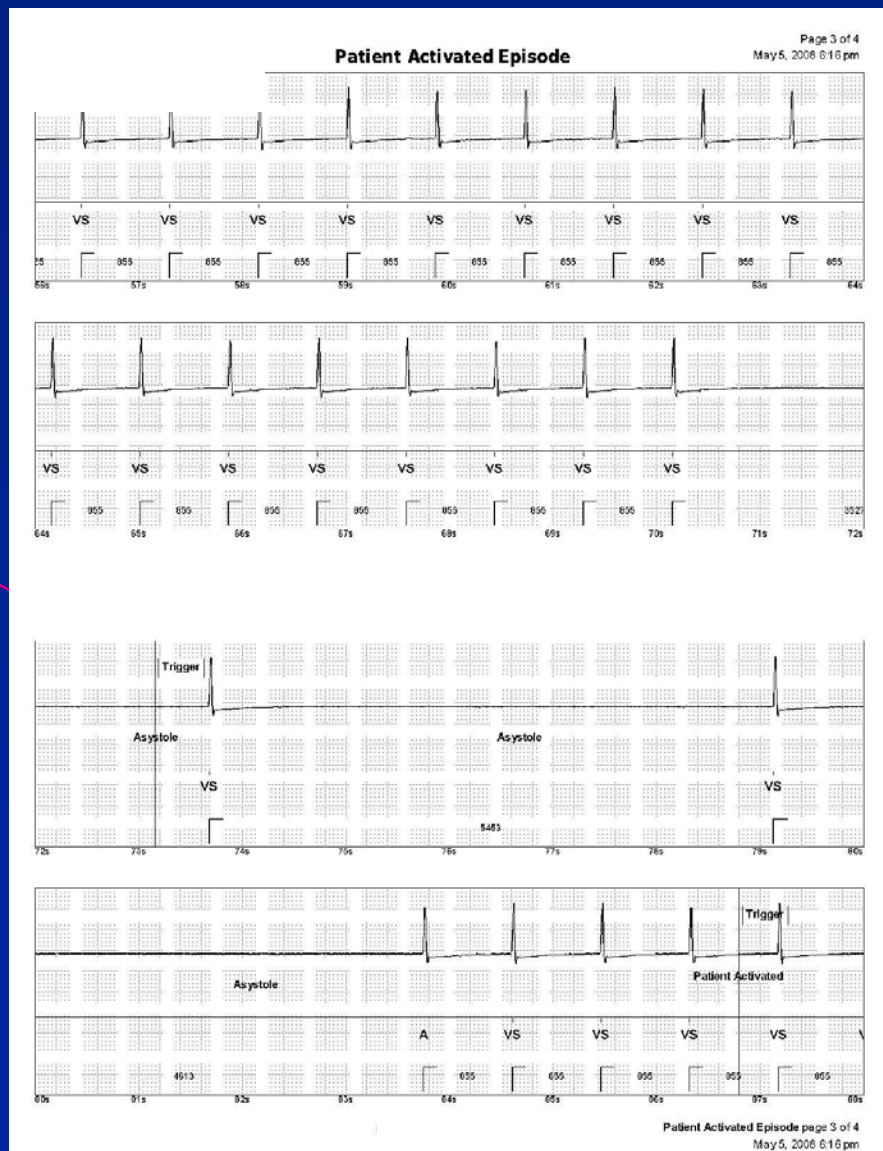


Back electrode



Symptom Rhythm Correlation: Automatic or Patient Triggered

Auto Activation
Point

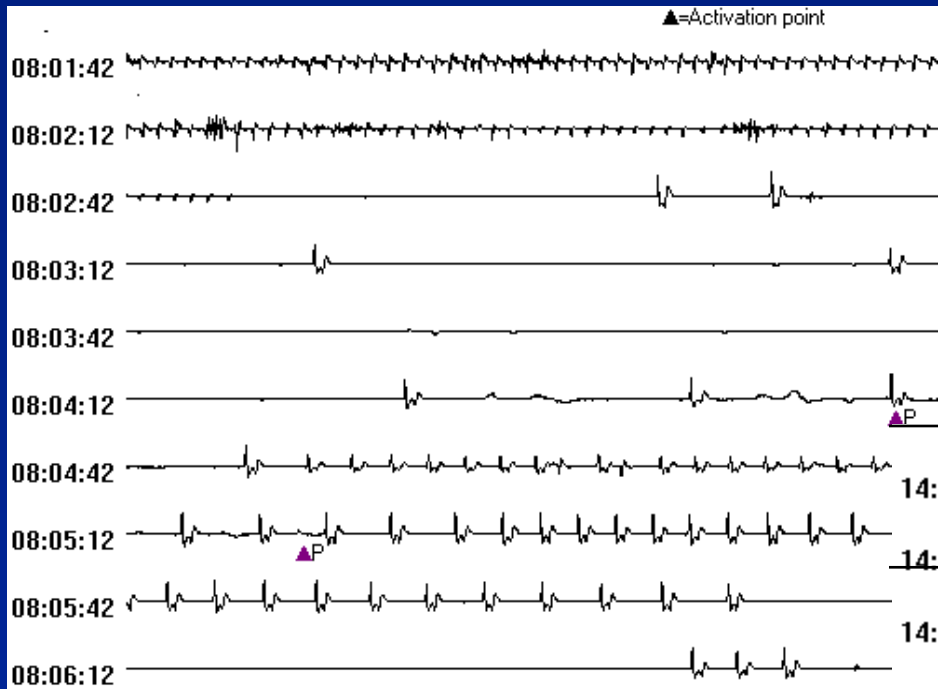


Patient Activation
Point

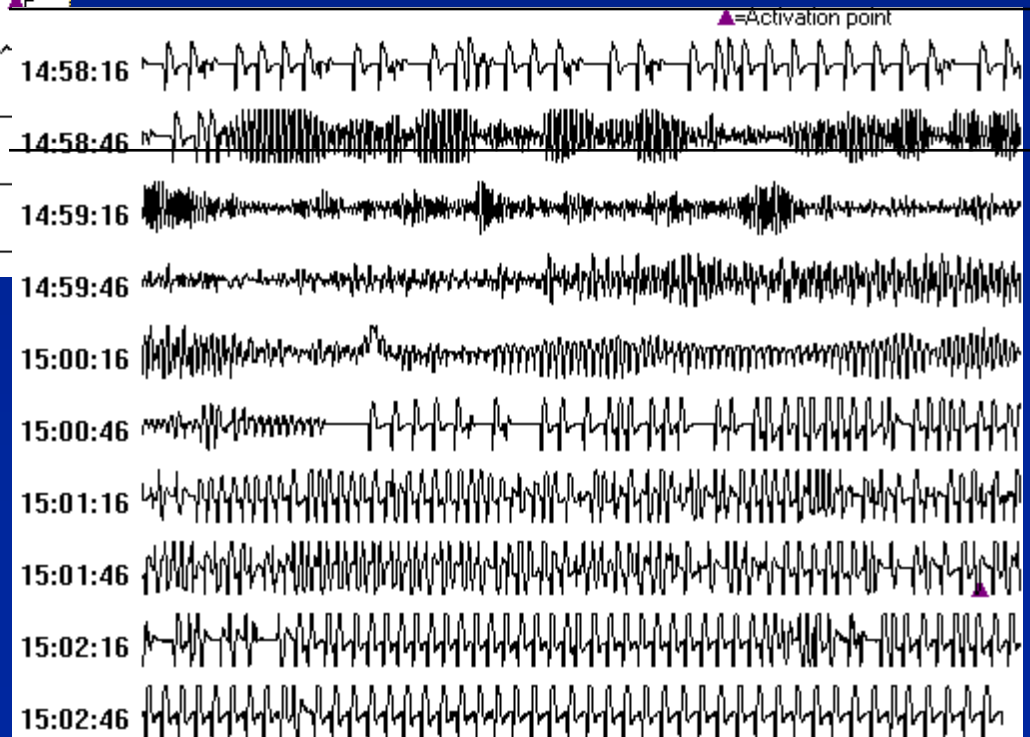
ICM Recordings

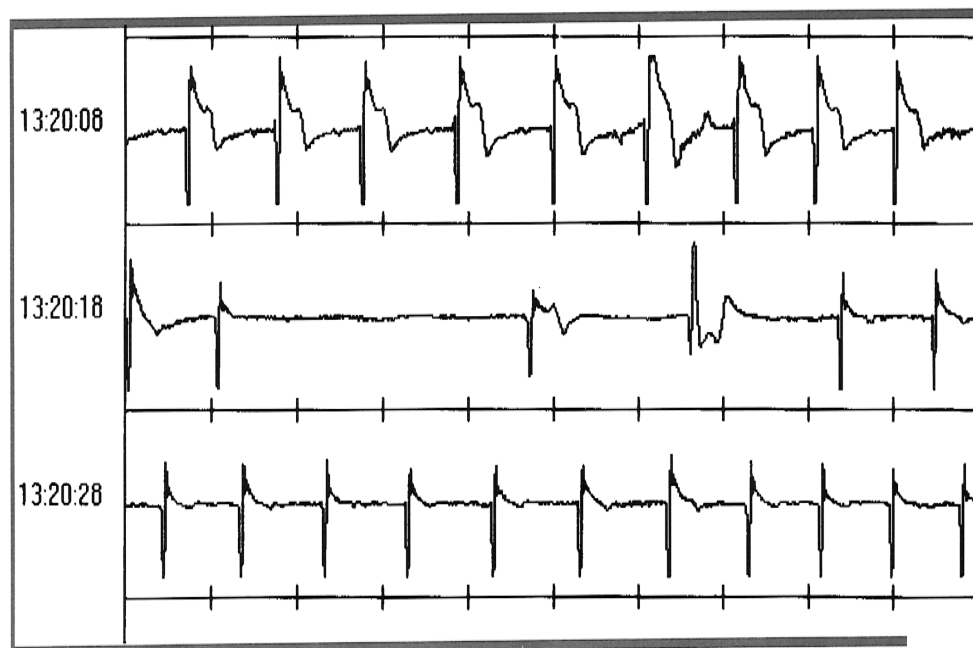
56 yo woman with recurrent syncope accompanied with seizures.

Infra-Hisian AV Block: Dual chamber pacemaker



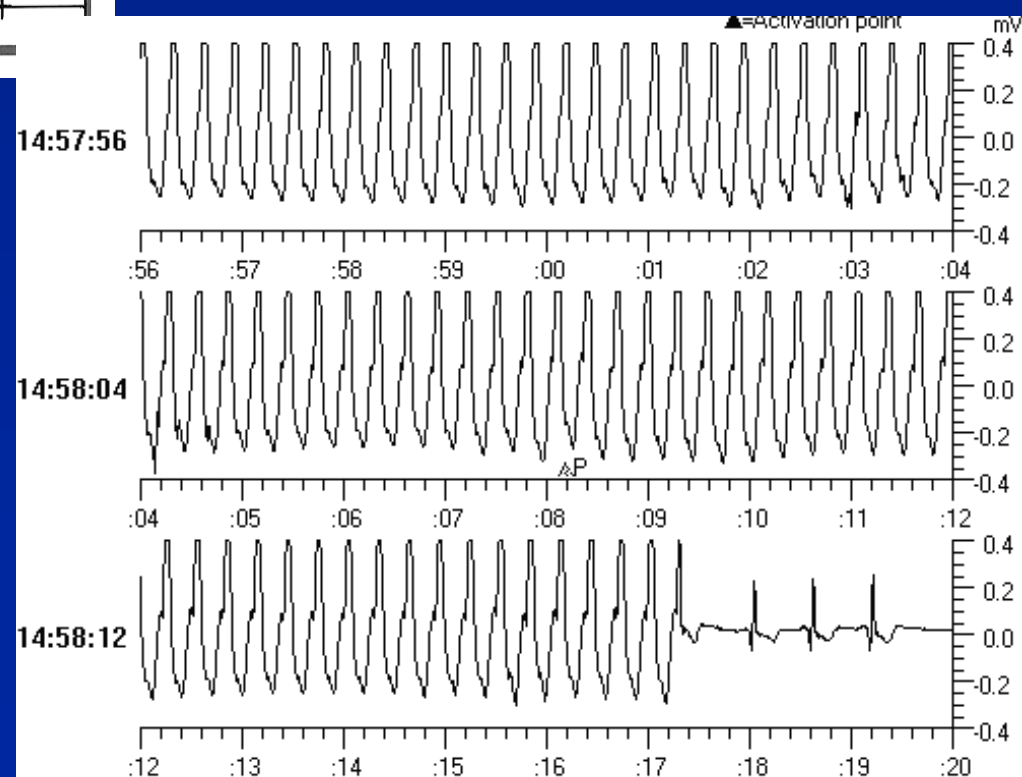
65 yo man with recurrent syncope accompanied with brief retrograde amnesia.
VT and VF: ICD and meds





28 yo man in the ER multiple times after falls resulting in trauma
VT: ablated and medicated

83 yo woman
Bradycardia: Pacemaker implanted



Indications for Implantable Cardiac Monitors

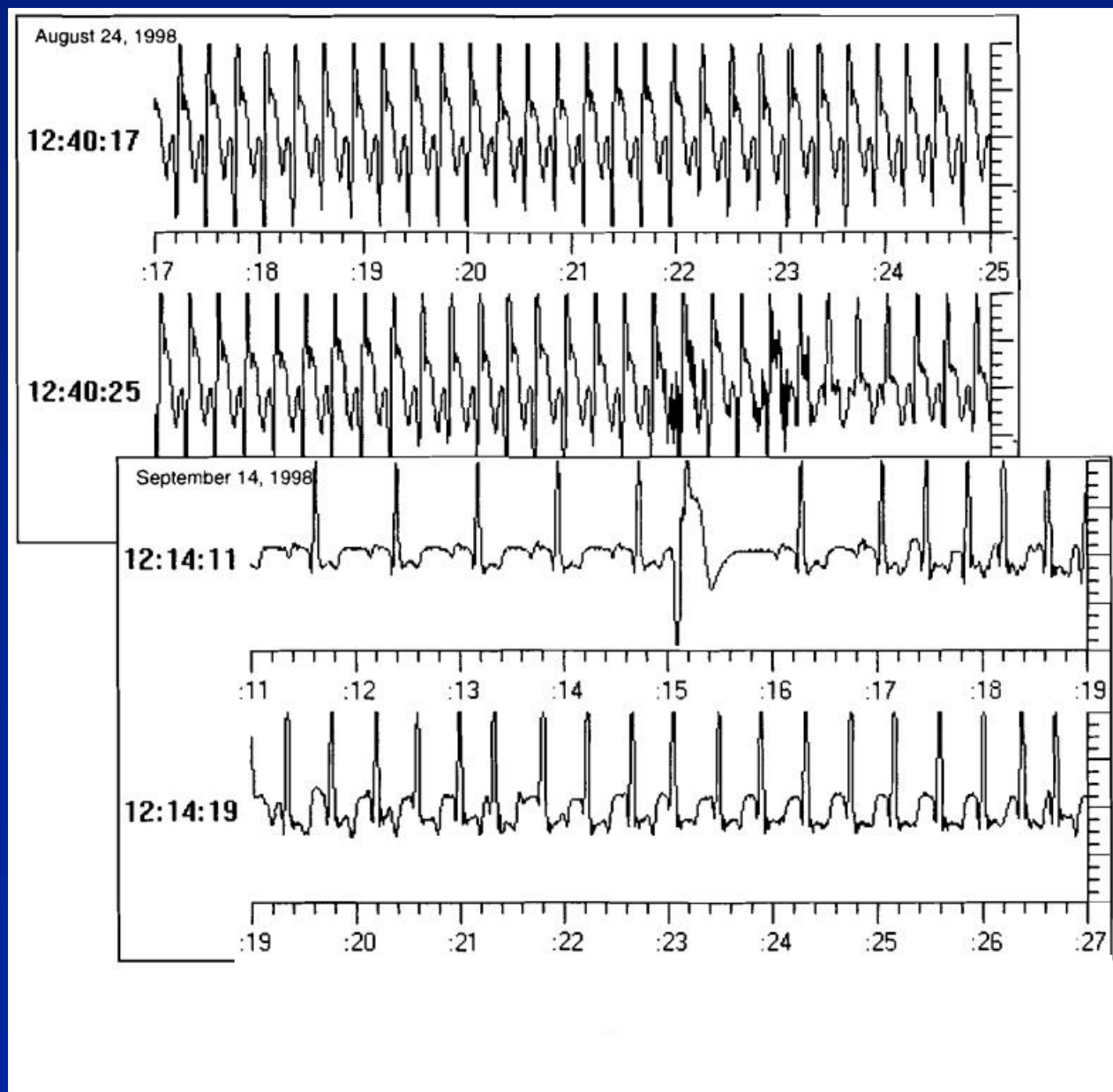
- ❖ Patients who experience transient symptoms that may suggest a cardiac arrhythmia
 - Syncope, Near Syncope
 - Lightheaded/dizzy
 - Palpitation
 - Falls/Refractory Seizures
- ❖ Patients with clinical syndromes or situations at increased risk of cardiac arrhythmias

BACKGROUND

- ❖ A 65 year-old male suffered recurrent syncopal episodes since 1996;
 - Seven short episodes (approx. 20 seconds) with loss of consciousness
 - History of exertional dyspnea (NYHA II) due to reduced left ventricular function following myocarditis
 - ACE inhibitor improved exertional dyspnea
 - Ejection fraction was 40%

WORKUP AND TREATMENT

- Repeated neurological exploration, CT of cerebrum, sonography of carotid arteries, and echocardiogram all negative
- ECG showed AV conduction delay of 230 msec with sinus rhythm
- EP examination showed HB interval extended to 62 msec at 750 msec sinus cycle length; neither supraventricular nor ventricular arrhythmias could be induced
- An implantable cardiac monitor (ICM) was implanted



CONCLUSION

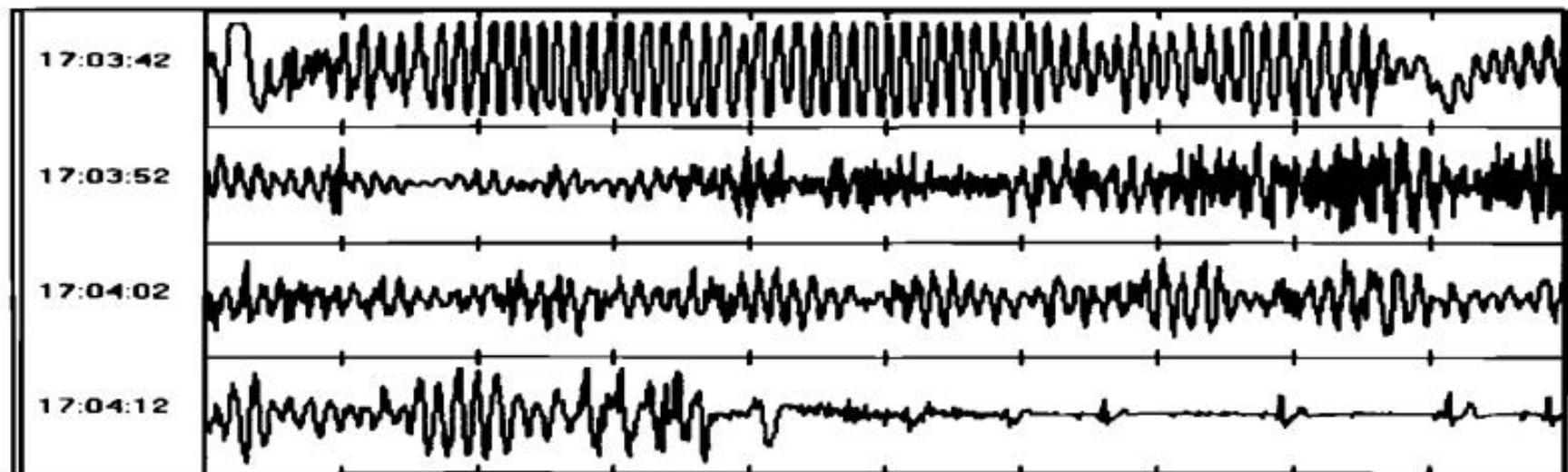
- ❖ 6 months after ICM implant, the patient experienced another episode; lost consciousness for approx 30 seconds
- ❖ Recordings showed VT at a rate of 206 bpm with spontaneous termination
- ❖ An additional event was recorded showing PAF
- ❖ An ICD was implanted and Medication based therapy was initiated using amiodarone
- ❖ Patient has had no recurrent events

BACKGROUND

- ❖ A 16 year-old female experienced repeated loss of consciousness; including one three-day episode with numerous syncopal events at the time of a traumatic family event
- ❖ Family history included syncope and respiratory arrest

WORKUP AND TREATMENT

- ❖ Workup included history, physical, 12-lead ECG, holter monitoring, tilt table, CSM, external event recorder, EP study, echocardiogram, MRI and psychiatric evaluation – all inconclusive
- ❖ An ICM was implanted



CONCLUSION

- ❖ The ICM captured episode three months after implantation
- ❖ ECG recordings showed Torsades des Pointes with spontaneous self-termination
- ❖ ICD was implanted

Conclusion

**Syncope is a common symptom,
often with dramatic consequences (injury or SCA),
which deserves thorough investigation
and appropriate treatment of its cause.**

**If History/Physical and initial evaluation are unremarkable consider an
Implantable Cardiac Monitor (ICM) early in the work up of these
patients.**

**In the post MI patient with preserved or reduced EF (above 35%) consider
use of an ICM if Electrophysiology Study is unremarkable**