

Syncope

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www.brain101.info

Syncope

- Definition
- Epidemiology
- Etiology
- Diagnosis & Evaluation Options
- Specific Conditions

Syncope - Definitions

- ACP 1997 - Transient loss of consciousness (LOC) with loss of postural tone, from which recovery is spontaneous.
- ACEP 2001 - Sudden, transient LOC with inability to maintain tone & is distinct from seizures, coma, vertigo, hypoglycemia and other states of altered consciousness.
- ESC 2001 - Transient, self limited LOC with a relatively rapid onset and usually leading to fainting; the subsequent recovery is spontaneous, complete, and usually prompt.
- AFP 2005 - Transient loss of consciousness, usually accompanied by falling, and with spontaneous recovery.

Syncope: **A Symptom...Not a Diagnosis**

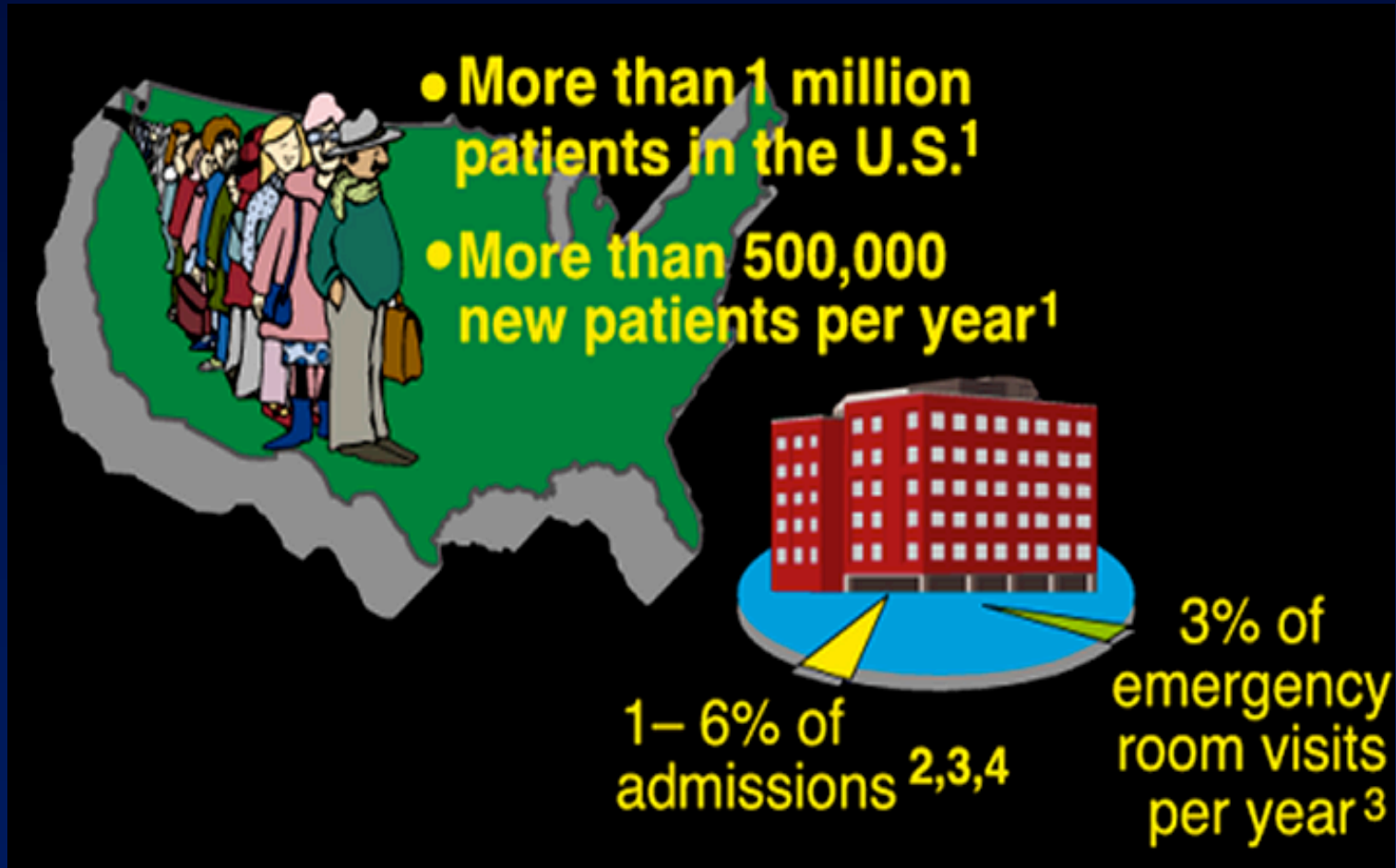
- Self-limited loss of consciousness and postural tone
- Relatively rapid onset
- Variable warning symptoms
- Spontaneous complete recovery

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

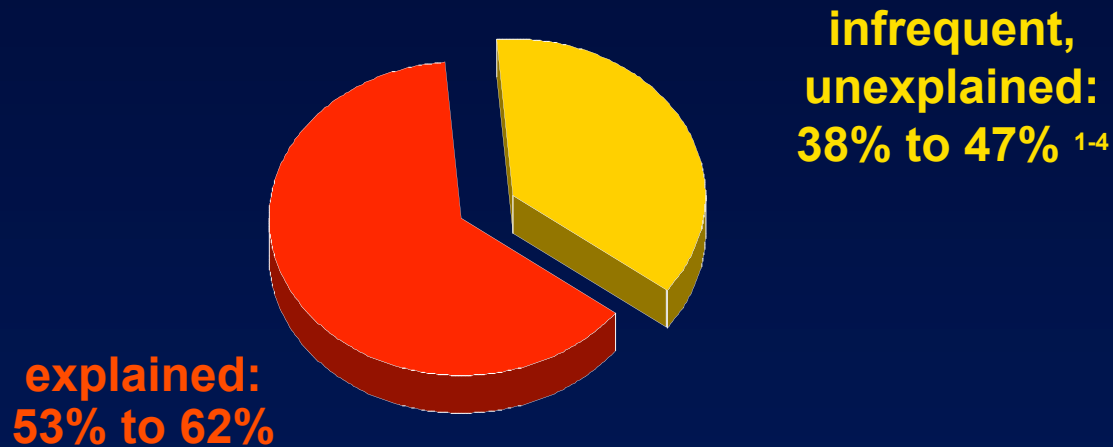
⁴ Kapoor W. Evaluation and outcome of patients with syncope. Medicine 1990;69:160-175

Syncope Reported Frequency

- Individuals <18 yrs **15%**
- Military Population 17- 46 yrs **20-25%**
- Individuals 40-59 yrs* **16-19%**
- Individuals >70 yrs* **23%**

*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.

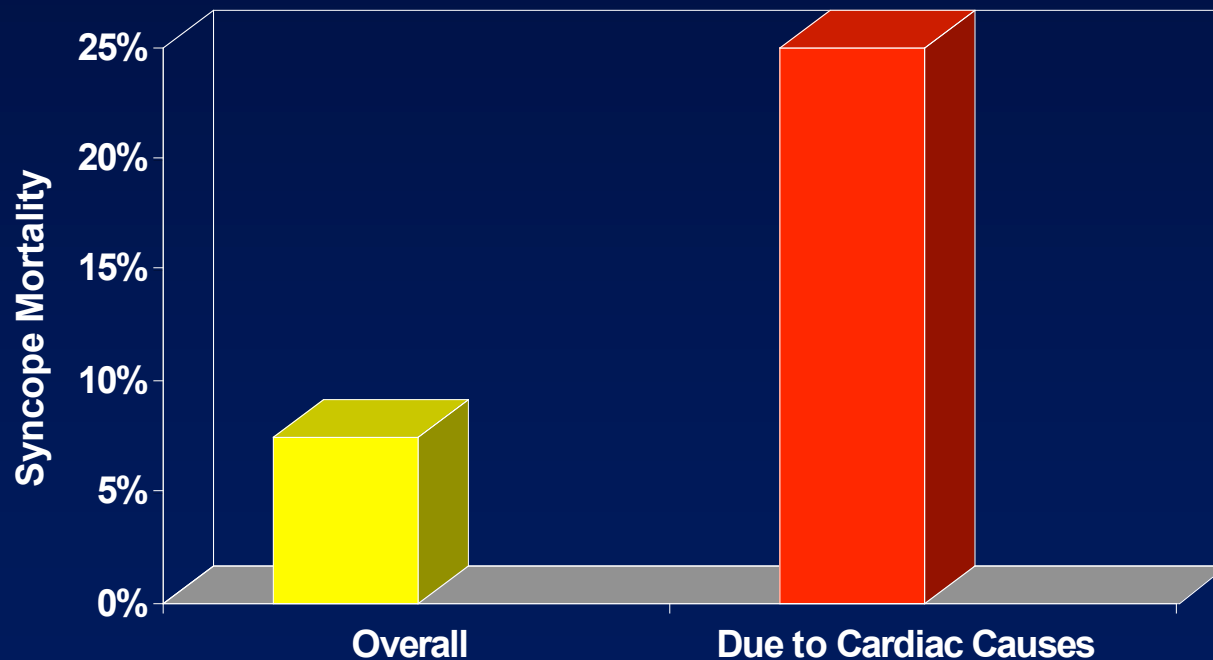
⁴ Kapoor W, et al. *N Eng J Med.* 1983;309:197-204.

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 (5 year mortality - 50 %, 1 year mortality - 30 %)



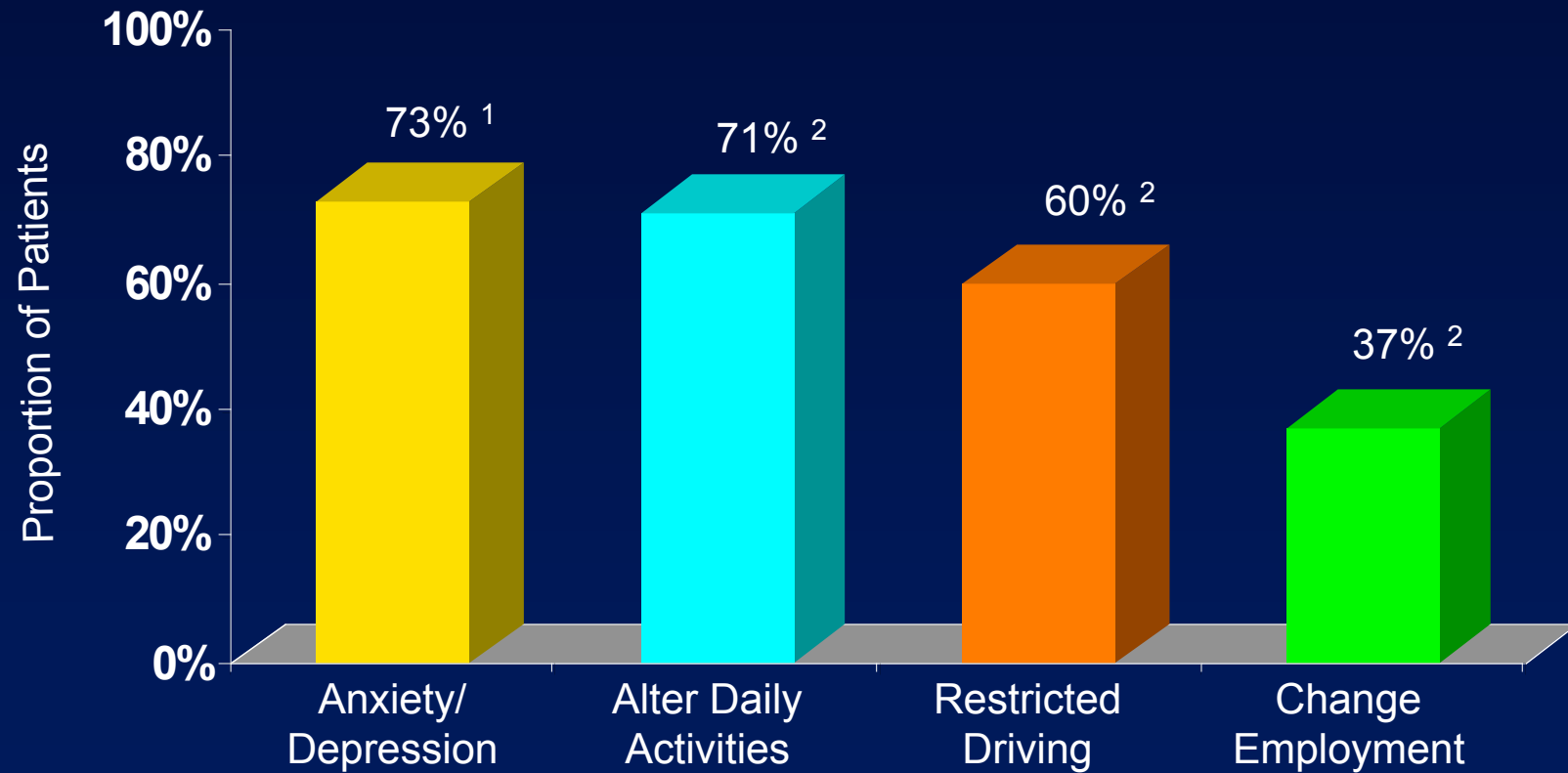
¹ Day SC, et al. *Am J of Med* 1982;73:15-23.

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.

Syncope - Mechanism

- Global cerebral hypoperfusion
- Interruption of sympathetic outflow
- Increased vagal tone
- Other mechanisms - edema, cerebral autoregulation, central serotonin pathways.

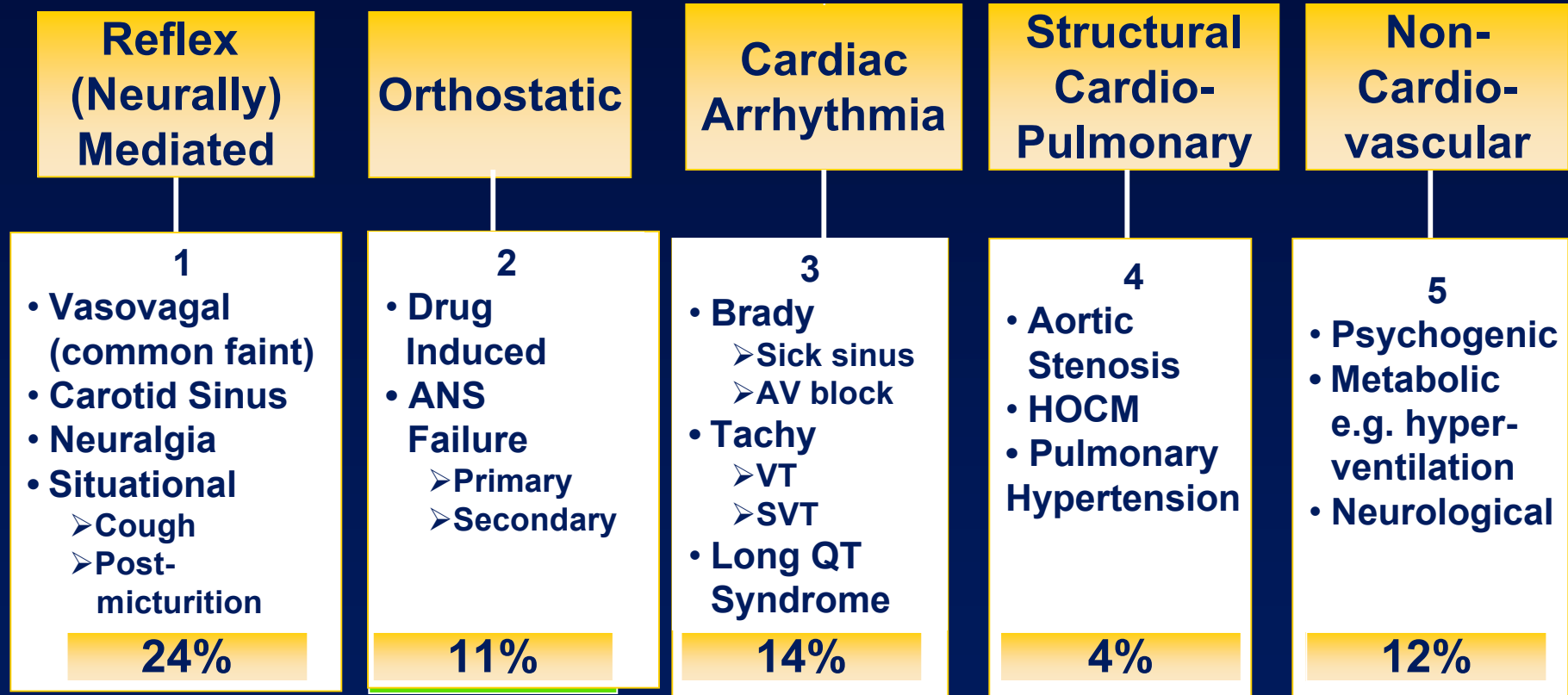
The trigger for the switch in autonomic response remains one of the unresolved mysteries in cardiovascular physiology*

Hainsworth. Syncope: what is the trigger? Heart 2003; 89: 123-124

Syncope - Etiology

- Reflex mediated - 40%
- Unexplained - 25%
- Cardiac - 15%
- Others - 20%
 - Orthostatic Hypotention
 - Cerebrovascular / Neurologic
 - Psychiatric
 - Hypoglycemia
 - Medications

Syncope - Etiology



Unknown Cause = 34%

Causes of Syncope¹

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, Olshansky B (eds) Syncope: Mechanisms and Management. Armonk NY; Futura Publishing Co, Inc: 1998; 1-13.

Causes of Syncope-like States

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

* may cause 'true' syncope

Syncope

Diagnostic Objectives

- Distinguish 'True' Syncope from other 'Loss of Consciousness' spells:
 - Seizures
 - Psychiatric disturbances
- Establish the cause of syncope with sufficient certainty to:
 - Assess prognosis confidently
 - Initiate effective preventive treatment

Initial Evaluation

(Clinic/Emergency Dept.)

- Detailed history
- Physical examination
- 12-lead ECG
- Echocardiogram (as available)

Syncope

Basic Diagnostic Steps

- Detailed History & Physical
 - Document details of events
 - Assess frequency, severity
 - Obtain careful family history
- Heart disease present?
 - Physical exam
 - ECG: long QT, WPW, conduction system disease
 - Echo: LV function, valve status, HOCM
- Follow a diagnostic plan...

Syncope

Evaluation and Differential Diagnosis

History – What to Look for

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

12-Lead ECG

- Normal or Abnormal?
 - Acute MI
 - Severe Sinus Bradycardia/pause
 - AV Block
 - Tachyarrhythmia (SVT, VT)
 - Preexcitation (WPW), Long QT, Brugada
- Short sampling window (approx. 12 sec)

Carotid Sinus Massage

- Site:

- Carotid arterial pulse just below thyroid cartilage

- Method:

- Right followed by left, pause between
- Massage, NOT occlusion
- Duration: 5-10 sec
- Posture – supine & erect

Carotid Sinus Massage

- Outcome:

- 3 sec asystole and/or 50 mmHg fall in systolic blood pressure with reproduction of symptoms =

Carotid Sinus Syndrome (CSS)

- Contraindications

- Carotid bruit, known significant carotid arterial disease, previous CVA, MI last 3 months

- Risks

- 1 in 5000 massages complicated by TIA

Head-up Tilt Test (HUT)

- Unmasks VVS susceptibility
- Reproduces symptoms
- Patient learns VVS warning symptoms
- Physician is better able to give prognostic / treatment advice



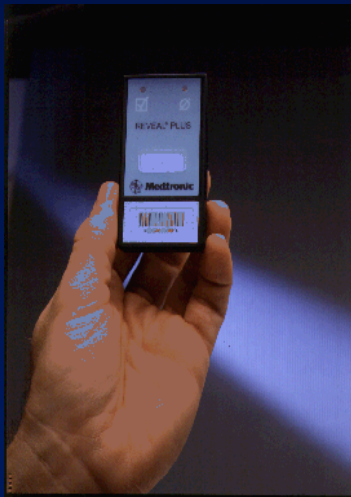
Electroencephalogram

- Not a first line of testing
- Syncope from Seizures
 - Abnormal in the interval between two attacks – Epilepsy
 - Normal – Syncope

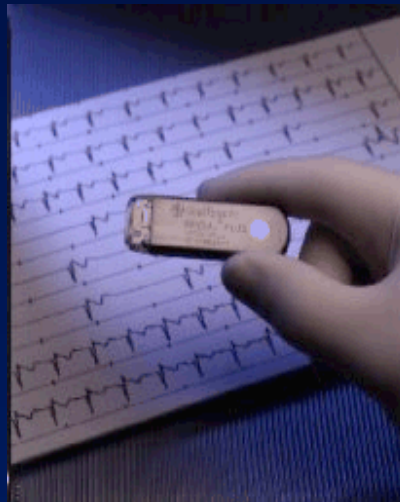
Ambulatory ECG

Method	Comments
Holter (24-48 hours)	Useful for infrequent events
Event Recorder	<ul style="list-style-type: none">■ Useful for infrequent events■ Limited value in sudden LOC
Loop Recorder	<ul style="list-style-type: none">■ Useful for infrequent events■ Implantable type more convenient (ILR)
Wireless (internet) Event Monitoring	Initiated

Reveal[®] Plus Insertable Loop Recorder



Patient Activator



Reveal[®] Plus ILR



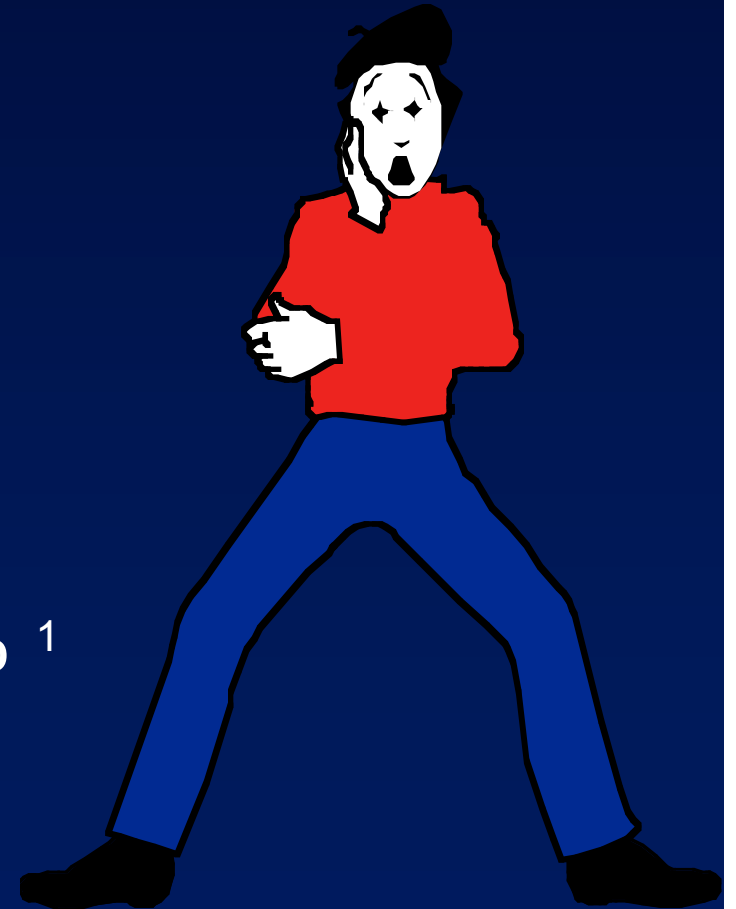
9790 Programmer

Conventional EP Testing in Syncope

- Limited utility in syncope evaluation
- Most useful in patients with structural heart disease
 - Heart disease.....50-80%
 - No Heart disease...18-50%
- Relatively ineffective for assessing bradyarrhythmias

Diagnostic Limitations

- Difficult to correlate spontaneous events and laboratory findings
- Often must settle for an attributable cause
- Unknowns remain 20-30% ¹

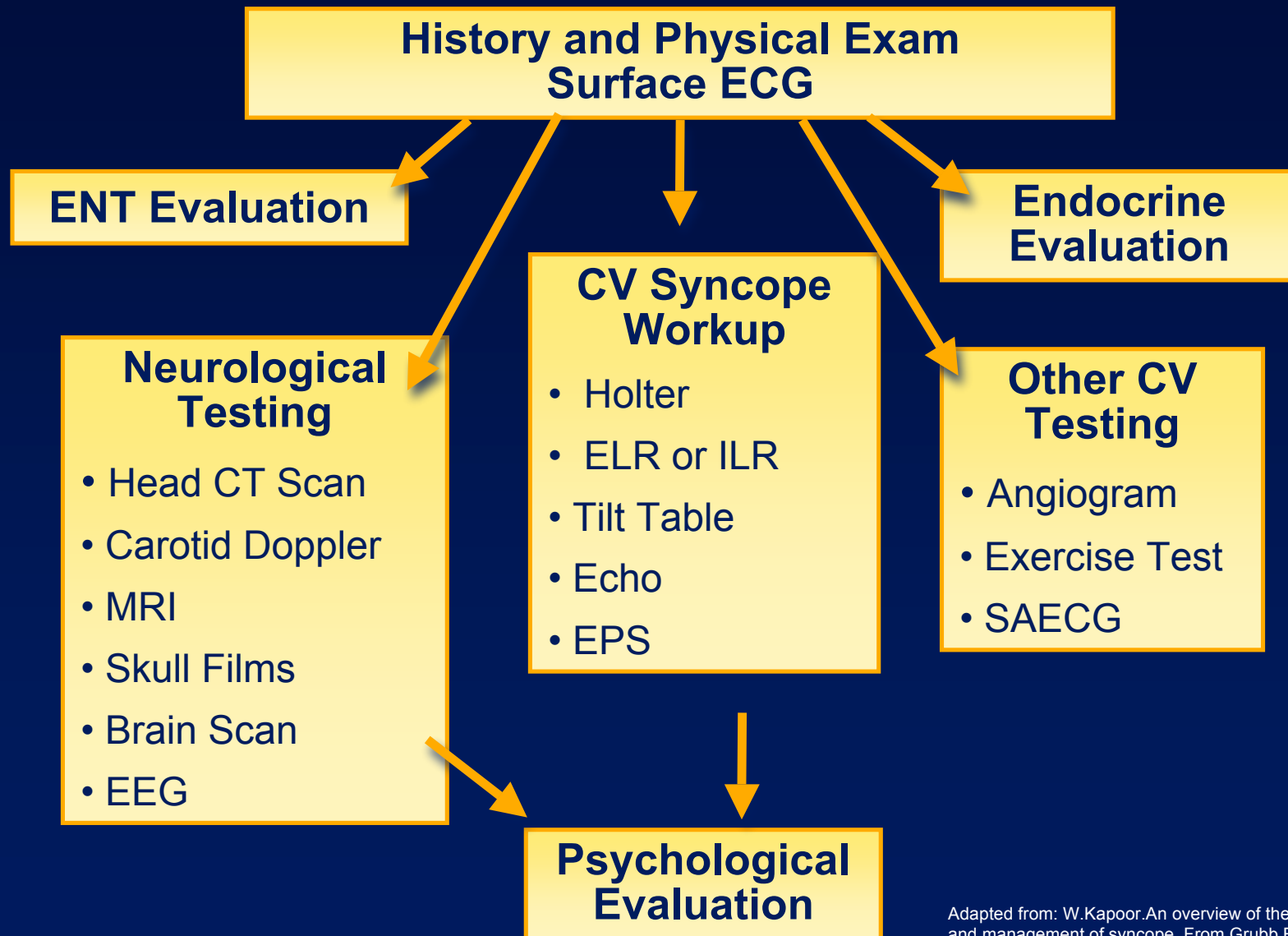


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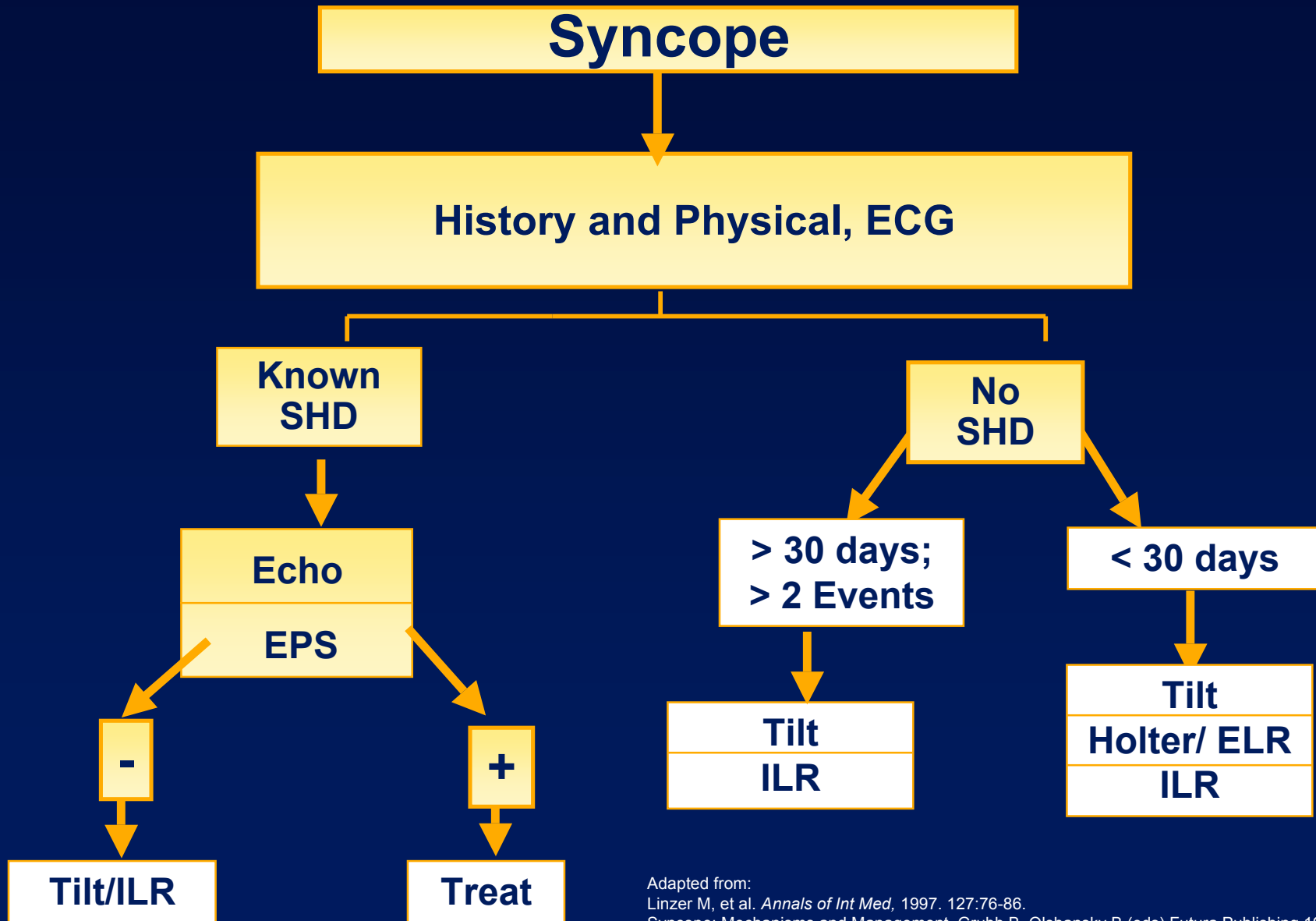
Challenges of Syncope

- Cost
 - Cost/year
 - Cost/diagnosis
- Quality of Life Implications
 - Work/financial
 - Mobility (automobiles)
 - Psychological
- Diagnosis & Treatment
 - Diagnostic yield and repeatability of tests
 - Frequency and clustering of events
 - Difficulty in managing/treating/controlling future events
 - Appropriate risk stratification
 - Complex Etiology

Unexplained Syncope Diagnosis



Typical Cardiovascular Diagnostic Pathway



Adapted from:
Linzer M, et al. *Annals of Int Med*, 1997. 127:76-86.
Syncope: Mechanisms and Management. Grubb B, Olshansky B (eds) Futura Publishing 1999
Zimetbaum P, Josephson M. *Annals of Int Med*, 1999. 130:848-856.
Krahn A et al. *ACC Current Journal Review*, 1999. Jan/Feb:80-84.

Specific Conditions

Neurally-Mediated Reflex Syncope (NMS)

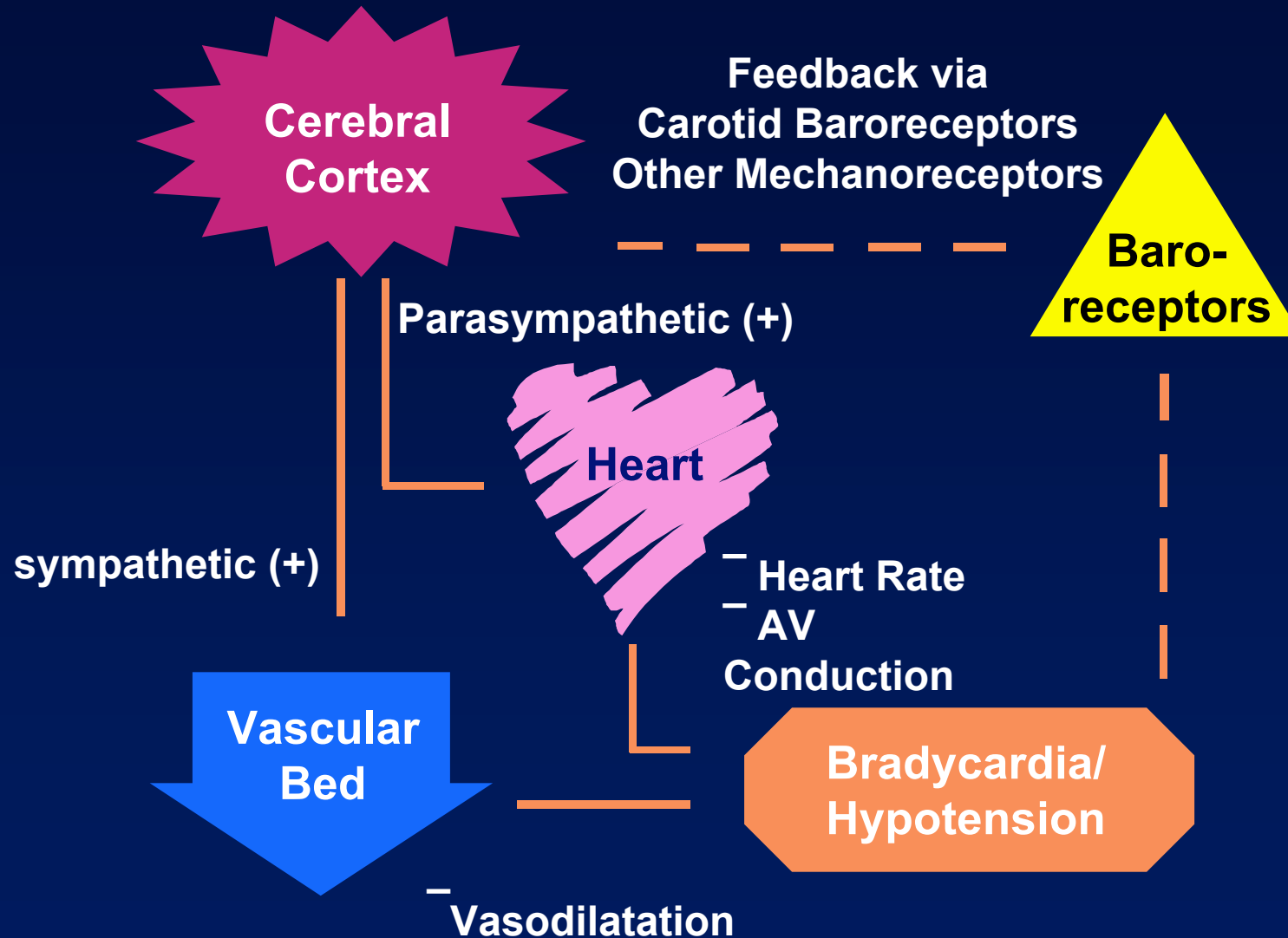
- Vasovagal syncope (VVS)
- Carotid sinus syndrome (CSS)
- Situational syncope
 - post-micturition
 - cough
 - swallow
 - defecation
 - blood drawing
 - etc.

NM Reflex Syncope: Pathophysiology

- Multiple triggers
- Variable contribution of vasodilatation and bradycardia



NMS – Basic Pathophysiology

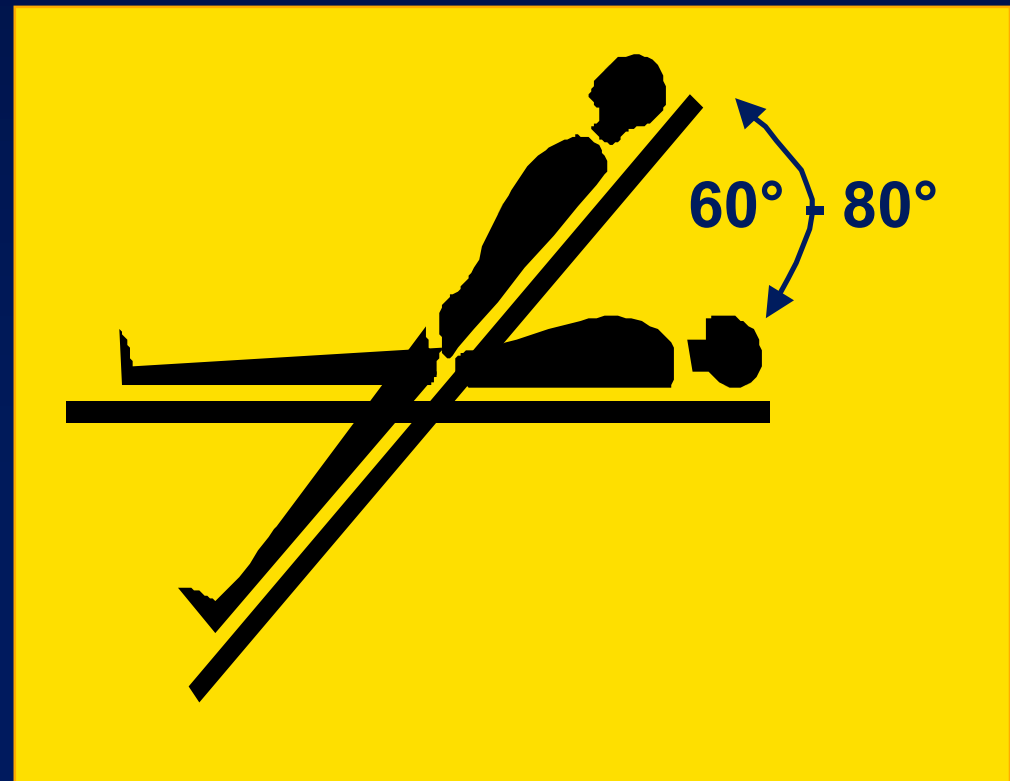


Vasovagal Syncope (VVS): Clinical Pathophysiology

- Neurally Mediated Physiologic Reflex Mechanism with two Components:
 - Cardioinhibitory (↓ HR)
 - Vasodepressor (↓ BP)
- Both components are usually present

Diagnosing VVS

- Patient history and physical exam
- Positive tilt table test
 - Overnight fast
 - ECG
 - Blood pressure
 - Supine and upright
 - Tilt to 60-80 degrees
 - Isoproterenol
 - Re-tilt



Management Strategies for VVS

- Optimal management strategies for VVS are a source of debate
 - Patient education, reassurance, instruction
 - Fluids, salt, diet
 - Tilt Training
 - Support hose
- Drug therapies
- Pacing
 - Class II indication for VVS patients with positive HUT and cardioinhibitory or mixed reflex

VVS: Treatment Overview

- Education
 - symptom recognition
 - reassurance
 - situation avoidance
- Tilt-Training
 - prescribed upright posture
- Pharmacologic Agents
 - salt/volume management
 - beta-adrenergic blockers
 - SSRIs
 - vasoconstrictors (e.g., midodrine)
- Cardiac Pacemakers

VVS: Tilt-Training

- Objectives

- Enhance Orthostatic Tolerance
- Diminish Excessive Autonomic Reflex Activity
- Reduce Syncope Susceptibility / Recurrences

- Technique

- Prescribed Periods of Upright Posture
- Progressive Increased Duration

VVS: Pharmacologic Rx

- Salt /Volume
 - Salt tablets, 'sport' drinks, fludrocortisone
- Beta-adrenergic blockers
 - 1 positive controlled trial (atenolol),
 - 1 on-going RCT (POST)
- Disopyramide
- SSRIs
 - 1 controlled trial
- Vasoconstrictors (e.g., midodrine)
 - 1 negative controlled trial (etilephrine)

Pacing in VVS

- Recent clinical studies demonstrated benefits of pacing in select VVS patients:
 - VPS I
 - VASIS
 - SYDIT
 - VPS II –Phase I
 - ROME VVS Trial

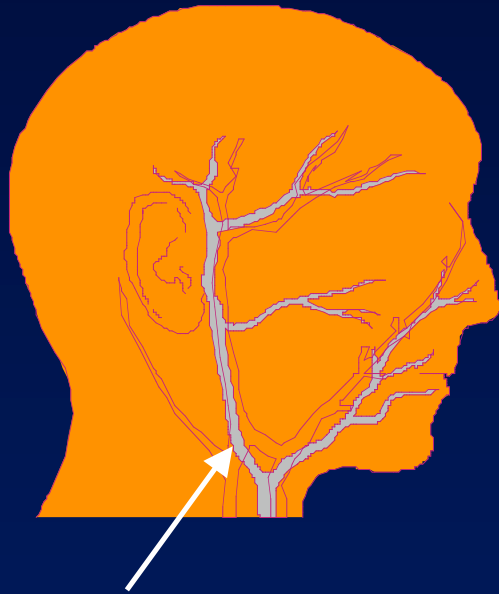
VVS Pacing Trials Conclusions

DDD pacing reduces the risk of syncope in patients with recurrent, refractory, highly-symptomatic, cardioinhibitory vasovagal syncope.

Carotid Sinus Syndrome (CSS)

- Syncope clearly associated with carotid sinus stimulation is rare ($\leq 1\%$ of syncope)
- CSS may be an important cause of unexplained syncope / falls in older individuals

Etiology of CSS



Carotid Sinus

- Sensory nerve endings in the carotid sinus walls respond to deformation
- “Deafferentation” of neck muscles may contribute
- Increased afferent signals to brain stem
- Reflex increase in efferent vagal activity and diminution of sympathetic tone results in bradycardia and vasodilation

Carotid Sinus Hypersensitivity(CSH)

- Abnormal response to CSM
- Absence of symptoms attributable to CSS
- CSH reported frequent in 'fallers' (Kenny)

CSH \neq CSS

CSS and Falls in the Elderly

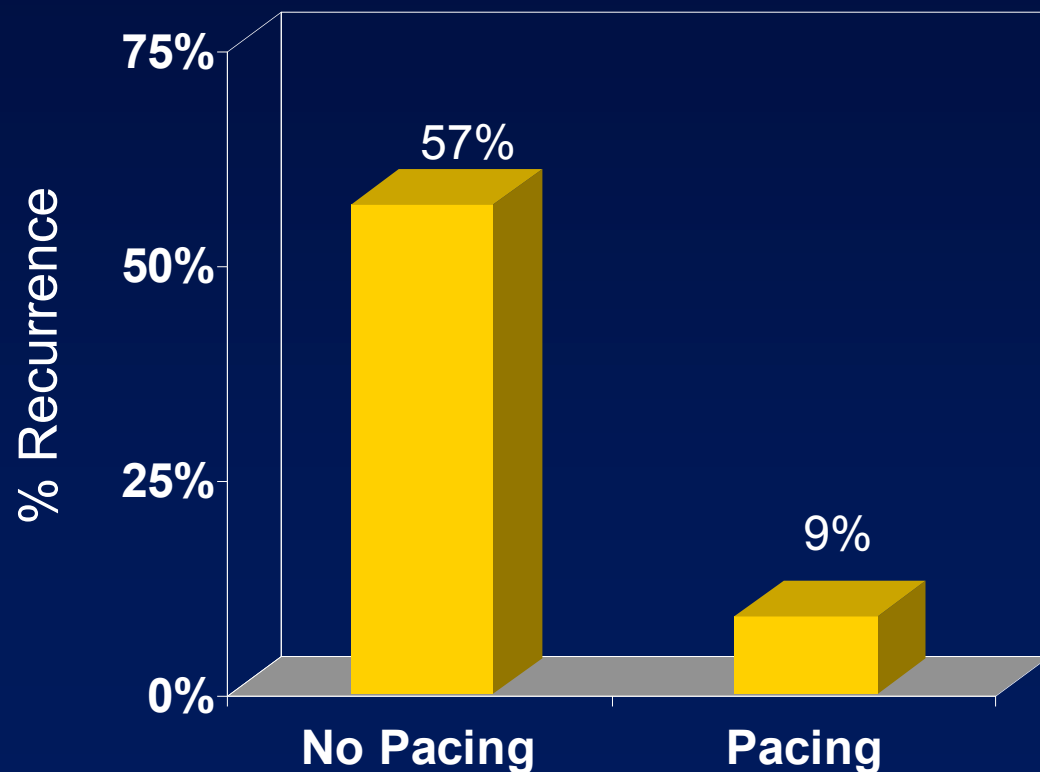
- 30% of people >65 yrs of age fall each year¹
 - Total is 9,000,000 people in USA
 - Approximately 10% of falls in elderly persons are due to syncope²
- 50% of fallers have documented recurrence³
- Prevalence of CSS among frequent and unexplained fallers unknown but...
 - CSH present in 23% of >50 yrs fallers presenting at ER³

¹Falling in the Elderly: U.S. Prevalence Data. *Journal of the American Geriatric Society*, 1995.

²Campbell et al: Age and Aging 1981;10:264-270.

³Richardson DA, Bexton RS, et al. Prevalence of cardioinhibitory carotid sinus hypersensitivity in patients 50 years or over presenting to the Accident and Emergency Department with "unexplained" or "recurrent" falls. *PACE* 1997

Role of Pacing in CSS -- Syncope Recurrence Rate



Class I indication for pacing (AHA and BPEG)
Limit pacing to CSS that is:

- Cardioinhibitory
- Mixed

DDD/DDI superior to VVI

(Mean follow-up = 6 months)

Principal Causes of Orthostatic Syncope

- Drug-induced (very common)
 - diuretics
 - vasodilators
- Primary autonomic failure
 - multiple system atrophy
 - Parkinsonism
- Secondary autonomic failure
 - diabetes
 - alcohol
 - amyloid
- Alcohol
 - orthostatic intolerance apart from neuropathy

Syncope Due to Arrhythmia or Structural CV Disease: General Rules

- Often life-threatening and/or exposes patient to high risk of injury
- May be warning of critical CV disease
 - Aortic stenosis, Myocardial ischemia, Pulmonary hypertension
- Assess culprit arrhythmia / structural abnormality aggressively
- Initiate treatment promptly

Principal Causes of Syncope due to Structural Cardiovascular Disease

- Acute MI / Ischemia
 - Acquired coronary artery disease
 - Congenital coronary artery anomalies
- HOCM
- Acute aortic dissection
- Pericardial disease / tamponade
- Pulmonary embolus / pulmonary hypertension
- Valvular abnormalities
 - Aortic stenosis, Atrial myxoma

Syncope Due to Cardiac Arrhythmias

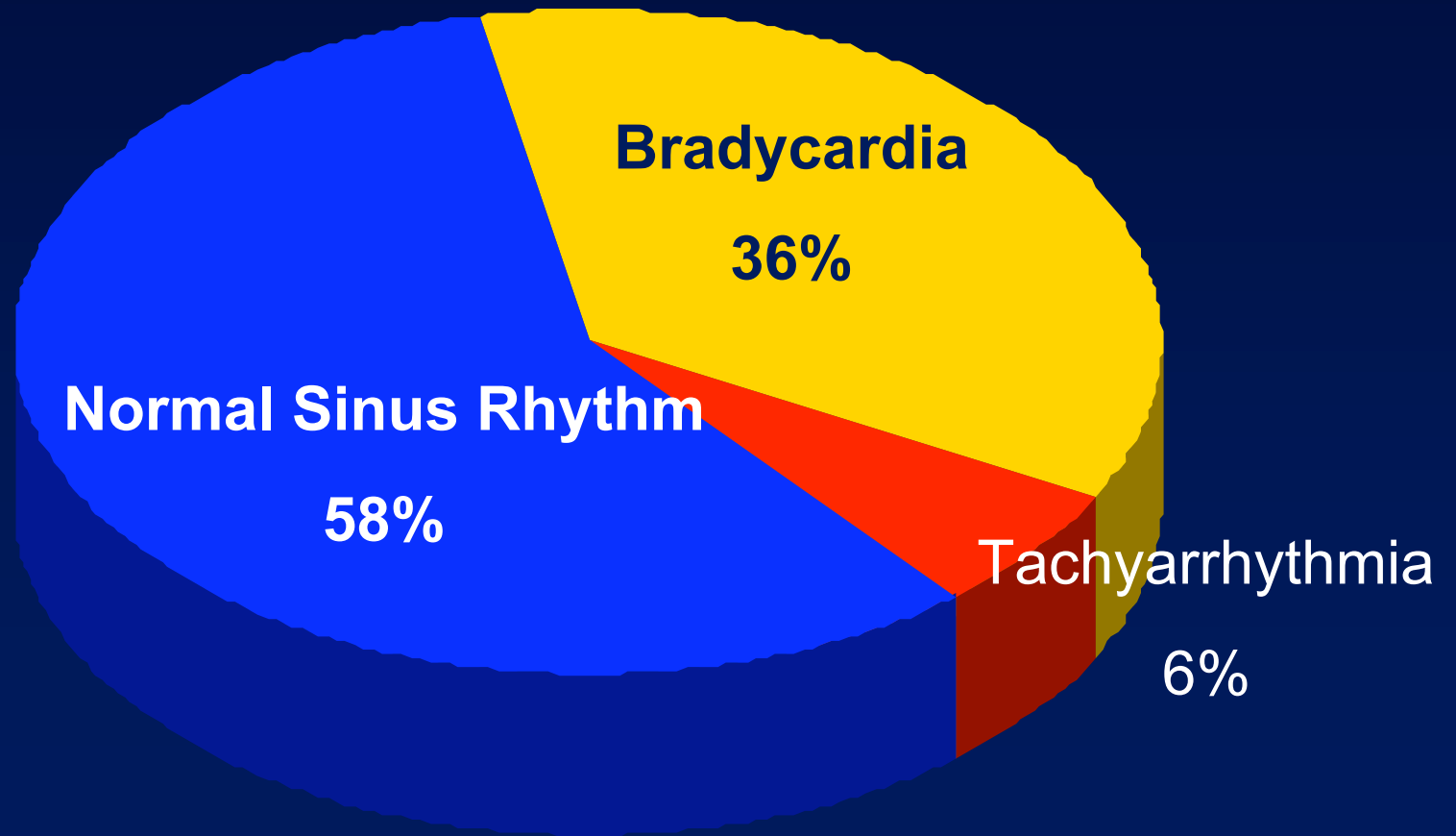
- Bradyarrhythmias

- Sinus arrest, exit block
- High grade or acute complete AV block

- Tachyarrhythmias

- Atrial fibrillation / flutter with rapid ventricular rate (e.g. WPW syndrome)
- Paroxysmal SVT or VT
- Torsades de pointes

Rhythms During Recurrent Syncope



Treatment of Syncope Due to Bradyarrhythmia

- Class I indication for pacing using dual-chamber system wherever adequate atrial rhythm is available
- Ventricular pacing in atrial fibrillation with slow ventricular response

Treatment of Syncope Due to Tachyarrhythmia

- Atrial Tachyarrhythmias;
 - AVRT due to accessory pathway – ablate pathway
 - AVNRT – ablate AV nodal slow pathway
 - Atrial fib^o – Pacing, linear / focal ablation, ICD selected pts
 - Atrial flutter – Ablation of reentrant circuit
- Ventricular Tachyarrhythmias;
 - Ventricular tachycardia – ICD or ablation where appropriate
 - Torsades de Pointes – withdraw offending Rx or ICD (long-QT/Brugada)
- Drug therapy may be an alternative in many cases

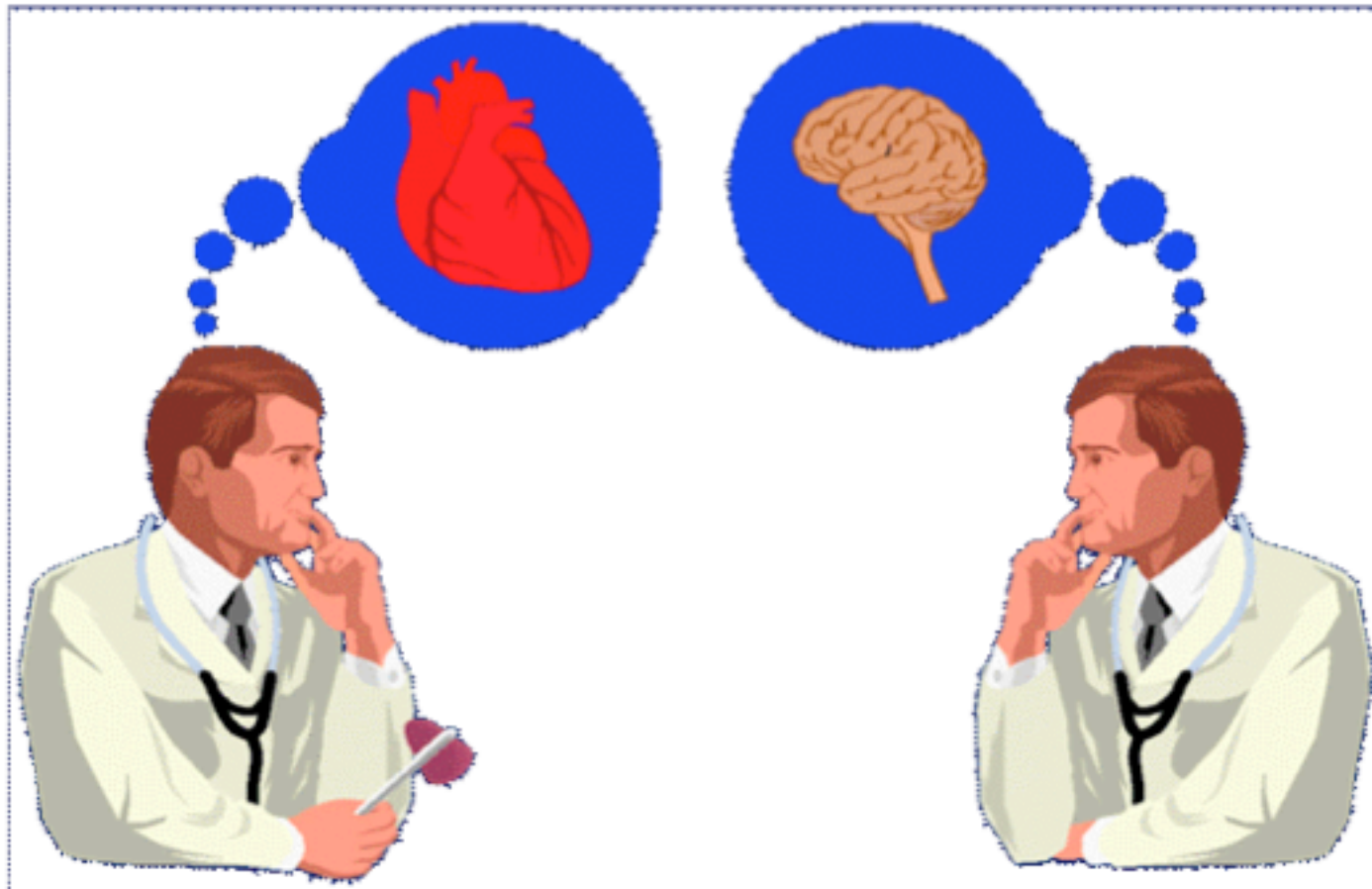
Conclusion

Syncope is a common symptom, often with dramatic consequences, which deserves thorough investigation and appropriate treatment of its cause.

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Discord in the Evaluation of Syncope



Neurologist

Cardiologist