SYNCOPE

Prof Neil Scolding
St Mary's Lacor and
Gulu University

University of BRISTOL
Institute of Clinical Neurosciences

Presentation Overview

I. Definition

II. Prevalence, Impact

III. Causes

IV. Diagnosis and Management

V. Specific Conditions

University of BRISTOL

Institute of Clinical Neurosciences

Syncope - definition

Syncope is a brief, self-limiting loss of consciousness and tone due to an acute global loss of cerebral circulation

It may occur without warning; or may be preceded by a syncopal prodrome, ***presyncope***

Transient loss of consciousness

Syncope

Epilepsy

Vertebrobasilar TIA

Hypoglycaemia

Transient CSF circulation block [tumours, esp. pineal]

Cataplexy

Head trauma

Intoxication

Hyperventilation

Sleep

Hysteria/functional

Impact of Syncope

- 40% of us will have syncope at least once[1]
- 10% of falls by elderly are due to syncope[2]
- Major morbidity reported in 6%[1]

  eg, fractures, motor vehicle accidents
- Minor injury in 29%[1]

  eg, lacerations, bruises

[1]Kenny RA, Kapoor WN. In: Benditt D, et al. eds. *The Evaluation and Treatment of Syncope*. Futura;2003:23-27..
[2]Campbell A, et al. *Age and Ageing*. 1981;10:264-270.

Institute of Clinical Neurosciences

Impact of Syncope: Costs

- Estimated hospital costs exceeded $10 billion[1]
- 1% emergency admissions to hospital
- 3% ED attendances
- Often misdiagnosed as epilepsy with major consequences for the patient

[1]Kenny RA, Kapoor WN. In: Benditt D, et al. eds. *The Evaluation and Treatment of Syncope*. Futura;2003:23-27.

GULU UNIVERSITY
FOR COMMUNITY TRANSFORMATION

University of BRISTOL
Institute of Clinical Neurosciences

Causes of Syncope

Neural

REFLEX
- VVS
- CSS
- Situational
  - Cough
  - Post-Micturition

ORTHOSTATIC
- Drug-Induced
- ANS Failure
  - Primary
  - Secondary

Cardiac

ARRHYTHMIC
- Brady
  - SN Dysfunction
  - AV Block
- Tachy
  - VT
  - SVT
- Long QT Syndrome

STRUCTURAL
- Acute Myocardial Ischemia
- Aortic Stenosis
- HCM
- Pulmonary Hypertension
- Aortic Dissection

GULU UNIVERSITY
FOR COMMUNITY TRANSFORMATION

University of BRISTOL
Institute of Clinical Neurosciences

Causes of Syncope

Neural

REFLEX

- VVS
- CSS
- Situational
  - Cough
  - Post-Micturition

ORTHOSTATIC

- Drug-Induced
- ANS Failure
  - Primary
  - Secondary

Cardiac

ARRHYTHMIC

- Brady
  - SN Dysfunction
  - AV Block
- Tachy
  - VT
  - SVT
- Long QT Syndrome

STRUCTURAL

- Aortic Stenosis
- HOCM
- Pulmonary Hypertension
- Aortic Dissection

Unexplained

GULU UNIVERSITY
FOR COMMUNITY TRANSFORMATION

University of BRISTOL

Institute of Clinical Neurosciences

Causes of Syncope

Neural

REFLEX 66%
- VVS
- CSS
- Situational
  - Cough
  - Post-Micturition

ORTHOSTATIC 10%
- Drug-Induced
- ANS Failure
  - Primary
  - Secondary

Cardiac

ARRHYTHMIC 10%
- Brady
  - SN Dysfunction
  - AV Block
- Tachy
  - VT
  - SVT
- Long QT Syndrome

STRUCTURAL 5%
- Aortic Stenosis
- HOCM
- Pulmonary Hypertension
- Aortic Dissection

Unexplained 10%

GULU UNIVERSITY
FOR COMMUNITY TRANSFORMATION

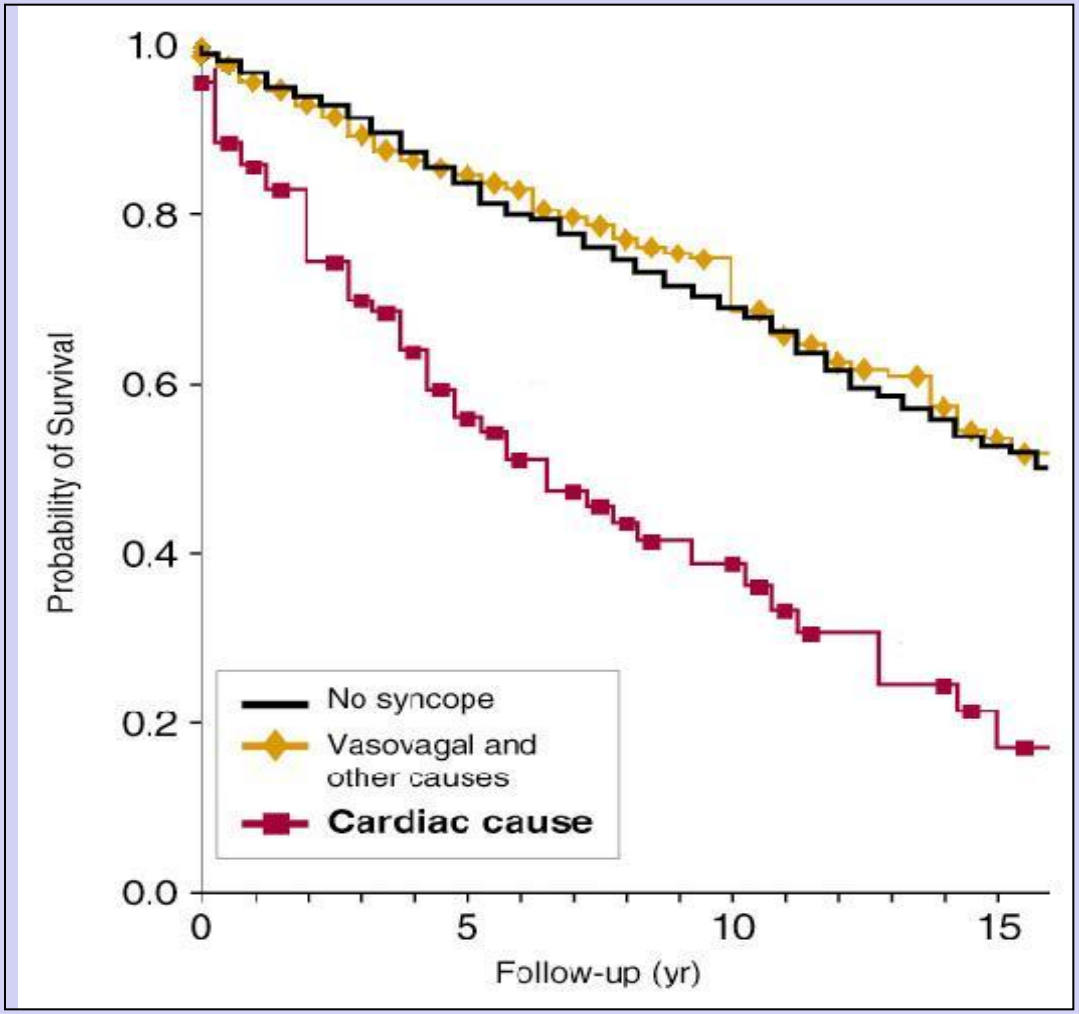
University of BRISTOL
Institute of Clinical Neurosciences

Syncope Mortality

Neural

vs.

Cardiac



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]

Institute of Clinical Neurosciences

SYNCOPE: diagnosis & management

Syncope

Epilepsy

Vertebro-basilar TIA

Hypoglycaemia

Transient CSF circulation block [tumours, esp. pineal]

Cataplexy

Head trauma

Intoxication

Hyperventilation

Sleep

Hysteria/functional

GULU UNIVERSITY
FOR COMMUNITY TRANSFORMATION

University of BRISTOL
Institute of Clinical Neurosciences

SYNCOPE: diagnosis & management

if unconscious…..

Airway, breathing, circulation
Exclude hypoglycaemia
Consider opiate or benzodiazepine overdose

History from all available sources

Examination

Investigations

- Bloods
- ECG
- ABGs
- CT head
- Lumbar puncture
- EEG

Glasgow coma scale

		Score
Eye opening	spontaneously	4
	to speech	3
	to pain	2
	none	1
Verbal response	orientated	5
	confused	4
	inappropriate	3
	incomprehensible	2
	none	1
Motor response	obeys commands	6
	localises to pain	5
	withdraws from pain	4
	flexion to pain	3
	extension to pain	2
	none	1
Maximum score		15

GULU UNIVERSITY
FOR COMMUNITY TRANSFORMATION

University of BRISTOL
Institute of Clinical Neurosciences

SYNCOPE: diagnosis & management

if unconscious…..

Signs of head injury +/- focal neurology
- CT head
- Other injuries
- Surgical management

Neck stiffness +/- focal neurology
- Blood cultures and antibiotics
- CT head, LP

Focal neurology without neck stiffness or head injury
- CT head

No head injury, neck stiffness or focal neurology
- Poisoning
- Metabolic disturbances
- Post-ictal
- Anoxic brain injury

GULU UNIVERSITY
FOR COMMUNITY TRANSFORMATION

University of BRISTOL
Institute of Clinical Neurosciences

Diagnostic Objectives

- Distinguish syncope from syncope mimic
  - especially epileptic seizures
- Establish the cause of syncope
  - determine presence of heart disease

GULU UNIVERSITY
FOR COMMUNITY TRANSFORMATION

University of BRISTOL
Institute of Clinical Neurosciences

History

- Circumstances of recent event
  - Eyewitness account of event
  - Symptoms at onset of event
  - Sequelae
  - Medications
- Circumstances of more remote events
- Concomitant disease, especially cardiac
- Pertinent family history
  - Cardiac disease
  - Sudden death
  - Metabolic disorders
- Past medical history
  - Neurological history
  - Syncope

Brignole M, et al. *Europace*, 2004;6:467-537.

Syncope – clinical features

Triggers - *severe pain; hot/airless/crowded room; sight of blood*

feel awful

vision blacks out

pale, sweaty before attack

<u>can have myoclonic jerks</u>

<u>rarely can have incontinence</u>

v rapid recovery, esp. awareness

Clinical Examination

- Vital signs
  - Heart rate
  - Orthostatic blood pressure change
- Cardiovascular exam: heart disease present?
  - ECG: Long QT, pre-excitation, conduction system disease
- Neurological exam
- *Carotid sinus massage* ***[NOT ROUTINELY]***
  - ***Only*** *perform under clinically appropriate conditions preferably during head-up tilt test*
  - *Monitor both ECG and BP*

Brignole M, et al. *Europace*, 2004;6:467-537.

Syncope

- History, Examination and ECG will give a presumptive diagnosis in 1/3rd of cases
- Red flag features increase risk of sudden death:-
  - Age > 50
  - Presence of heart disease
  - Family History of sudden cardiac death <35
  - Abnormal ECG
  - These patients need urgent cardiac assessment

Syncope

In susceptible people, coughing, swallowing or micturition may provoke vasovagal syncope.

Syncope during exertion is potentially serious and must be investigated in detail to exclude cardiac causes. However, most cases are usually eventually explained as being due to exercise-induced vasovagal syncope (which typically causes fainting immediately after exercise).

		Reflex (vasovagal) syncope	Seizure	Cardiac syncope
Prodrome	Trigger	Common (upright, bathroom, blood, needles)	Rare (flashing lights, hyperventilation)	Rare, exertional (consider left ventricular outflow obstruction)
	Prodrome	Almost always (presyncope)	Common (aura)	Uncommon or brief
	Onset	Gradual (often minutes)	Usually sudden	Usually sudden
Index event	Duration	1—30 s	1—3 min	Brief but variable
	Convulsive jerks	Common (brief)	Common (prolonged)	Common (brief)
	Incontinence	Uncommon	Common	Uncommon
	Lateral tongue bite	Very rare	Common	Very rare
	Colour	Very pale, cold skin	Pale or flushed (partial seizure); blue (tonic-clonic seizure)	Very pale, cold skin
Recovery	Post-ictal confusion	Rare (wakes on floor)	Common (wakes in ambulance)	Rare (wakes on the floor)
	Recovery	Quickly orientated	Slow (confused)	Quickly orientated
	After	Fatigue (minutes-hours)	Fatigue (minutes-hours)	No fatigue
		Predominantly young and healthy	Any	Older people with vascular risk factors

When is History and Physical Sufficient

- Young patient with single presentation or clear situational dependency
- Normal physical examination
- Normal ECG
- No significant injury
- Low risk occupation

Other Diagnostic Tests

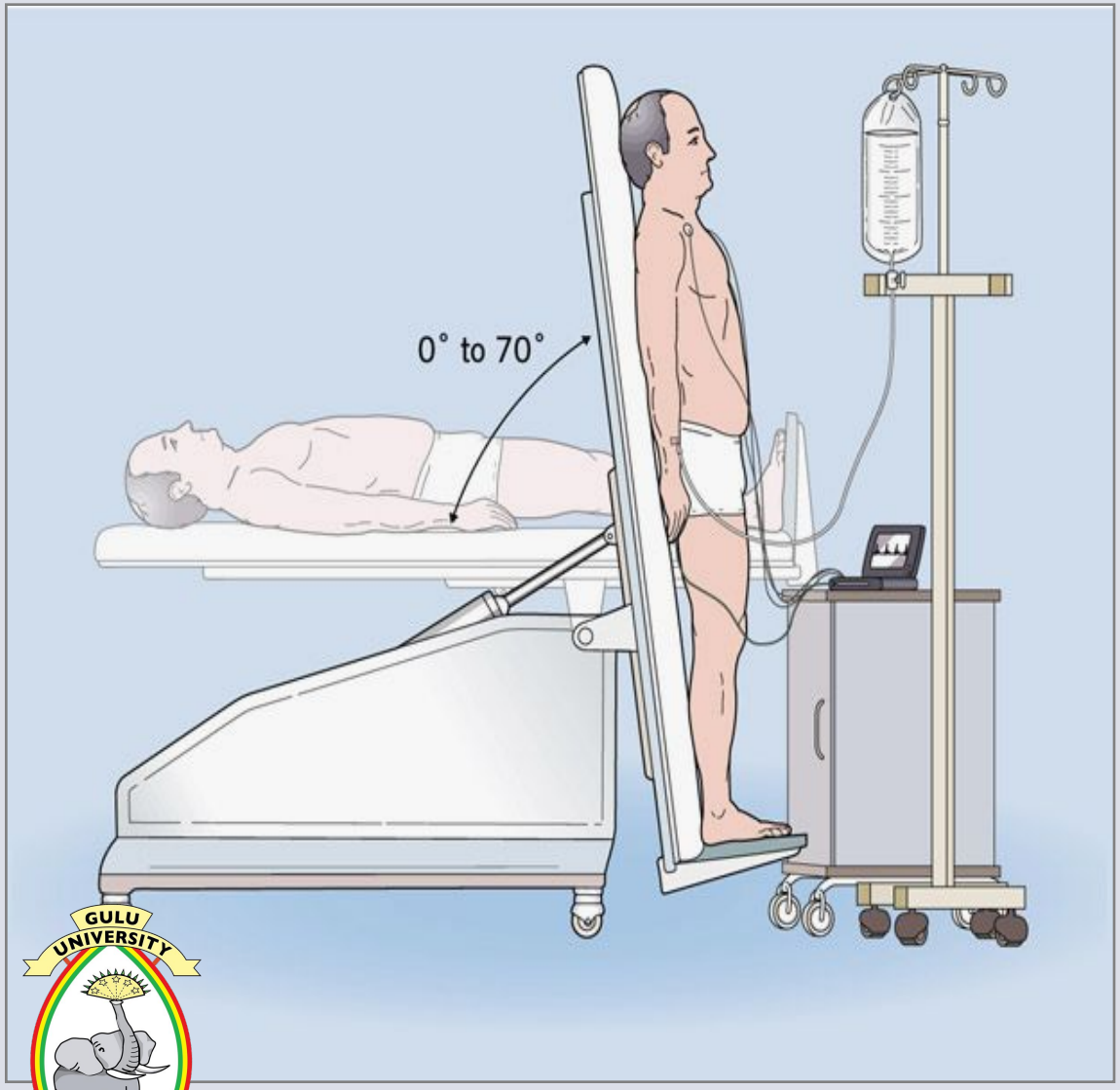
- Head-Up Tilt (HUT)
  - may include drug provocation (GTN, isoproterenol)
  - Carotid Sinus Massage (CSM)
- Echocardiography
- Ambulatory ECG
  - Holter monitoring
  - Event recorder
    - Insertable Loop Recorder (ILR)

Brignole M, et al. *Europace*, 2004;6:467-537.

University of BRISTOL

Institute of Clinical Neurosciences

Tilt table test



Tilt patient 70º, 15-45 min.

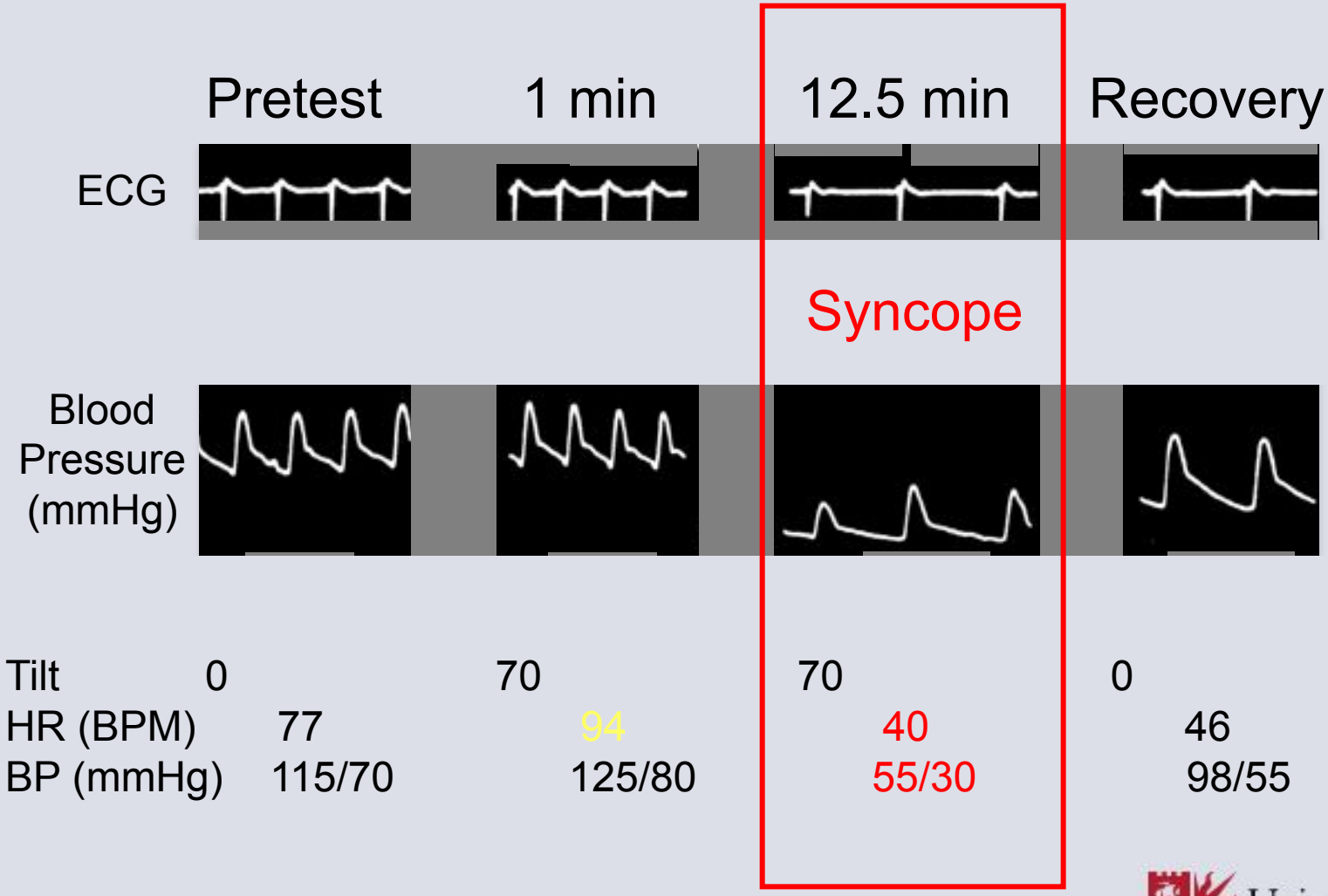
Identifies patients prone to vasodepressor syncope.

NB “=ve” result in ~7% of normal individuals without syncope

GULU UNIVERSITY
FOR COMMUNITY TRANSFORMATION

University of BRISTOL
Institute of Clinical Neurosciences

Tilt Table Response consistent with VVS



Sra JS. Ann Intern Med. 1991;114:1013-1019.

Carotid Sinus Massage (CSM)

- Carries a risk of sudden death
  - Prolonged asystole
  - Stroke

Institute of Clinical Neurosciences

Carotid Sinus Massage (CSM)

- Absolute contraindications[2]
  - Carotid bruit/known carotid disease
  - Previous CVA
  - MI last 3 months
- Complications
  - Primarily neurological
  - Less than 0.2%[3]
  - *Usually* transient

[1]Kenny RA. *Heart*. 2000;83:564.
[2]Linzer M. *Ann Intern Med*. 1997;126:989.
[3]Munro N, et al. *J Am Geriatr Soc*. 1994;42:1248-1251.

University of BRISTOL

Institute of Clinical Neurosciences

Carotid Sinus Massage (CSM)

- Method
  - Massage, 5-10 seconds
  - Don't occlude
  - Supine and upright posture (on tilt table)
- Outcome
  - 3 second asystole and/or 50 mmHg fall in sBP with reproduction of symptoms

    = Carotid Sinus Syndrome

Kenny RA. *Heart*. 2000;83:564.
Linzer M. *Ann Intern Med*. 1997;126:989.
Munro N, et al. *J Am Geriatr Soc*. 1994;42:1248-1251.

Institute of Clinical Neurosciences

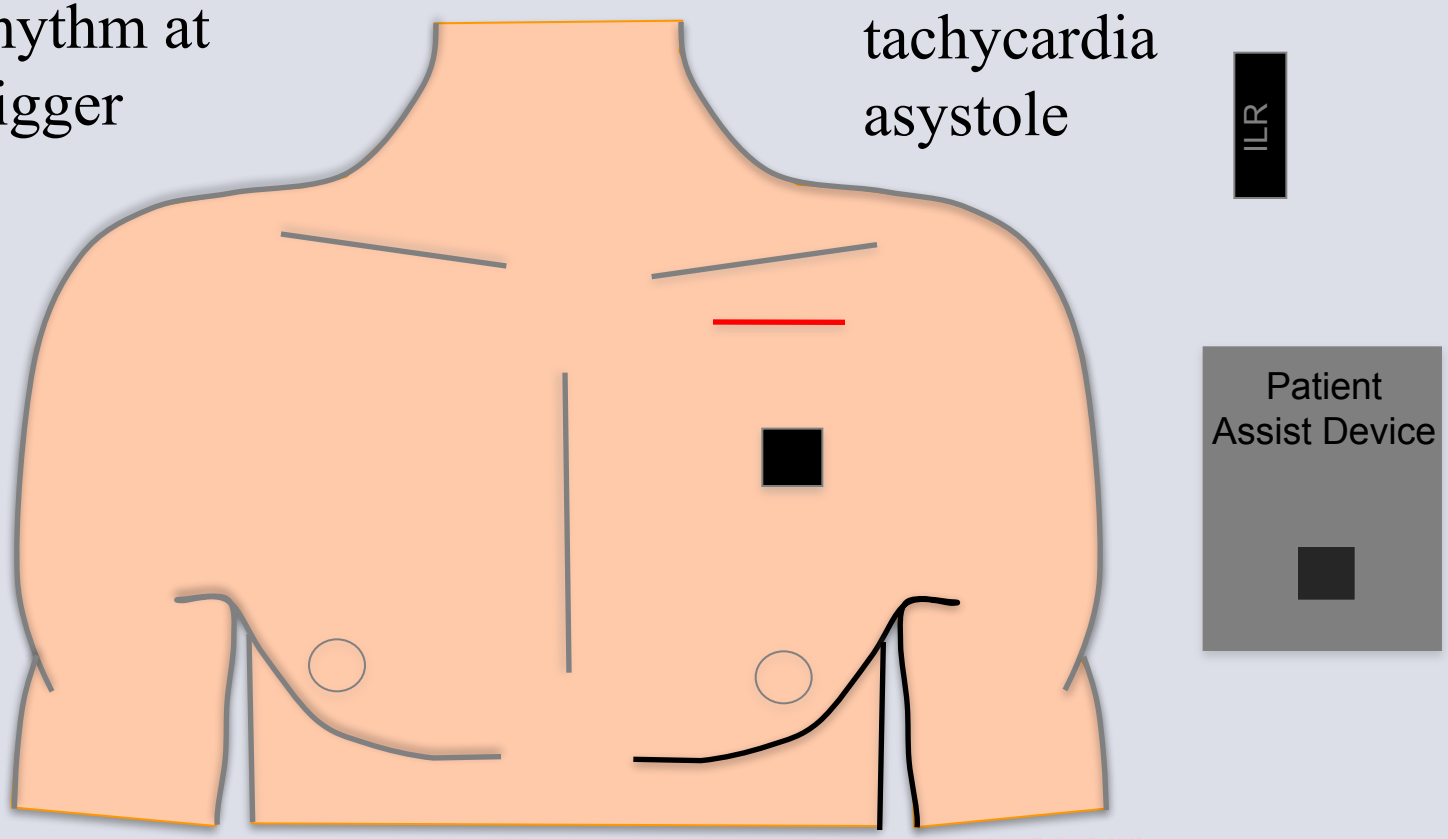
Electrophysiology Study

- Risk stratification of ventricular arrhythmias – assess for inducibility
- Poor at diagnosing brady-arrhythmias
- Highly sensitive for tachycardias.

Implantable Loop Recorders (ILR)

Records rhythm at time of trigger

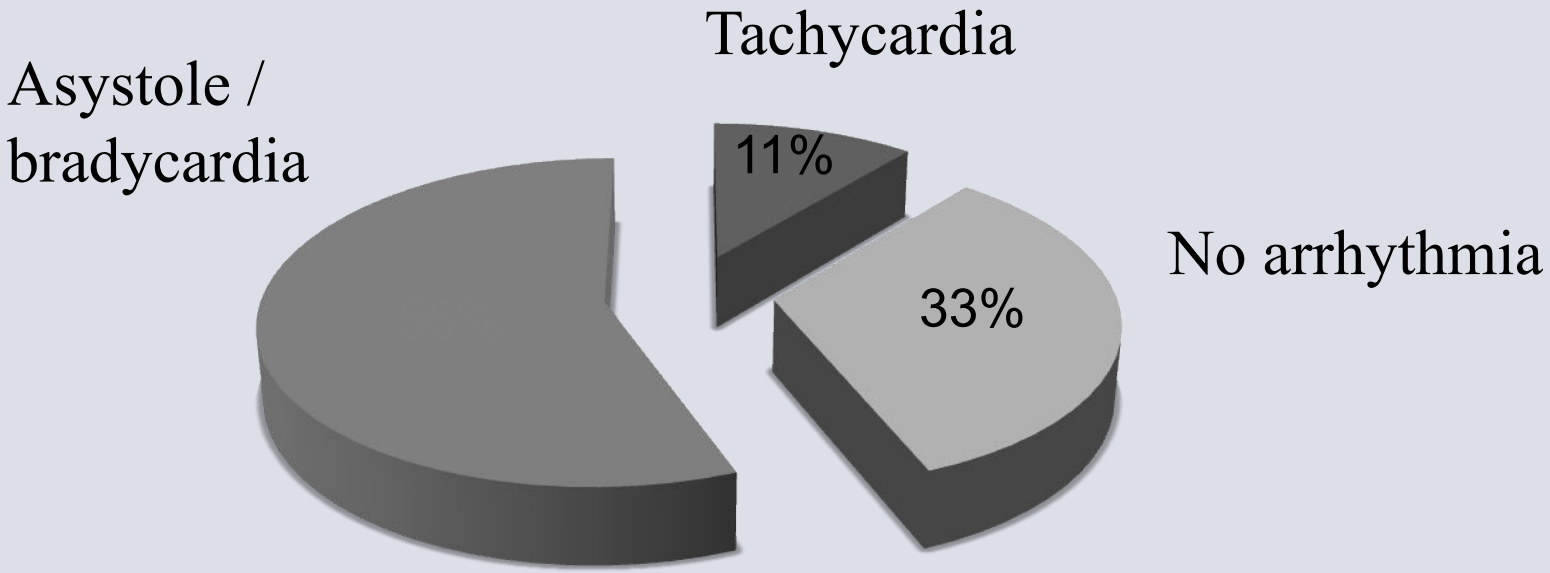
Automatically detects
bradycardia
tachycardia
asystole



GULU UNIVERSITY
FOR COMMUNITY TRANSFORMATION

University of BRISTOL
Institute of Clinical Neurosciences

ILR in unexplained syncope
with normal conventional work-up



Diagnostic yield: 35%
(175/506 patients)

Brignole et al. Europace 2009;11,671-687

Institute of Clinical Neurosciences

Diagnostic Assessment: Yields

(N=341[1] to 433[2])

Initial Evaluation	Yield (%)
History, Physical Exam, ECG	38-40
Other Tests/Procedures	
Head-Up Tilt	27
External Cardiac Monitoring	5-13
Insertable Loop Recorder (ILR)	43-88[3-5]
EP Study	<2-5
Exercise Test	0.5
EEG	0.3-0.5
MRI	No data available[6]

References Available

Institute of Clinical Neurosciences

Vasovagal (Reflex) Syncope

- Commonest form of syncope
- 35% of patients report recurrence ≤3 years[1]

[1]Savage D, et al. *STROKE.* 1985;16:626-29.
[2]Sheldon R, et al. *Circulation.* 1996;93:973-81.

Vasovagal (Reflex) Syncope

Pathophysiology

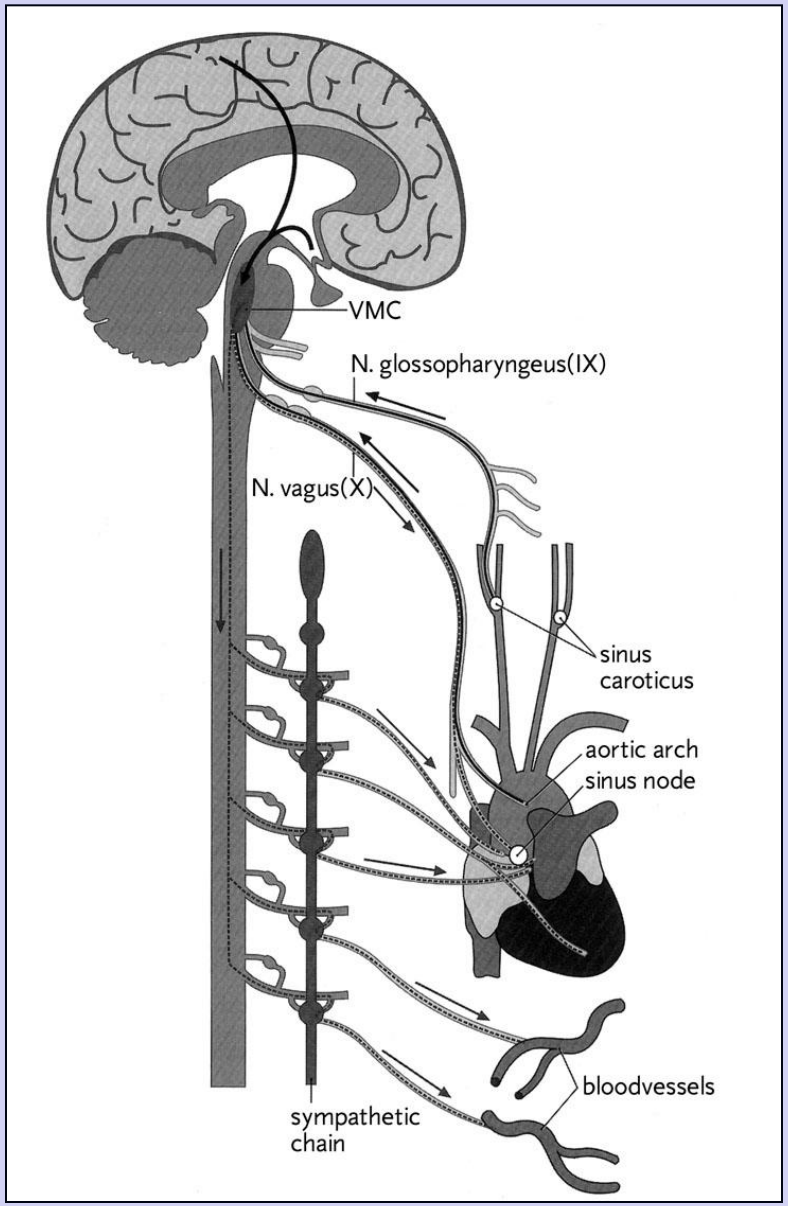
Autonomic Nervous System

Triggers - pain, emotional upset, etc → parasympathetic signals from the cortex → ↓ HR and ↓ AV conduction ↓ sympathetic activity → vasodilatation → HYPOTENSION

Carotid baroreceptors, other mechanoreceptors give paradoxical feedback to CNS, aggravating bradycardia and vasodilatation.

→ downward spiral in HR & BP

→ SYNCOPE

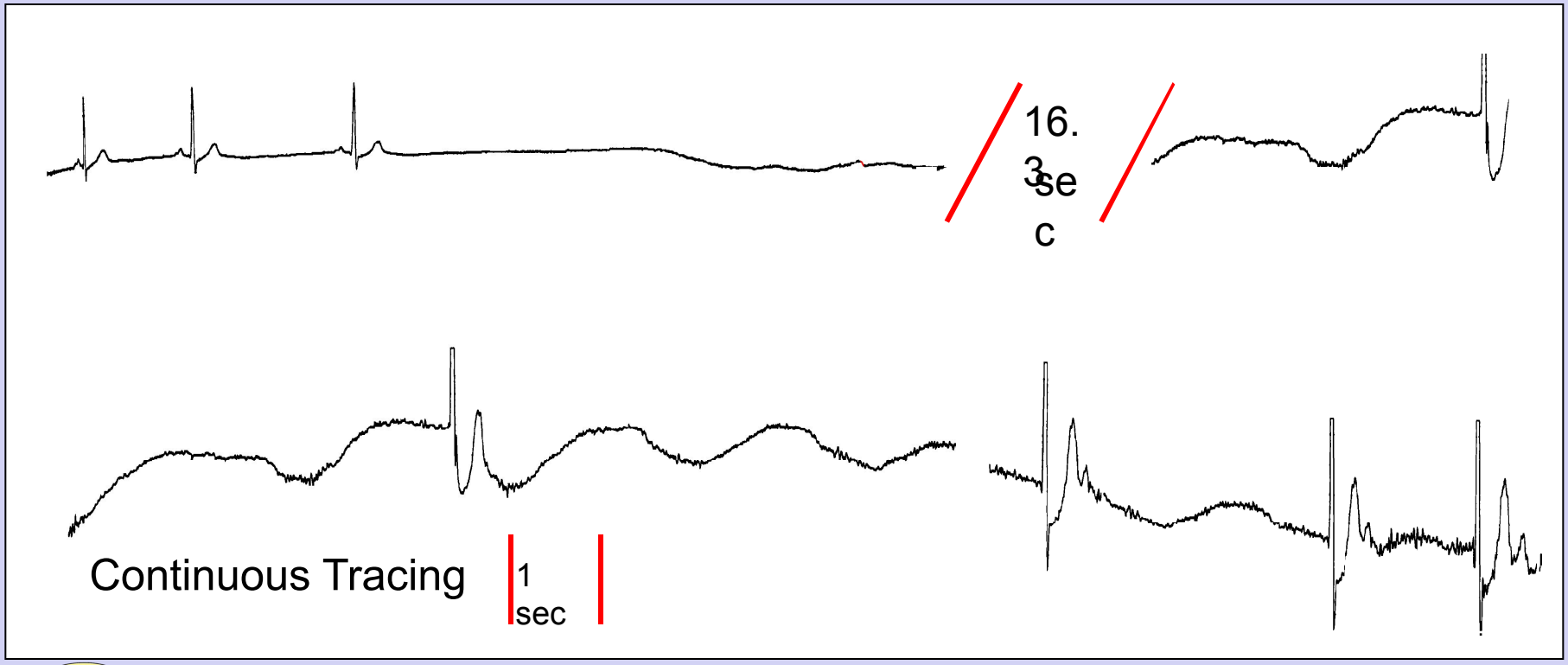


Benditt D, et al. *Neurally mediated syncope: Pathophysiology, investigations and treatment*. Blanc JJ, et al. eds. Futura. 1996.

University of BRISTOL
Institute of Clinical Neurosciences

Vasovagal (Reflex) Syncope

16 year-old male, healthy, athletic, monitored for fainting.



From the files of DG Benditt, MD. U of M Cardiac Arrhythmia Center

Vasovagal (Reflex) Syncope

Treatment

Acute intervention – often successful

- Physical manoeuvres
  - Lying down
  - Lowering head

Longer term prevention – often unsuccessful

- Education/avoidance
- Tilt training
- Diet, fluids, salt
- Drug therapy
- Pacing

Institute of Clinical Neurosciences

Vasovagal (Reflex) Syncope

- Tilt training

- Objectives
  - Enhance orthostatic tolerance / diminish excessive autonomic reflex activity
  - Reduce syncope recurrences
- Technique
  - Prescribed periods of upright posture against a wall
  - Start with 3-5 min BID
  - Increase by 5 min each week until a duration of 30 min is achieved
- Results
  - Reybrouck et al - 38 patients' poor adherence; likely placebo effect
  - Foglia-Manzillo et al - 68 patients, placebo-controlled: NO BENEFIT

Reybrouck T, et al. *PACE*. 2000;23(4 Pt. 1):493-498 .
Foglio-Manzillo G, et al. *Europace*. 2004;6:199-204.

Institute of Clinical Neurosciences

Vasovagal (Reflex) Syncope

Pharmacologic Treatment

- Fludrocortisone
- Beta-adrenergic blockers
- SSRI
- Vasoconstrictors ?? midodrine

Ward C, et al. *Heart*. 1998;79:45-49.
Perez-Lugones A, et al. *J Cardiovasc Electrophysiol*. 2001;12(8):935-938.

GULU UNIVERSITY
FOR COMMUNITY TRANSFORMATION

University of BRISTOL
Institute of Clinical Neurosciences

Vasovagal (Reflex) Syncope

Pacing

- study results not very encouraging
- older patients, & those with long asystolic pauses most likely to benefit
- should be considered the therapy of last resort if no other medical therapy is effective

Connolly S. *JAMA*. 2003;289:2224-2229.
Giada F. *PACE* . 2003;26:1016 (abstract).
Occhetta E, et al. *Europace*. 2004;6:538-547.

GULU UNIVERSITY
FOR COMMUNITY TRANSFORMATION

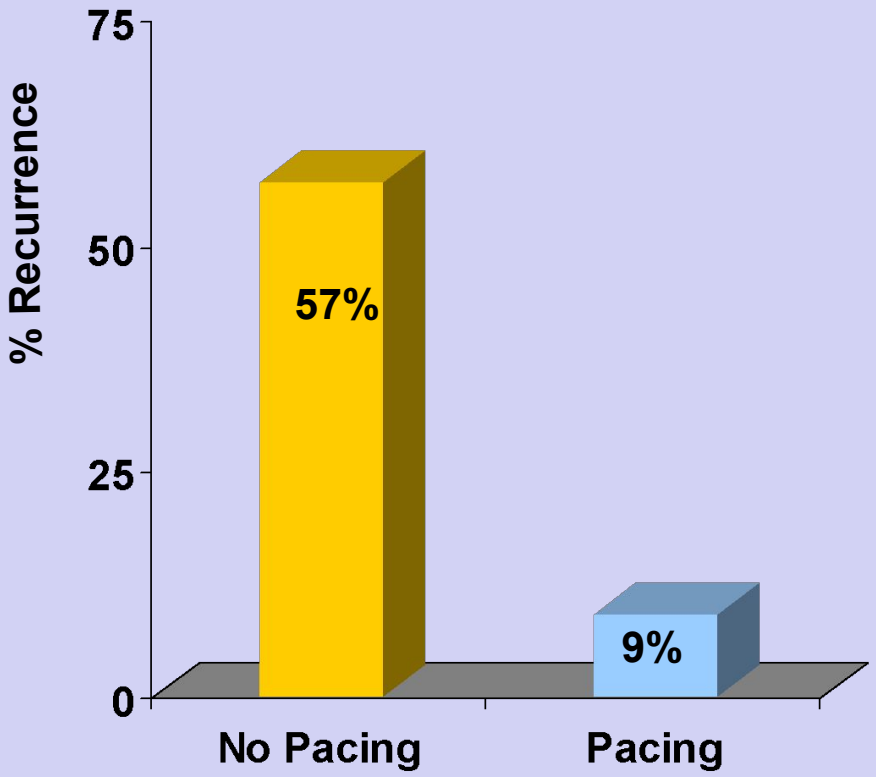
University of BRISTOL
Institute of Clinical Neurosciences

Carotid Sinus Syndrome

- rare (≤1% of syncope)
- sensory nerve endings in carotid sinus walls abnormally responsive
- reflex ↑ in efferent vagal activity & ↓ sympathetic tone results in bradycardia and vasodilatation
- usually individuals > 50
- head-turning, tight collar may be present
- important to spot because…

Carotid Sinus Syndrome

- Class I indication for pacing
- AV sequential pacing better than ventricular demand pacing
- Falls also reduced



Brignole M, et al. *Eur JCPE*. 1992;4:247-254.

Kenny RA. *J Am Coll Cardiol. 2001*;38:1491-1496.

Institute of Clinical Neurosciences

Orthostatic Hypotension

- Drop in sBP ≥ 20mmHg or dBP ≥ 10mmHg 3 minutes after standing [or head-up tilt on a tilt table]
- an important cause of syncope
- caused by sympathetic autonomic (vasoconstrictor) failure
- most cases, no compensatory increased heart rate
- [can be ‘delayed’ – beyond 3 minutes]

GULU UNIVERSITY
FOR COMMUNITY TRANSFORMATION

University of BRISTOL
Institute of Clinical Neurosciences

Orthostatic Hypotension Aetiology

- an important cause of syncope

- Drug-induced (very common)
  - Diuretics
  - Vasodilators
- Primary autonomic failure
  - Multiple system atrophy
  - Parkinson's Disease
  - Postural Orthostatic Tachycardia Syndrome (POTS)
- Post-prandial
- Volume depletion
- Secondary autonomic failure
  - Diabetes
  - Alcohol
  - Amyloid
  - HIV neuropathy

GULU UNIVERSITY
FOR COMMUNITY TRANSFORMATION

University of BRISTOL
Institute of Clinical Neurosciences

Orthostatic Hypotension Treatment

- Patient education, injury avoidance
- Hydration
  - Fluids, salt, diet
  - Minimize caffeine/alcohol
- Sleeping with head of bed elevated
- Tilt training, leg crossing, arm pull
- Support stockings
- Drug therapies - Fludrocortisone, midodrine, erythropoietin
- Tachy-Pacing (probably not useful)

GULU UNIVERSITY
FOR COMMUNITY TRANSFORMATION

University of BRISTOL
Institute of Clinical Neurosciences

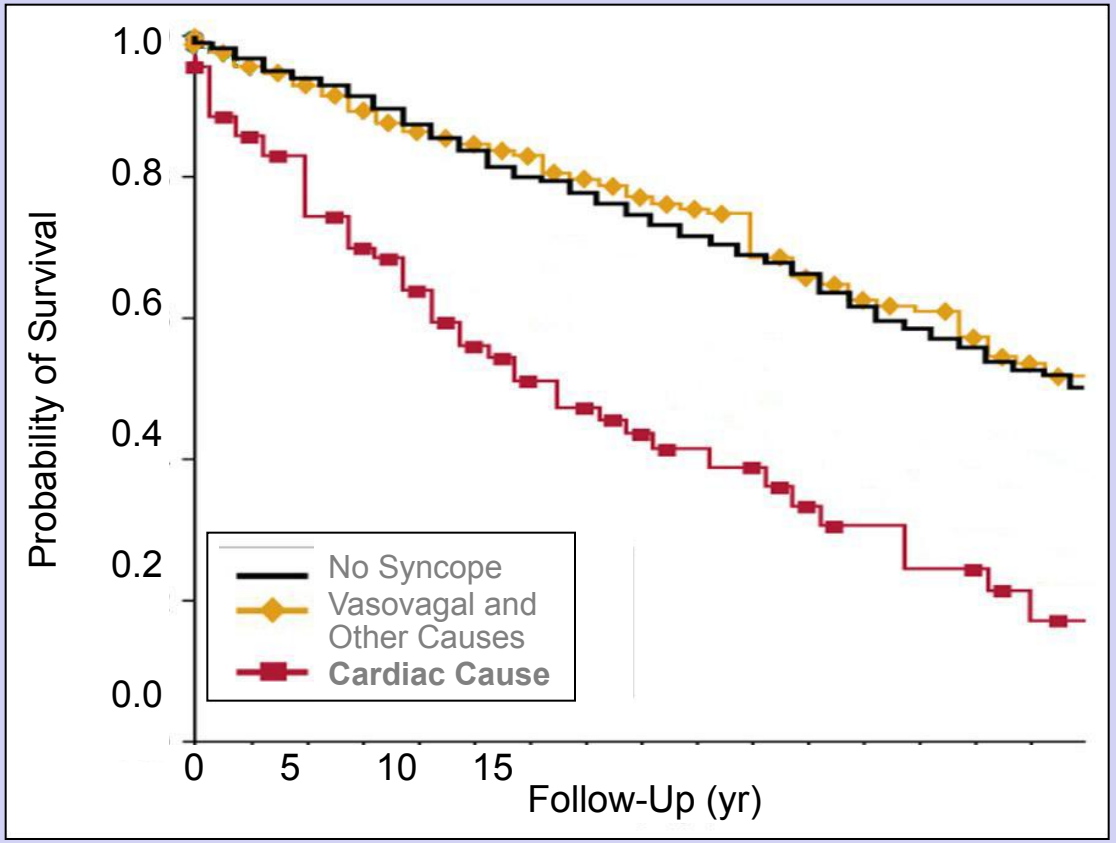
Cardiac syncope

- Cardiac arrhythmia
  - Brady/Tachycardia
  - Long QT syndrome
  - Torsade de pointes

- Structural cardio-pulmonary
  - Aortic stenosis
  - HOCM

Cardiac syncope

- 6-month mortality rate > 10%
- Cardiac syncope doubles the risk of death

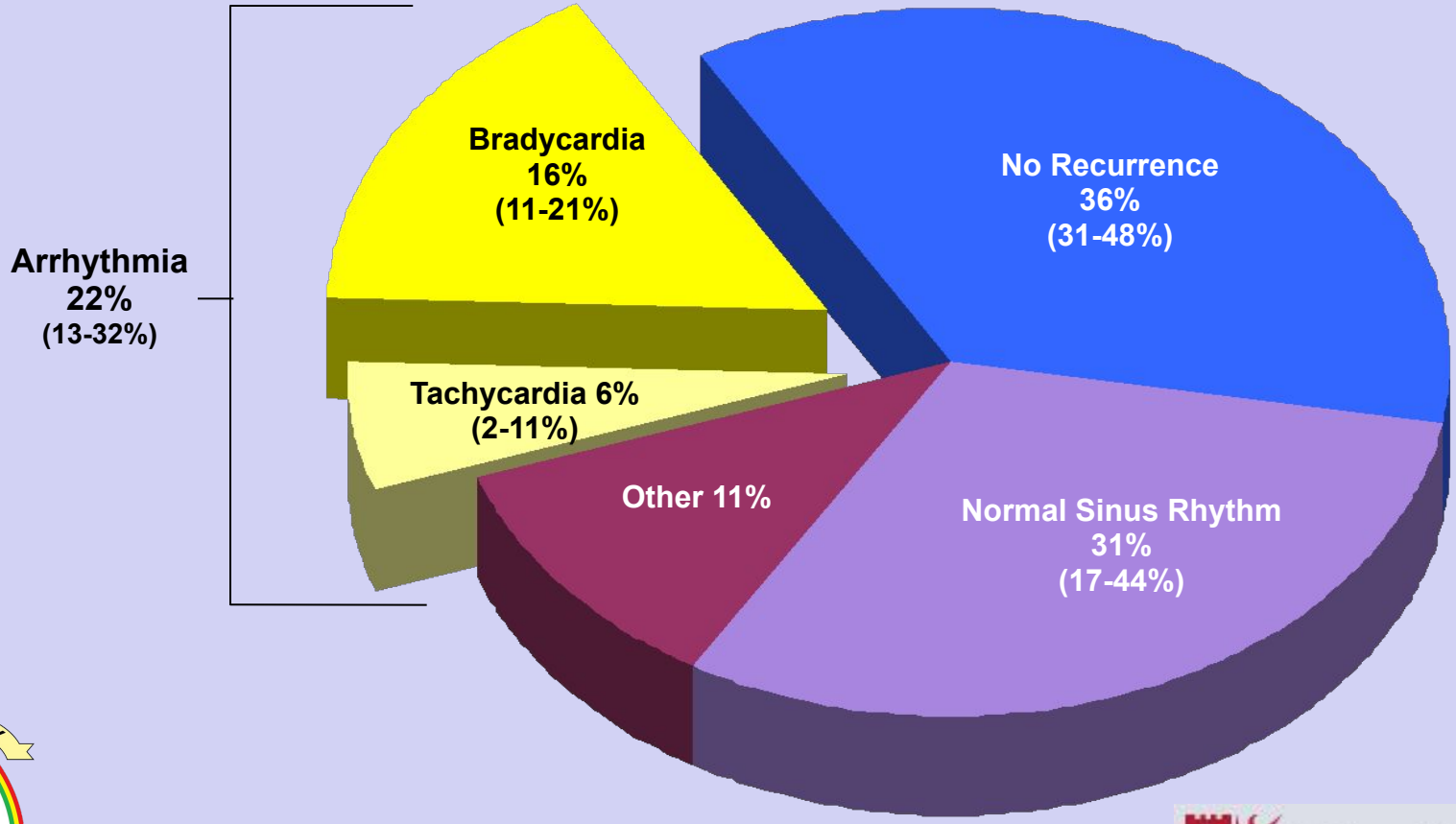


Soteriades ES, et al. *N Engl J Med.* 2002;347:878.

Syncope Due to Cardiac Arrhythmias

- Bradyarrhythmias
  - Sinus arrest, exit block
  - High grade or acute complete AV block
  - Can be accompanied by vasodilatation (VVS, CSS)
- Tachyarrhythmias
  - Atrial fibrillation/flutter with rapid ventricular rate (eg, pre-excitation syndrome)
  - Paroxysmal SVT or VT
  - Torsade de pointes

Cardiac Rhythms During Unexplained Syncope



Seidl K. *Europace*. 2000;2(3):256-262.
Krahn AD. *PACE*. 2002;25:37-41.
Medtronic ILR Replacement Data. FY03, 04. On file.

GULU UNIVERSITY
FOR COMMUNITY TRANSFORMATION

University of BRISTOL
Institute of Clinical Neurosciences

Long QT Syndromes

- Mechanism
  - Abnormalities of sodium and/or potassium channels
  - Susceptibility to polymorphic VT (Torsade de pointes)
- Prevalence
  - Drug-induced forms – Common
  - Genetic forms – Relatively rare, but increasingly being recognized
  - “Concealed” forms:
    - May be common
    - Provide basis for ***drug-induced torsade***

Drug-Induced QT Prolongation

(List is continuously being updated)

- Antiarrhythmics
  - Class IA ...Quinidine, Procainamide, Disopyramide
  - Class III…Sotalol, Ibutilide, Dofetilide, Amiodarone, NAPA*
- Antianginal Agents
  - Bepridil*
- Psychoactive Agents
  - Phenothiazines, Amitriptyline, Imipramine, Ziprasidone
- Antibiotics
  - Erythromycin, Pentamidine, Fluconazole, Ciprofloxacin and its relatives
- Nonsedating antihistamines
  - Terfenadine*, Astemizole
- Others
  - Cisapride*, Droperidol, Haloperidol

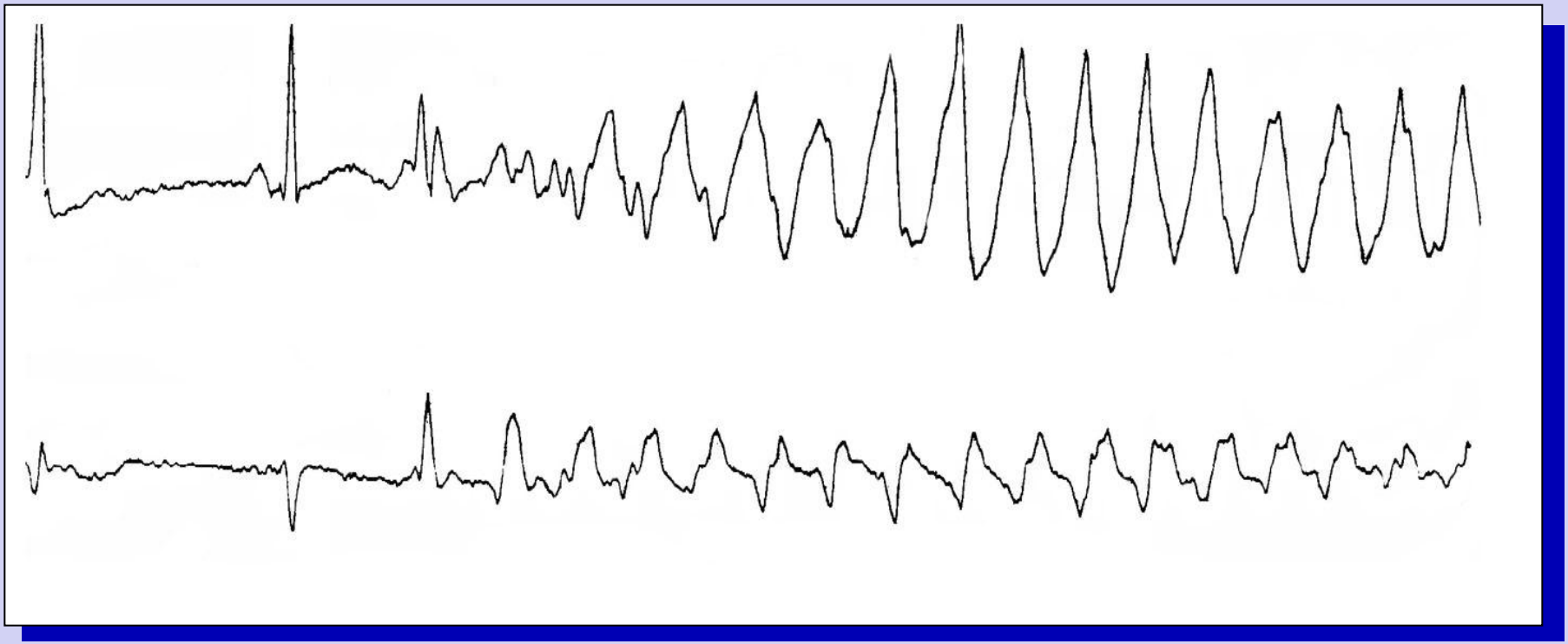
*Removed from U.S. Market

Brignole M, et al. *Europace*, 2004;6:467-537.

GULU UNIVERSITY
FOR COMMUNITY TRANSFORMATION

University of BRISTOL
Institute of Clinical Neurosciences

Syncope: Torsade de Pointes



From the files of DG Benditt, MD. U of M Cardiac Arrhythmia Center

Institute of Clinical Neurosciences

Treatment of Long QT

- Suspicion and recognition are critical
- Emergency treatment
  - Intravenous magnesium
  - Pacing to overcome bradycardia or pauses
  - Isoproterenol to increase heart rate and shorten repolarization
  - ICD if prior SCA or strong family history
  - If drug induced:
    - Reverse bradycardia
    - Withdraw drug
    - Avoid ALL long-QT provoking agents
  - If genetic: Avoid ALL long-QT provoking agents
- *For more information visit www.longqt.org*

Treatment of syncope due to arrhythmia

Bradyarrhythmia

- Class I indication for pacing using dual chamber system wherever possible
- Ventricular pacing in AF with slow ventricular response

ACC/AHA/NASPE 2002 Guideline Update. *Circ*. 2002;106:2145-2161.

University of BRISTOL

Institute of Clinical Neurosciences

Treatment of syncope due to arrhythmia

Tachyarrhythmia

- Atrial tachyarrhythmias
  - AVRT due to accessory pathway – Ablate pathway
  - AF – Pacing, linear/focal ablation for paroxysmal AF
  - Atrial flutter – Ablate the IVC-TV isthmus of re-entrant circuit
- Ventricular tachyarrhythmias
  - Ventricular tachycardia – ICD or ablation where appropriate
  - Torsade de pointes – Withdraw offending drug or implant ICD (long QT/Brugada/short QT)
- Drug therapy may be an alternative in some cases

ACC/AHA/NASPE 2002 Guideline Update. *Circ*. 2002;106:2145-2161.

Conclusions

- Syncope is common, and has many causes
- Can be very serious
- Therefore needs assessment and appropriate treatment
- Potentially life-threatening causes : **rare**, but can usually be successfully prevented
- Vasovagal syncope **common**, not life-threatening, but harder to prevent

University of BRISTOL

Institute of Clinical Neurosciences