

IMPROVING THE EVALUATION AND MANAGEMENT OF SYNCOPE

Kapil Kumar, MD

Director of Arrhythmia Services, Atrius Health
Instructor in Medicine Part-Time, Harvard Medical School
Boston, MA

DISCLOSURES

- No disclosures relevant to this topic

History & Exam

Testing

Treatment

DEFINITION: KEY ELEMENTS



GLOBAL CEREBRAL
HYPERFUSION



TRANSIENT LOSS OF
CONSCIOUSNESS
AND POSTURAL TONE



RAPID AND BRIEF



SPONTANEOUS
RECOVERY



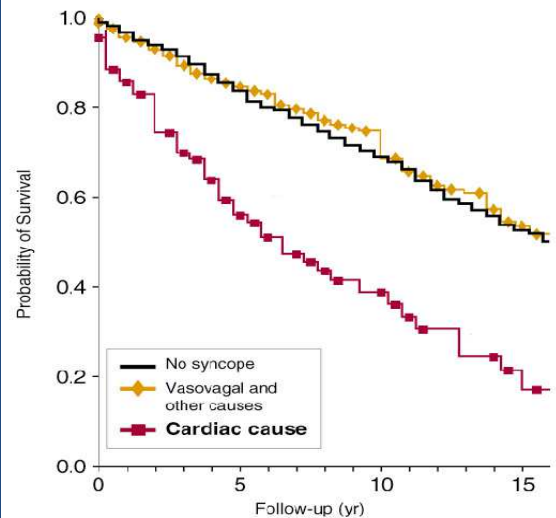
VARIABLE
PRODROMAL
SYMPTOMS



CARDIAC CAUSE OF SYNCOPE

- Etiology of syncope has a significant impact on mortality
 - Cardiac vs non-cardiac syncope
- Appropriate, timely therapy has great potential to prevent morbidity and mortality

Soteriades *N Engl J Med.* 2002



CASE#1



HISTORY

26yo female with no significant PMH presents with first syncope in setting of heated argument with parents



PRODROME

none



WITNESSES

arm shaking for ~2-3 min, urinary incontinence



UPON WAKING

confused, disoriented for >1 hour



WORKUP

not orthostatic, laboratories and ECG normal
Exam with horizontal nystagmus, tongue bleeding

*WHAT DO YOU DO NEXT?

1. No further testing, discharge home
2. Echocardiogram
3. Head CT/MRI
4. Stress test
5. Start fludrocortisone

*WHAT DO YOU DO NEXT?

1. No further testing, discharge home
2. Echocardiogram
3. Head CT/MRI
4. Stress test
5. Start fludrocortisone

Likely first time seizure

WEED OUT IMPOSTERS

Hypoglycemia

Hypoxia

Sleep Disorders: narcolepsy

Drop Attack: loss of postural tone without LOC

Coma: LOC without spontaneous recovery

Seizure: no cerebral hypoperfusion

TIA/stroke: may have vagal component early on



CASE#2



HISTORY

26yo female with no significant PMH presents with first syncope in setting of heated argument with parents



PRODROME

Lightheaded, no palpitations/chest pain/dyspnea



WITNESSES

Some arm twitching, looked pale



UPON WAKING

Nauseated, fatigued, better after 15 minutes



WORKUP

Not orthostatic, normal exam/laboratories/ECG

*WHAT DO YOU DO NEXT?

1. No further testing, discharge home
2. Echocardiogram
3. Head CT/MRI
4. Stress test
5. Start fludrocortisone

*WHAT DO YOU DO NEXT?

1. **No further testing, discharge home**
2. Echocardiogram
3. Head CT/MRI
4. Stress test
5. Start fludrocortisone

Vasovagal/neurocardiogenic syncope

NMS VS SEIZURE

	NMS	Seizure
Occurs supine	Uncommon	<i>Common</i>
Typical prodrome- warm, clammy	<i>Common</i>	Uncommon- occasional aura
Pallor	<i>Common</i>	Uncommon
Tongue biting	Uncommon- at the tip	Common- on the sides
Eye deviation	Fixed/upward	Lateral deviation
Incontinence	Uncommon	<i>Common</i>
Muscle movement/tone	Pleomorphic/flaccid	Rhythmic and generalized/tonic
Duration of LOC	< 1 minute	<i>Often several minutes</i>
Postictal symptoms	Brief fatigue, nausea, clammy	Confusion

Adapted from Sheldon Cardiol Clin 2015 and ESC 2009 guidelines

HISTORY

A detailed history is the FIRST and MOST important tool in diagnosis

- Severity of injury sustained during syncope does **NOT** correlate with etiology of syncope
 - Manifestation of activity around time of syncope

HISTORY

Circumstances

- Time of day, relation to eating, emotional or painful stimulus, location, atmosphere, going to bathroom

Position

- Standing vs supine, change in posture

Activity

- During or after exercise, arm movement, quick head turning

Prodrome

- Aura, nausea, diaphoresis, palpitations

Recovery

- Rapid recovery or prolonged symptoms

EGSYS SCORE

Predictors of cardiac cause of syncope

Variable	OR (95% CI)	Score
Palpitations	64.8 (8.9 to 469.8)	4
Heart disease or abnormal ECG	11.8 (7.7 to 42.3)	3
Syncope during exertion	17.0 (4.1 to 72.2)	3
Syncope while supine	7.6 (1.7 to 33.0)	2
Precipitating factors	0.3 (0.1 to 0.8)	-1
Autonomic prodrome	0.4 (0.2 to 0.9)	-1

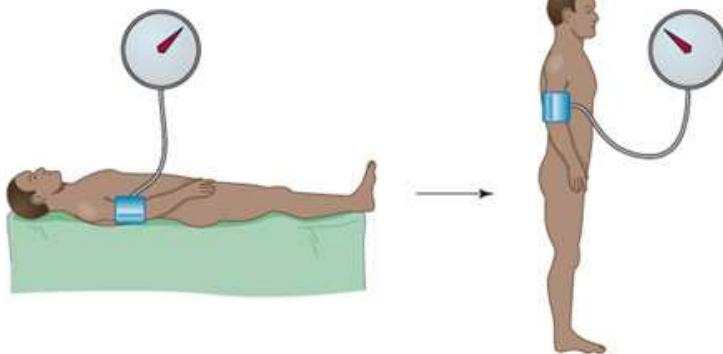
Score >3
Suggestive of
cardiac cause
of syncope

Adapted from Del Rosso Heart 2008

Excellent Review: Albassam JAMA 2019:321

EXAM

- Orthostatic vital signs
- Tongue biting or focal neurologic deficit
- Murmurs- examine in 2 positions
 - Sitting up and leaning forward
 - Left lateral recumbent
 - PMI-point of maximal impulse- diffuse or laterally displaced?
- Injury pattern- able to brace their fall?- indicates prodrome
- Peripheral edema- symmetric or asymmetric?



May take up to 3-5 minutes for BP drop

HOW TO PERFORM ORTHOSTATICS

Diagnostic:

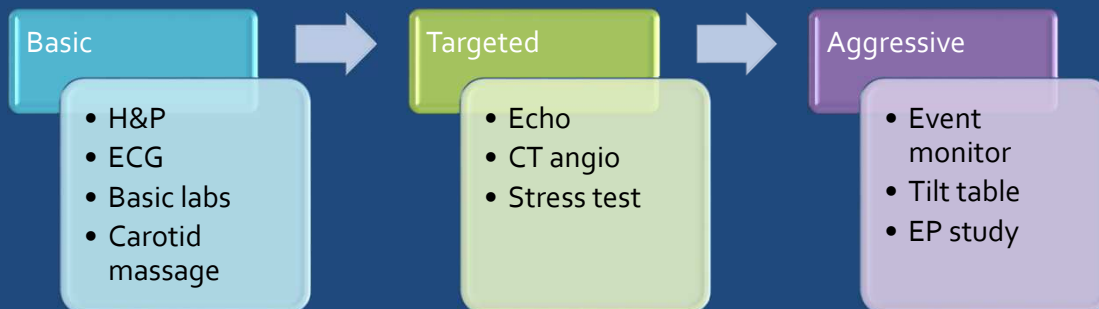
- Symptoms reproduced
- Fall in SBP >20 mmHg or DBP >10 mmHg
- Decrease in SBP to <90 mmHg

Suggestive:

- No symptoms
- Fall in SBP >20 mmHg or DBP >10 mmHg
- Decrease in SBP to <90 mmHg
- Symptoms from history are consistent with orthostatic hypotension

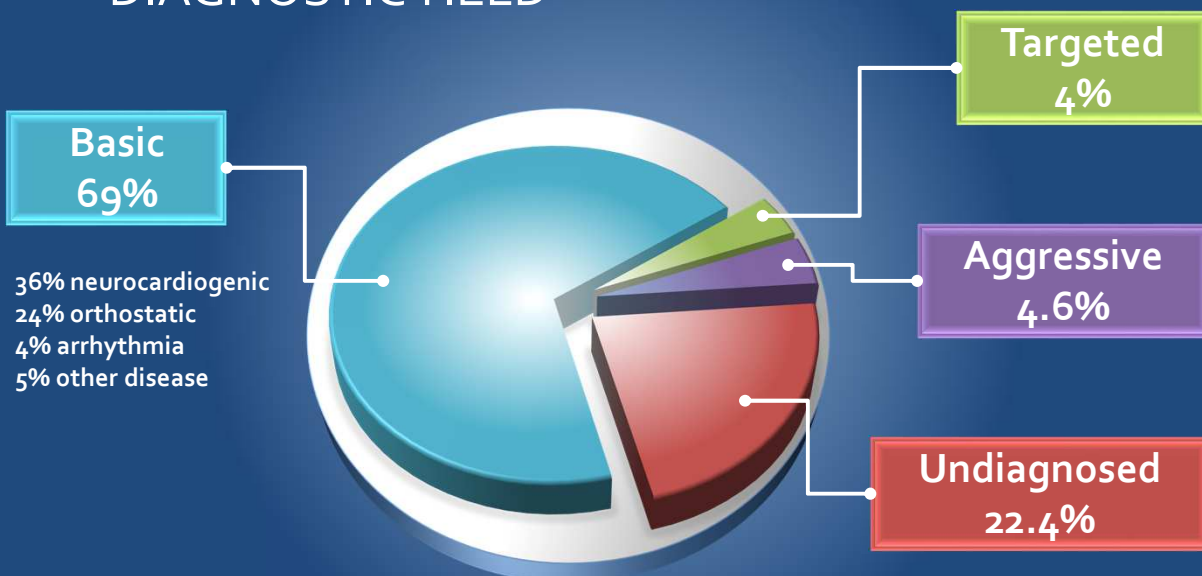
DIAGNOSTIC YIELD

- 650 consecutive patients presenting to ER with syncope as chief complaint followed for up to 18 months



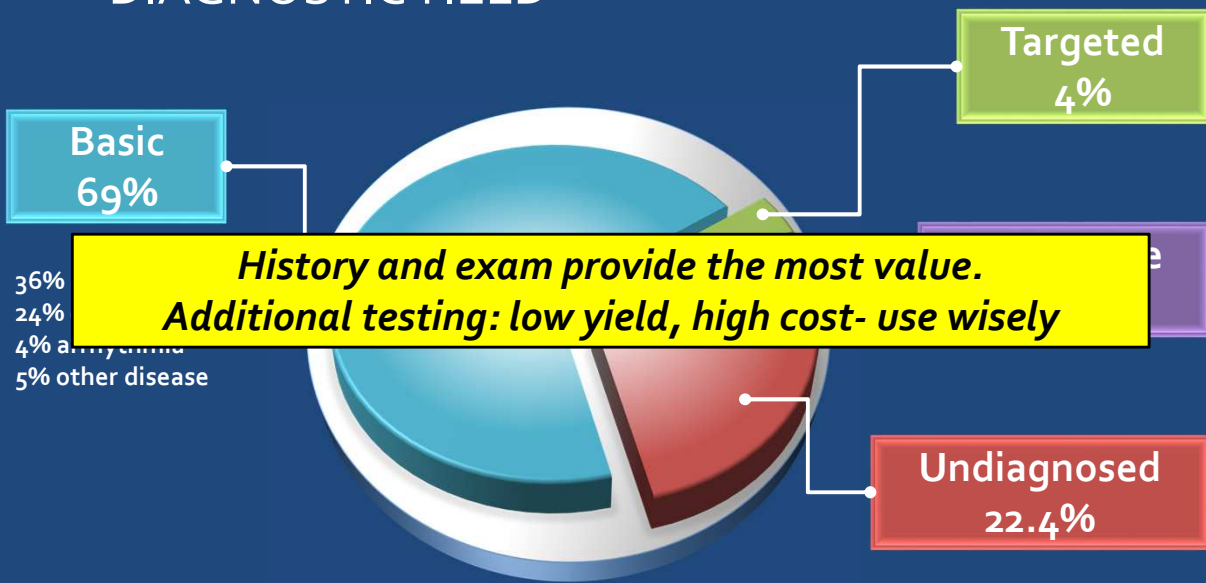
Sarasin AM J Med 2001

DIAGNOSTIC YIELD



Sarasin AM J Med 2001

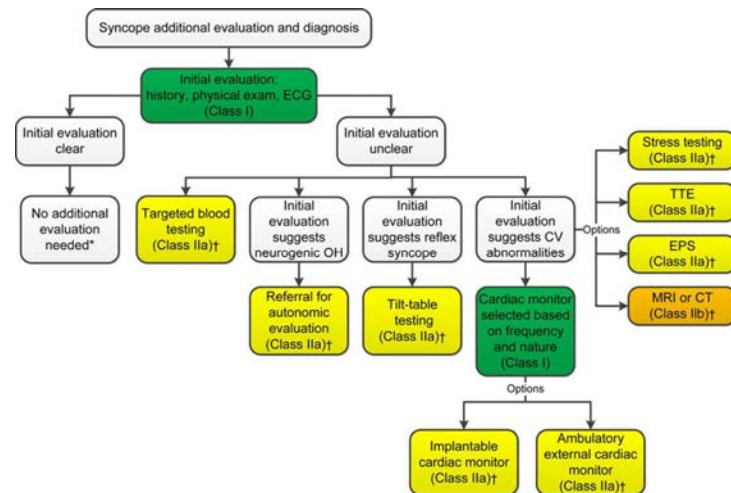
DIAGNOSTIC YIELD



WHEN TO DO ANCILLARY TESTING

TESTING ALGORITHM

- Selective testing based on key elements of history, exam, and ECG



Syncope guidelines Circulation. 2017;136 Figure 3

CASE#3



HISTORY

26yo female with no significant PMH presents with first syncope in setting of daily run



PRODROME

Lightheaded/palpitations briefly



WITNESSES

Some arm twitching, blue lips



UPON WAKING

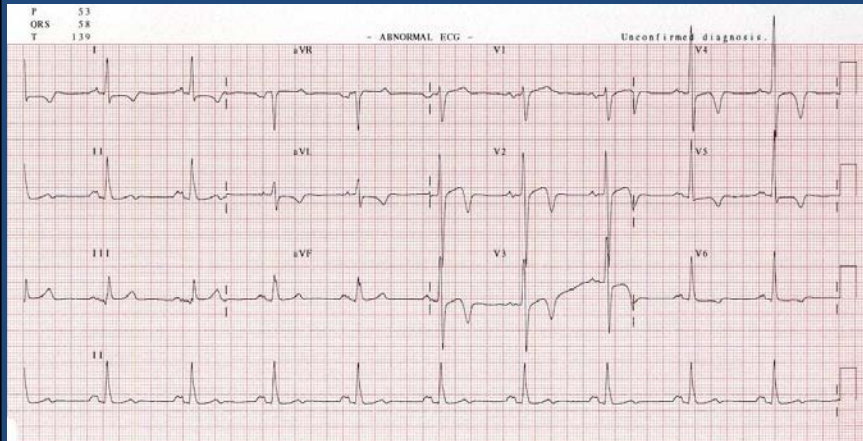
Felt well, confused, ready to run again



WORKUP

Not orthostatic, normal exam/laboratories
Abnormal ECG

CASE#3 ECG



- High QRS voltage
- Very abnormal T waves

*WHICH IS THE NEXT BEST TEST?

1. No further testing, discharge home
2. Echocardiogram
3. Head CT/MRI
4. Stress test
5. Start fludrocortisone

* WHICH IS THE NEXT BEST TEST?

1. No further testing, discharge home
2. Echocardiogram
3. Head CT/MRI
4. Stress test
5. Start fludrocortisone

Hypertrophic cardiomyopathy

CASE#4



HISTORY

46yo male with syncope while rushing up stairs
History of hypertension on lisinopril 10mg daily



PRODROME

Brief lightheaded, no palpitations/chest pain/dyspnea



WITNESSES

None



UPON WAKING

Confused for 5 minutes, no incontinence



WORKUP

BP 110/70, HR 80, creatinine 0.9, BUN 20
Mildly orthostatic, normal exam/ECG

*WHAT DO YOU DO NEXT?

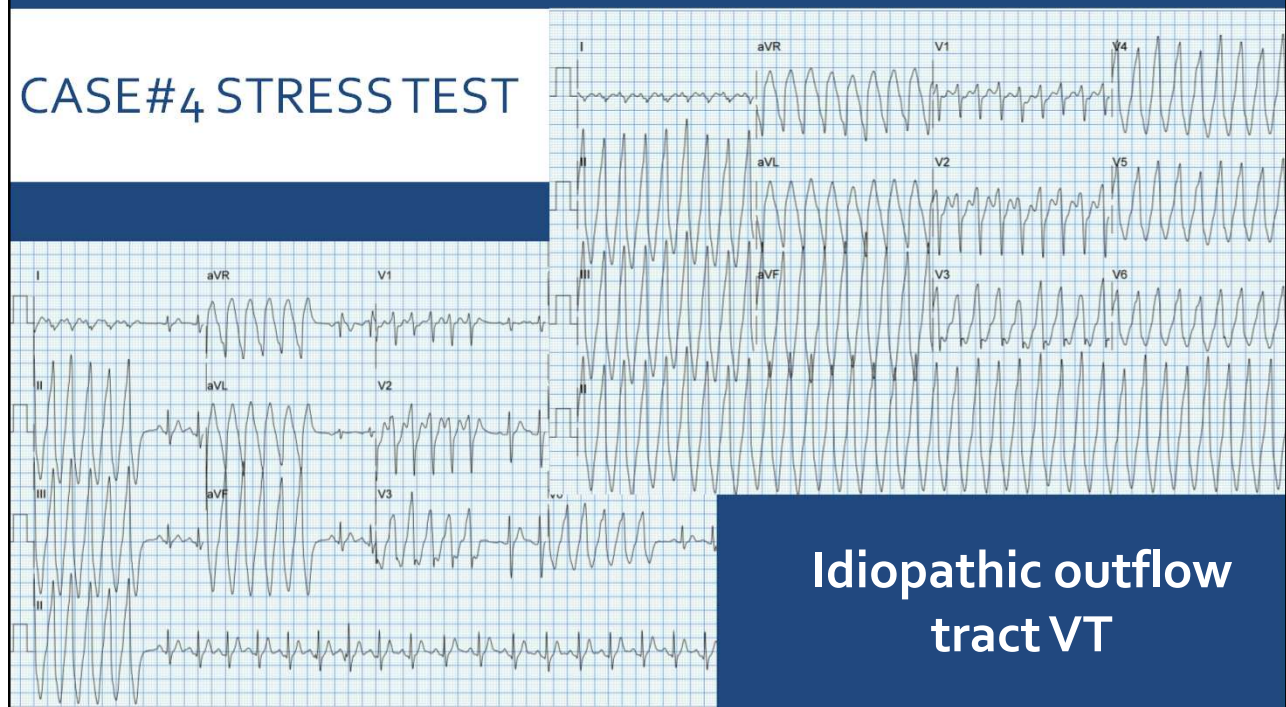
1. Hydrate and discharge home
2. Echocardiogram
3. Head CT/MRI
4. Stress test
5. Start fludrocortisone

*WHAT DO YOU DO NEXT?

1. Hydrate and discharge home
2. Echocardiogram
3. Head CT/MRI
4. **Stress test**
5. Start fludrocortisone

Exertional syncope is a RED FLAG!

CASE#4 STRESS TEST



**Idiopathic outflow
tract VT**

CARDIAC TESTING

- Echocardiogram (IIa, LOC-B)
 - Part of extended workup when cardiac etiology is suspected
 - Cheap, simple, and reliable method for evaluating structural heart disease
- Exercise stress testing (IIa, LOC-C)
 - Stress testing is most valuable in patients who have experienced episodes of syncope *during or shortly after exertion*

CASE#5



HISTORY

83yo M with CKD III, remote renal cell cancer

Syncope during daily walk, road trip 2 weeks ago



PRODROME

None



WITNESSES

None



UPON WAKING

Mild dyspnea, nausea and chest pain

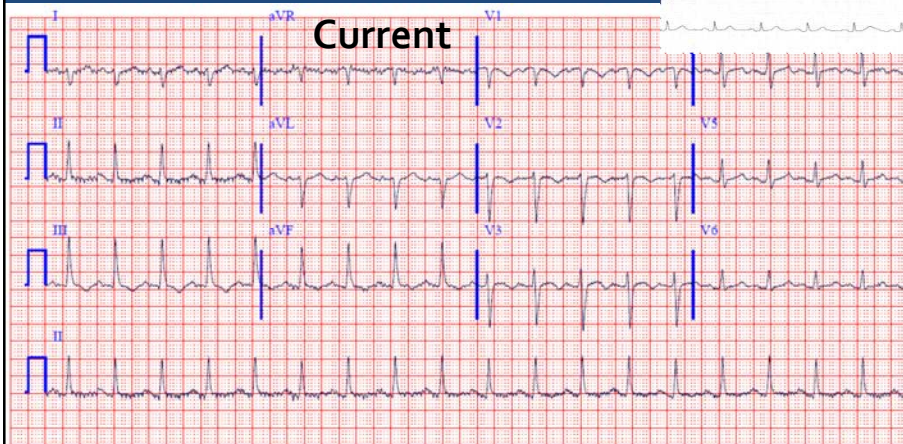


WORKUP

SBP 100->80, HR 110bpm, JVP 16, 2/6 systolic murmur

1+ LLE, bilateral carotid bruits, crt 2.2, Hb 11

CASE#5 ECG



Baseline



1. Tachycardic
2. Rightward axis
3. S in lead I
4. Inverted T in lead III
5. Inverted T in V1-V3

*WHAT DO YOU DO NEXT?

1. Diagnosis of orthostatic hypotension is clear, no further testing necessary, hydrate with IV fluids
2. Admit to hospital and observe overnight
3. Additional labs: troponin, BNP, D-dimer
4. Cardiology consult for urgent coronary catheterization
5. Obtain head CT and carotid ultrasound

*WHAT DO YOU DO NEXT?

1. Diagnosis of orthostatic hypotension is clear, no further testing necessary, hydrate with IV fluids
2. Admit to hospital and observe overnight
3. **Additional labs: troponin, BNP, D-dimer**
4. Cardiology consult for urgent coronary catheterization
5. Obtain head CT and carotid ultrasound

ADDITIONAL LABS

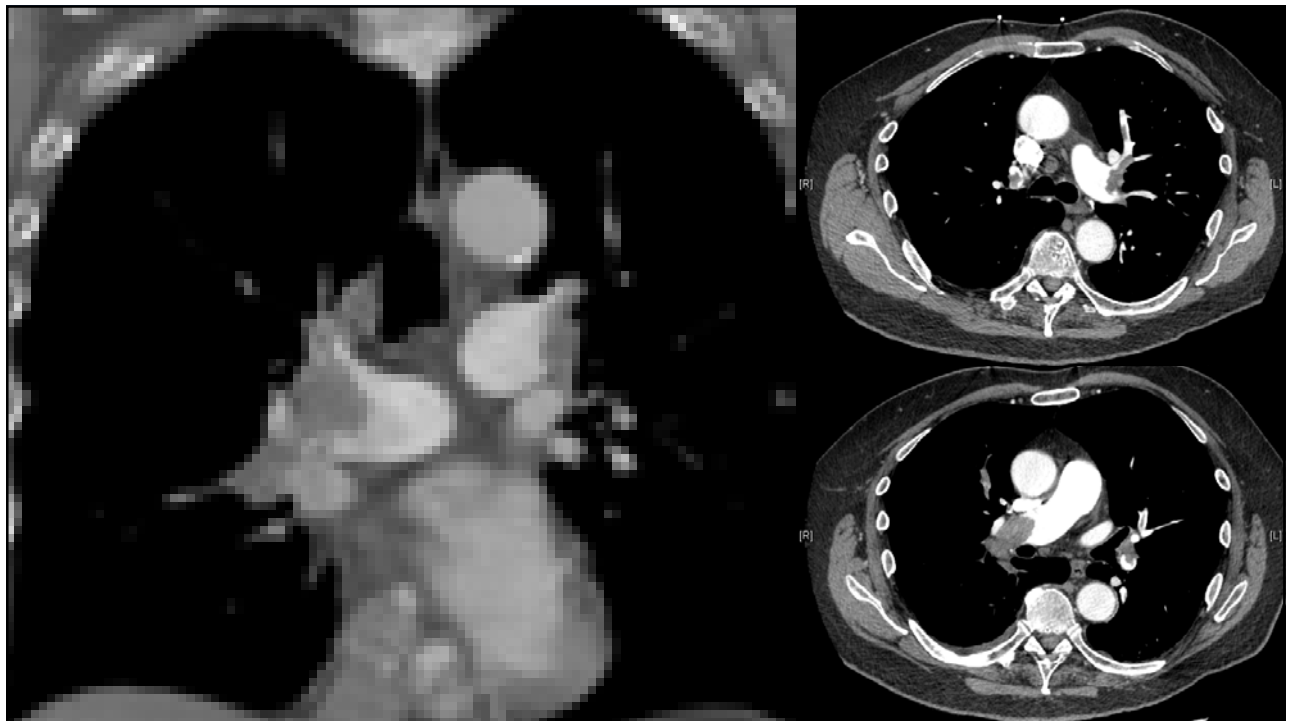
- TroponinT 0.18 ng/dL
 - >0.1ng/dL suggestive of acute MI
- D-Dimer 2000 ng/mL
 - <500ng/mL is normal
- Pro-NT BNP 655 pg/mL
 - 0-177 pg/mL is normal
 - <450 pg/mL 99% Neg pred value

*WHAT DO YOU DO NEXT?

1. Diagnosis of orthostatic hypotension is clear, no further testing necessary, hydrate with IV fluids
2. Echocardiogram
3. Chest CT angiogram
4. Cardiology consult for urgent coronary catheterization
5. Obtain head CT and carotid ultrasound

*WHAT DO YOU DO NEXT?

1. Diagnosis of orthostatic hypotension is clear, no further testing necessary, hydrate with IV fluids
2. Echocardiogram
3. **Chest CT angiogram**
4. Cardiology consult for urgent coronary catheterization
5. Obtain head CT and carotid ultrasound





LABORATORIES

- Key elements of history helps to focus testing
- Combo of elevated high sensitivity Troponin and BNP may suggest a cardiac etiology

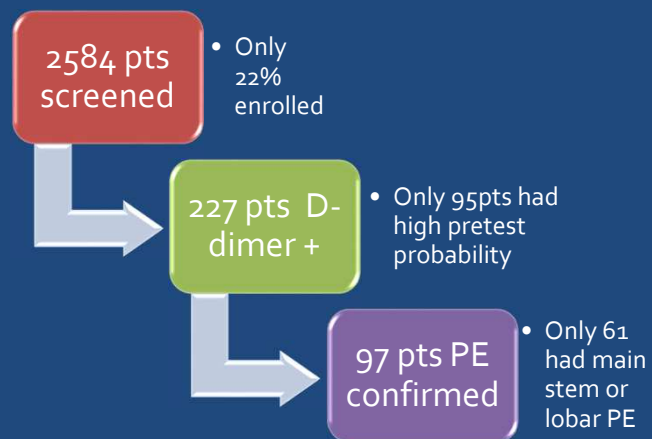
Du Fay de Lavallaz Circ. 2019;139

COR	LOE	Recommendations
IIa	B-NR	Targeted blood tests are reasonable in the evaluation of selected patients with syncope identified on the basis of clinical assessment from history, physical examination, and ECG. ⁸²
IIb	C-LD	Usefulness of brain natriuretic peptide and high-sensitivity troponin measurement is uncertain in patients for whom a cardiac cause of syncope is suspected. ⁸³⁻⁸⁶
III: No Benefit	B-NR	Routine and comprehensive laboratory testing is not useful in the evaluation of patients with syncope. ^{87,88}

Syncope guidelines Circulation. 2017;136

WHAT IS THE ROLE OF D-DIMER TESTING

- Hospitalized for 1st episode of syncope
- All had detailed history and basic blood work including D-dimer
- CT angiogram or V/Q scan performed if:
 - Elevated D-dimer
 - High pre-test probability based on Wells score
- Bottom line: 1/6 (17%) pts presenting with syncope had a pulmonary embolus



Prandoni NEJM 2016;375:1524

WHAT IS THE ROLE OF D-DIMER TESTING

- Hospitalized for 1st episode of syncope
- All had detailed history and basic D-dimer testing
- CT angiography was performed if:
 - Elevated D-dimer
 - High clinical probability
 - Baseline probability
- Bottom line: 1/6 (17%) pts presenting with syncope had a pulmonary embolus

2584 pts screened

- Only 22% enrolled

Pulmonary embolism may be an important etiology in patients admitted for syncope

dimer +

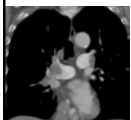
high probability

However, only 3.8% of initial screened patients diagnosed with pulmonary embolism

confirmed

Only 61 had main stem or lobar PE

Prandoni NEJM 2016;375:1524



SYNCOPE AND PE

- Meta-analysis to determine prevalence of PE in patients presenting to ED or hospitalized due to syncope
- No *systematic* evaluation of PE in all patients

12 studies

- 7582 pts presented to ED or hospitalized

ED pts

- Pooled estimate of ED patients: **0.8%** (95% CI 0.5-1.3%)

Hospitalized pts

- Pooled estimate of hospitalized patients: **1.0%** (95% CI 0.5-1.9%)

Ogab Am J Emerg Med 2018;36



STRUCTURAL HEART DISEASE

Any structural or physiologic abnormality that **limits the augmentation of cardiac output during exertion** may lead to global cerebral hypoperfusion

Since cardiopulmonary structures are connected in “series”, any restriction in the circuit has the potential to obstruct flow

- **Aortic stenosis and mitral stenosis** are the most common
- Regurgitant valve lesions rarely cause syncope

CASE#6



HISTORY

69yo F with asx paroxysmal Afib, HTN on warfarin
Second time unresponsive while watching TV in 2 months



PRODROME

“Vision blackening”



WITNESSES

Eyes rolled back, no jerking movement, <1 minute



UPON WAKING

Felt well



WORKUP

Not orthostatic, normal exam/laboratories
ECG: sinus brady at 55bpm, otherwise normal

***WHAT TYPE OF CARDIAC MONITOR IS MOST APPROPRIATE?**

1. 48hr Holter
2. Zio patch (2 weeks)- no live monitoring
3. Mobile cardiac telemetry (MCOT) (2-4 weeks)
4. Apple watch
5. Implantable loop monitor
6. Kardia cell phone attachment

***WHAT TYPE OF CARDIAC MONITOR IS MOST APPROPRIATE?**

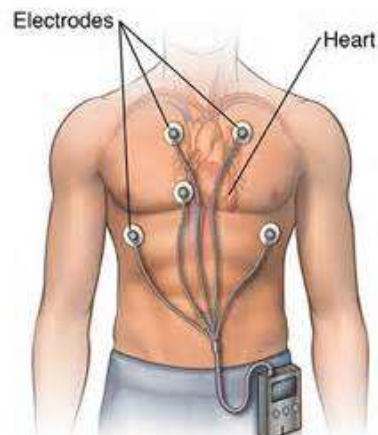
1. 48hr Holter
2. Zio patch (2 weeks)- no live monitoring
3. **Mobile cardiac telemetry (MCOT) (2-4 weeks)**
4. Apple watch
5. Implantable loop monitor
6. Kardia cell phone attachment

EVALUATION FOR ARRHYTHMIA

Method	Comment
ECG (12 seconds)	Low yield, but excellent screening test
Holter (24-48 hours)	Useful only for very frequent events
Extended monitor (7-30 days)	Useful for less frequent events
Implantable Loop Recorder (ILR)	For very infrequent events Battery life can last up to 3 years
Invasive Electrophysiologic study (EPS)	Mostly helpful in structural heart disease or abnormal EKG Tachyarrhythmias>>>bradyarrhythmias

NON-live monitors are NOT appropriate for syncope workup

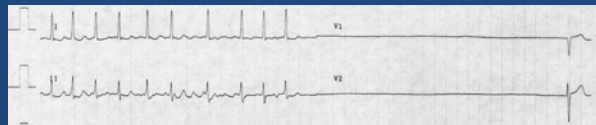
CARDIAC MONITORS



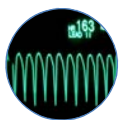


BRADYARRHYTHMIAS

- Most common type of arrhythmia associated with syncope
- Problem with impulse **generation**
 - Sinus arrest, sinus exit block, conversion pause



- Problem with impulse **conduction**
 - High grade or complete AV block

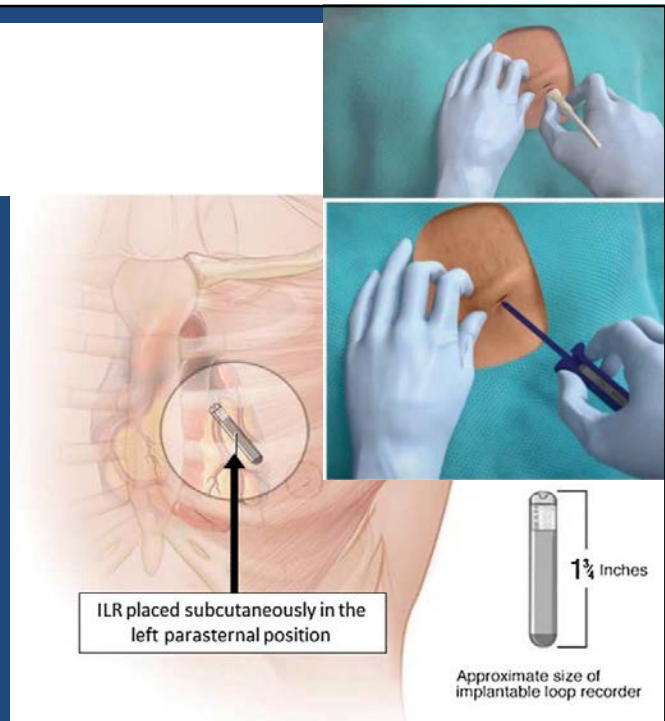


TACHYARRHYTHMIAS

- Supraventricular Tachycardia
 - AVNRT – AV nodal reentrant tachycardia more commonly associated with syncope
- Ventricular Tachycardia
 - Structural heart disease – i.e. prior myocardial infarction, hypertrophic cardiomyopathy
 - Inherited arrhythmia syndromes - i.e. Long QT syndrome
 - Drug/metabolic induced- i.e. Torsade de pointes, bidirectional VT (digoxin toxicity)
 - Pre-excited atrial fibrillation in WPW
 - Idiopathic VT- uncommon

IMPLANTABLE LOOP RECORDER

- Consider ILR if syncope is recurrent, rare, and workup including event monitor has not been diagnostic
- Simple brief surgical procedure
- Long term monitoring (3 years)
- Patient non-compliance eliminated
- Gold standard in recurrent unexplained syncope



IMPLANTABLE LOOP RECORDER

EaSyAS II trial

- 2 syncopal episodes within 2 years
- 246 pts randomized to ILR vs conventional management and syncope clinic (CONV)
- **50%** had ECG diagnosis of syncope with ILR with mean of 95 days
- **17%** had ECG diagnosis in CONV, mostly using tilt table testing
- ILR pts had less testing performed

Sulke Europace 2016;18:912

FRESH study

- 2 syncopal episodes within 1 year
- 78 pts randomized to ILR vs conventional management
- **46%** of ILR pts had diagnosis established within 14 month f/u
- **5%** of CONV pts had diagnosis established
- ILR pts had less testing performed

Podoleanu Arch Cardiovasc Dis 2014;107:546

IMPLANTABLE LOOP RECORDER

EaSyAS II trial

- 2 syncopal episodes within 2 years
- 246 pts randomized to ILR vs

FRESH study

- 2 syncopal episodes within 1 year
- 78 pts randomized to ILR vs

***ILRs most effective in establishing or refuting arrhythmic etiology of recurrent syncope.
Perhaps cheaper as well?***

- 17% had ECG diagnosis in CONV, mostly using tilt table testing
- ILR pts had less testing performed

- diagnosis established
- ILR pts had less testing performed

Sulke Europace 2016;18:912

Podoleanu Arch Cardiovasc Dis 2014;107:546

CASE#7



HISTORY

81yo F with CAD, Afib, diabetes, and CKD

Unwitnessed fall resulting in right wrist fracture



PRODROME

No recollection, ? Loss of consciousness



WITNESSES

None



UPON WAKING

Nausea and wrist pain



WORKUP

Mildly orthostatic, no head trauma, L carotid bruit

R hand pain/weakness, no other deficit

*WHICH IS LEAST LIKELY TO BE USEFUL?

1. Echocardiogram
2. Head CT and carotid ultrasound
3. D-Dimer
4. Event monitor

*WHICH IS LEAST LIKELY TO BE USEFUL?

1. Echocardiogram
2. Head CT and carotid ultrasound
3. D-Dimer
4. Event monitor

What is the value of neuroimaging in syncope?

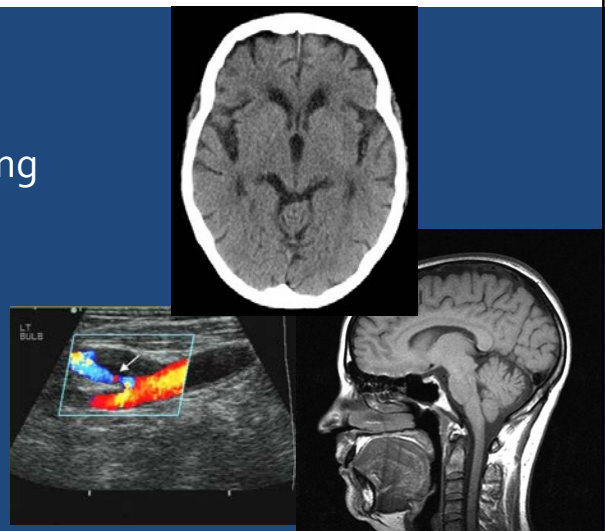
NEURO IMAGING

- 1114 pts presenting to the ED with syncope with or without mild head trauma
- Pts with focal neuro deficits, dizziness, N/V, or anticoagulant use were excluded
- Head CT was performed in 62.3% and Brain MRI in 10.2%
 - Total of 808 studies
- **NONE** of the neuro imaging studies revealed any clinically significant findings

Idil Amer J Emer Med 2018

NEURO IMAGING

- If no focal neuro deficits, **brain imaging NOT necessary**
- Reasonable to order if suspecting
 - Seizure
 - Acute CVA
 - Head trauma
- Class III, LOE B: **No Benefit**





TRUE COST OF TESTING



CEREBROVASCULAR DISORDERS

- **Subclavian steal:** vigorous arm movement, shunts blood flow to arm through reversal of vertebral artery flow secondary to stenosis of subclavian artery- reproducible
- **TIA of vertebrobasilar system:** can cause LOC- often with vertigo and possible drop attacks
- **TIA of carotid artery:** rarely causes LOC unless concomitant severe stenosis causing global cerebral ischemia
 - Can sometimes have associated vasovagal syncope

ALL of these syndromes typically have associated focal exam findings

CASE#8



HISTORY

46yo M with recurrent syncope, 5 times over 2 years
Associated with stressful/emotional events



PRODROME

Lightheaded, cold sweat



WITNESSES

Looked "white as a ghost"



UPON WAKING

Nausea/vomiting, better after 30 minutes



WORKUP

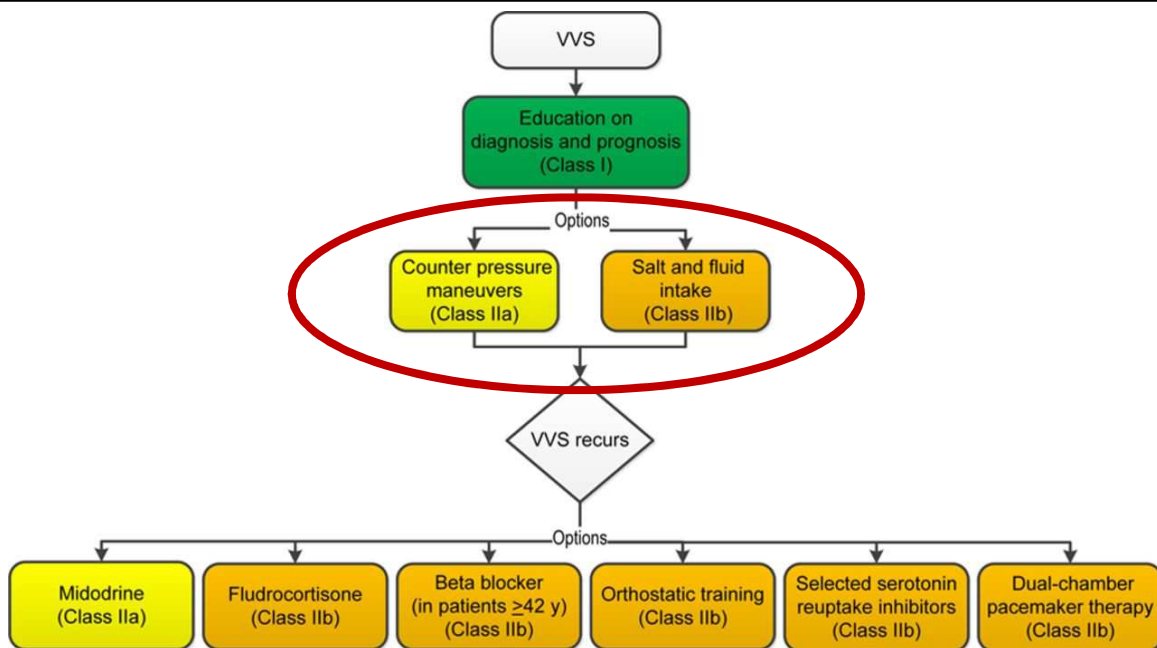
BP 105/70, HR 58, not orthostatic
Normal exam/labs/ECG

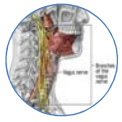
***WHICH THERAPY CAN PREVENT RECURRENT SYNCOPE IN THIS PATIENT?**

1. Physical counter pressure maneuvers
2. Salt and volume loading
3. Midodrine
4. Fludrocortisone
5. Fluoxetine
6. Metoprolol
7. Dual chamber pacemaker
8. Cardioneuro ablation

*WHICH THERAPY CAN PREVENT RECURRENT SYNCOPE IN THIS PATIENT?

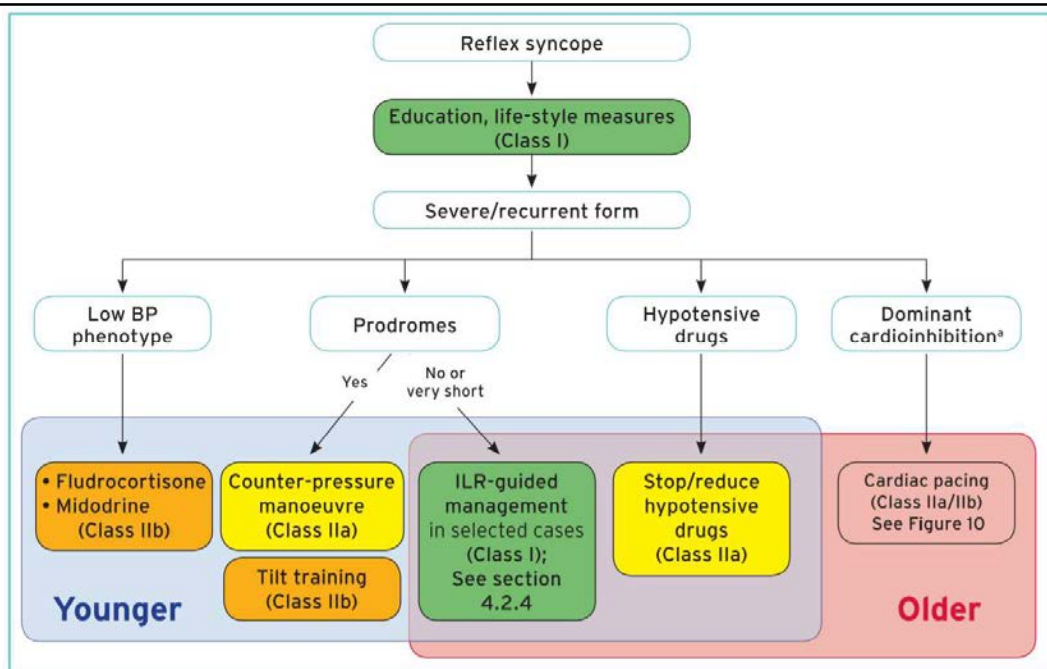
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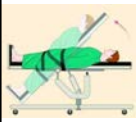




NEURALLY MEDIATED SYNCOPE TREATMENT

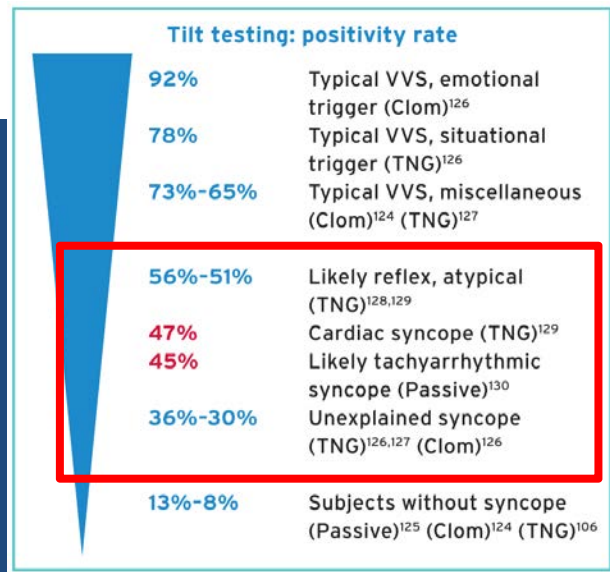
- **Lack** of strong data for any treatment
- Acceptable to turn syncope into near syncope
- Trigger and prodrome recognition and prevention
- Cornerstone of therapy is salt and volume loading
 - Hydration with increased salt intake
- Physical counter pressure maneuvers
 - Arm tensing, hand grip, leg crossing
- **Determine if predominantly vasodepressor vs cardioinhibitory**



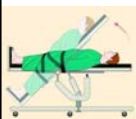


TILT TABLE TESTING

- TTT provides little diagnostic value for whom it is most needed
- At most can suggest "hypotensive susceptibility"
- Can be helpful in pts with suspected diagnosis of POTS



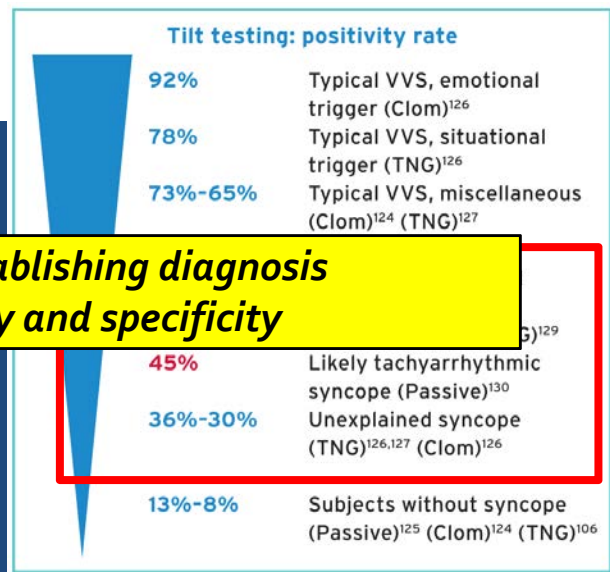
ESC Syncope guidelines Eur Heart J. 2018;1183 Figure 7



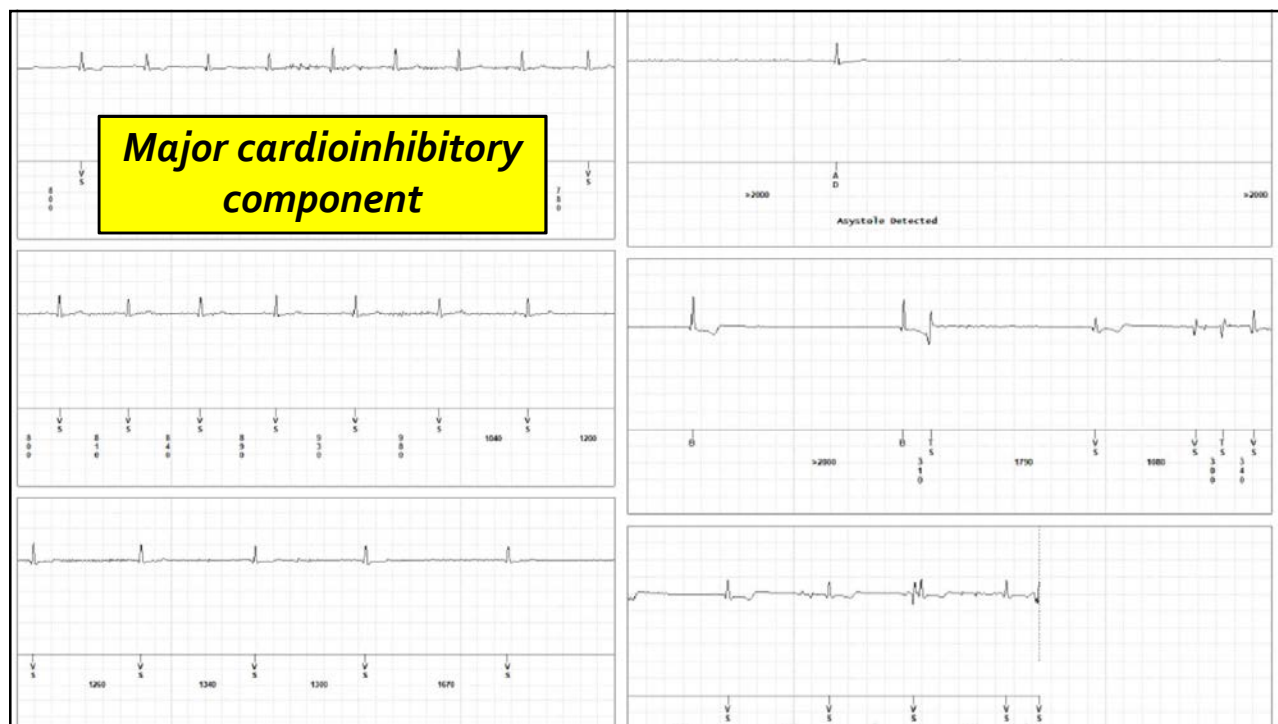
TILT TABLE TESTING

- TTT provides little diagnostic value for whom it is most needed
- At most can suggest "hypotensive susceptibility"
- Can be helpful in pts with suspected diagnosis of POTS

Limited value in establishing diagnosis
Limited sensitivity and specificity



ESC Syncope guidelines Eur Heart J. 2018;1183 Figure 7



NMS: PACEMAKERS

- Several randomized trials with various methodological limitations
 - Many early studies were negative
- Pacemaker implantation most beneficial in patients with documented asystole >3 sec either by tilt table testing or ILR
- 5 yr follow-up study: 66% RRR and 24% ARR in recurrent syncope

Russo Int J Cardiol 2018

Table 3

Trials that have assessed the role of pacing in reflex syncope

Trial	Inclusion Criteria	Design
VPS ⁴⁵	Positive TT with HR <60, 70, 80 bpm	PI vs conventional treatment
VASIS ⁴⁶	Positive TT with HR <40 bpm or asystole >3 s	PI vs conventional treatment
SYDIT ⁴⁷	Positive TT with HR <40 bpm or asystole >3 s	PI vs atenolol
VPSII ⁴⁹	Positive TT with BP x HR <6000	PI with randomization DDD vs ODO
SYNPACE ⁵⁰	Positive TT with HR <40 bpm or asystole >3 s	PI with randomization DDD vs ODO
INVAS ⁵¹	Positive TT with cardioinhibitory or mixed response	PI with randomization DDD-CLS vs DDI
Flamang et al, ⁵⁵ 2012	Asystole >10 s after intravenous ATP administration	PI with randomization DDD vs AAI
ISSUE 3 ⁵⁵	Syncope with documented asystole >3 s or asymptomatic spontaneous asystole >6 s (usually documented by ILR)	PI with randomization DDD vs VVI 40 bpm Moya Cardiol Clin 2015



NMS: PACEMAKERS

- Several randomized trials with various methodological limitations

- Many early studies were negative

Utility limited to select patients
Limited efficacy

- 5 yr follow-up study: 66% RRR and 24% ARR in recurrent syncope

Russo Int J Cardiol 2018

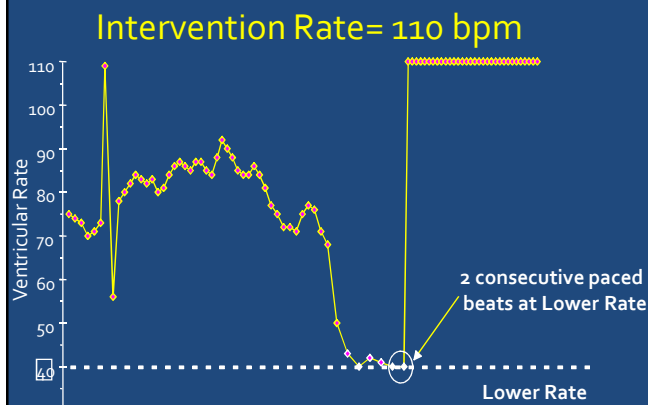
Table 3
Trials that have assessed the role of pacing in reflex syncope

Trial	Inclusion Criteria	Design
VPSII ⁴⁹	Positive TT with BP × HR <6000	PI with randomization DDD vs ODO
SYNPACE ⁵⁰	Positive TT with HR <40 bpm or asystole >3 s	PI with randomization DDD vs ODO
INVASY ⁵¹	Positive TT with cardioinhibitory or mixed response	PI with randomization DDD-CLS vs DDI
Flamang et al, ⁵⁵ 2012	Asystole >10 s after intravenous ATP administration	PI with randomization DDD vs AAI
ISSUE 3 ⁵⁶	Syncope with documented asystole >3 s or asymptomatic spontaneous asystole >6 s (usually documented by ILR)	PI with randomization DDD vs VVI 40 bpm

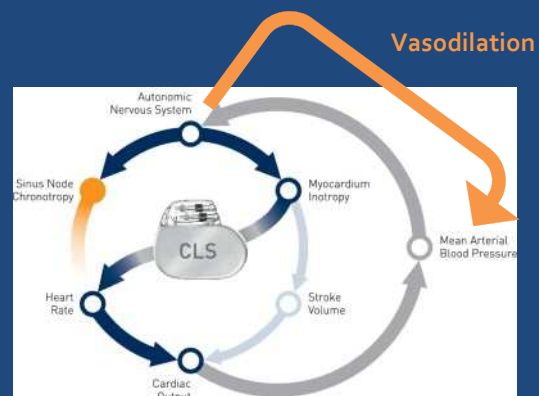
Moya Cardiol Clin 2015



PACEMAKERS: RATE DROP RESPONSE



Rate drop response



Biotronik closed loop system

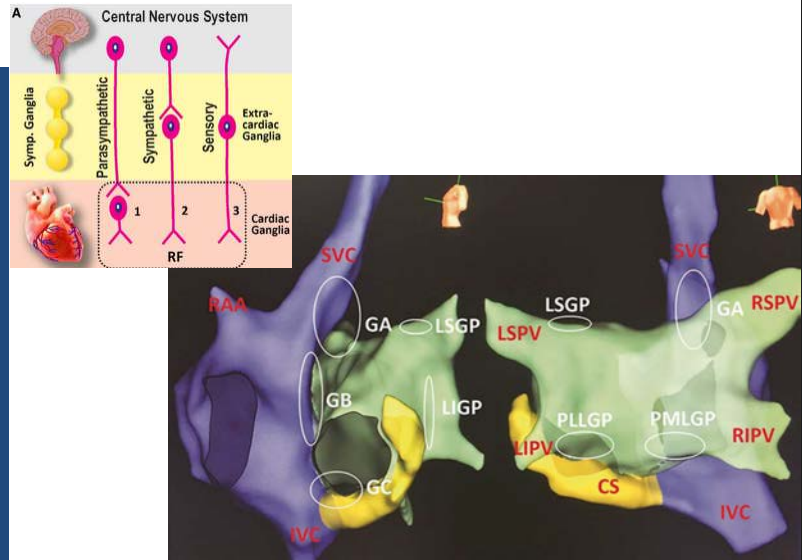
Adapted from Benditt and Sutton "Syncope A diagnostic and Treatment Strategy"

CARDIONEURO ABLATION (CNA)

- Targets *intrinsic cardiac parasympathetic ganglia* from endocardial approach
- “Modification” of Afib ablation
- 1-2 years follow-up data
- Early data is highly promising
 - 92% (CI 88.1%-94.6%) freedom from recurrent syncope

Vandenberk Heart Rhythm 2022

Cardiac Parasympathetic Ganglia



Pachon Circ Arrhythm Electrophysiol 2020; Aksu J Inter Cardiac Electrophysiol 2020

CASE#9



HISTORY

78yo M with Parkinson's presents with recurrent syncope most commonly with standing up quickly



PRODROME

None



MEDICATIONS

Midodrine, fludrocortisone



UPON WAKING

Feels back to normal within 5 minutes



WORKUP

BP 125/60, HR 76, orthostatic with 40mmHg drop
Normal exam/labs/ECG

*WHICH THERAPY IS *LEAST LIKELY* TO HELP THE ORTHOSTATIC HYPOTENSION?

1. Water "bolus" before standing
2. Salt and volume loading
3. Abdominal binder
4. Lifestyle/activity counseling
5. Dual chamber pacemaker
6. Atomoxetine

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ORTHOSTATIC HYPOTENSION

Drug	Mechanism
Droxidopa	Norepinephrine precursor
Midodrine	Direct α_1 -adrenoreceptor agonist
Fludrocortisone	Mineralocorticoid (volume expander), increases sodium reabsorption and enhances sensitivity of α -adrenoreceptors
Atomoxetine	Norepinephrine reuptake inhibitor
Pyridostigmine	Acetylcholinesterase inhibitor
Octreotide	Somatostatin analog reducing postprandial splanchnic hyperemia induced by gastrointestinal vasodilatory peptides
Desmopressin	V1a (vascular smooth muscle) and V2 (distal convoluted tubule and collecting ducts of the kidney) receptor agonist. Vasopressin analogue (volume expander), increases water reabsorption and reduces nocturia
Ephedrine/pseudoephedrine	Direct and indirect α_1 -adrenoreceptor agonist

Fredorowski Circ Arrhythm and Electrophysio 2022

Magkas J Clin Hypertens 2019

SUMMARY

- Basic workup
 - Detailed history and exam, orthostatic vitals, ECG
 - Will provide the greatest diagnostic yield
 - Remember key "*red flag*" signs and symptoms for cardiac etiology
- Targeted workup
 - Labs, ECG, echocardiogram, chest CT, etc. as warranted
 - Provides small additional yield
- Recurrent syncope
 - Frequency dictates which cardiac monitor to use
 - Implantable loop recorders: highest diagnostic yield of secondary testing
- Brain Imaging
 - **ONLY** if focal neuro deficits or head trauma