

5th Congress of the European Academy of Neurology

Oslo, Norway, June 29 - July 2, 2019

Teaching Course 4

**Emergencies in neurology: dealing effectively with
syncope and transient loss of consciousness (TLOC)
(Level 1)**

**When neurologists and cardiologists must
meet**

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When neurologists and cardiologists must meet ...

5th EAN Congress Oslo, June 29, 2019

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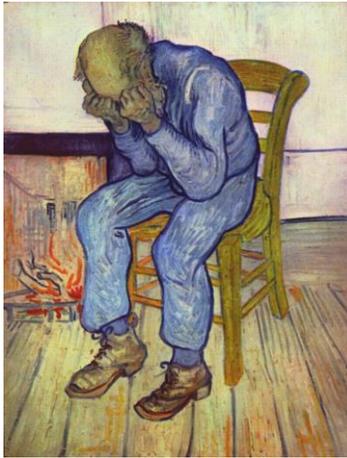
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Conflict of Interest

- I am not a neurologist but I have a few friends among them, Gert, Alessandra, to name few ...
- Stroke unit is on the same floor as our cardiology department
- While at work, I used to have lunch with a neurologist
- And I received fees and royalties from non-neurological companies, Medtronic, Thermofisher and Cardiome

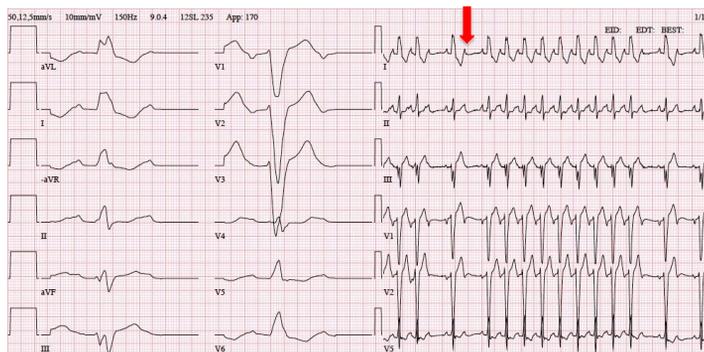




Should I really talk to a neurologist?

Department of Clinical Sciences, Malmö, Lund University and Skåne University Hospital, Malmö, Sweden

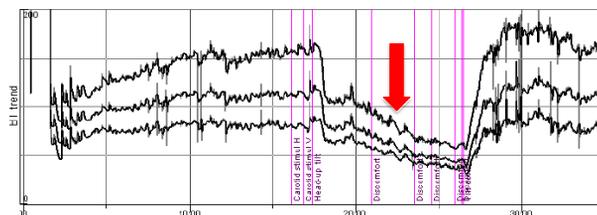
- **Man 46y, diabetes, non-smoker, truck driver**
 - Nov 2010, **myocardial infarction, by-pass op**, ECHO ejection fraction 35-40%, ECG: left bundle branch block; cardiac MRI: EF 26%. Discharged.
 - Feb 2011, **syncope** -> atrioventricular block, asystole 4-8sec;



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- Feb 2011, **syncope** -> AV Block, asystole 4-8sec; → **device = Cardiac resynchronization therapy; defibrillator, pacemaker: CRT-D**
- April 2011, hypertension 160/100mmHg-> amlodipine
- May 2011, **syncope in the morning while in the bathroom; CRT-D interrogation neg; ECHO neg for syncope etiology**
- **What was the cause of syncope?**

- Syncope expert: bedside orthostatic test positive for OH;
- **Head-up tilt test (HUT) -> classical OH:**
- **SBP fall 120->75 mmHg / normal Valsalva**
- Amlodipine out; droxidopa in -> sporadic presyncope
- Oct 2011: 24h ABPM 123/87 mmHg; no nighttime dipping



- **And the story continues...**

- Jan 2012, **syncope in the bathroom**, florinef added, later midodrine ...
- No reports on recurrent syncope until ...
- Sep 2016, chest pain + **syncope**; Non-STEMI; PCI-> Vein graft occlusion; CRT-D interrogation neg; *pain-mediated vasovagal reflex?*
- Oct 2016, chest pain + LOC, jerking movements in the arms/ unresponsive for 10 min + reports on spasms in supine position; symptom resolution
- April 2017, chest pain and more frequent **syncope**; LOC with spasms at ED in supine position -> **stroke unit (cardiology consultant: “this is definitely not cardiac”)**
- EEG monitoring/ Brain CT scans normal -> discharged

- **And then...?**

- July 2017 – **syncope** with headache -> normal brain CT -> admitted to **stroke unit** -> repeated LOCs with convulsions in supine position -> **check with the syncope expert**
- Neurologist (senior consultant) talks to us and records “syncope” **with a mobile phone**
- The videoclip shows “**psychogenic pseudosyncope**” -> pat informed and discharged
- Aug 2018 – stroke (hemiparesis sin) + **syncope**; thrombolysis with “a good result...”
- Two days after discharge the same symptoms ... no changes in brain CT scans. Patient informed about “**functional background**” of symptoms (PNES + PPS).

- **Finally ...**

- Spontaneous regress from 10 attacks/week to 1 attack/month since Dec 2018
- Jan 2019 – hospitalized with “hemiparesis” and “syncope with convulsions” – again informed about “dissociative/functional” basis of his symptoms.
- Patient feels this is not psychological but may come from the brain and nerves ... as a sort of “resetting the brain” due to stress.
- 2019-06-26: phone call. Patient feels quite good. The heart works well, orthostatic symptoms are under control, and “brain attacks” are very sporadic although hard to predict.

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Let us take a look at the cardiology guidelines ...

2018 ESC Guidelines for the diagnosis and management of syncope

Available on www.escardio.org/Guidelines

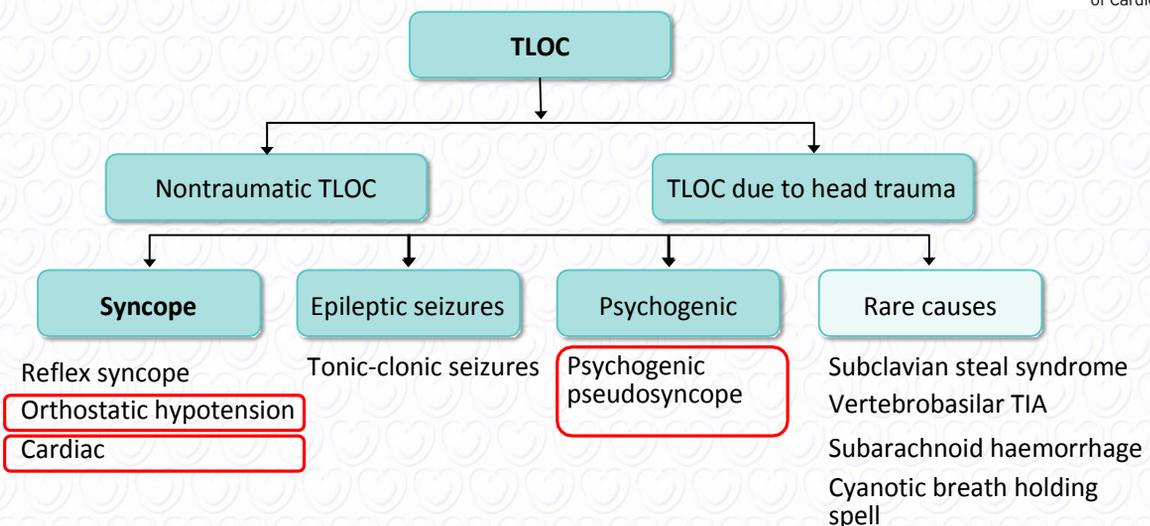
2018 ESC Guidelines on Syncope – Michele Brignole & Angel Moya
European Heart Journal (2018) 39, 1883–1948



Definition

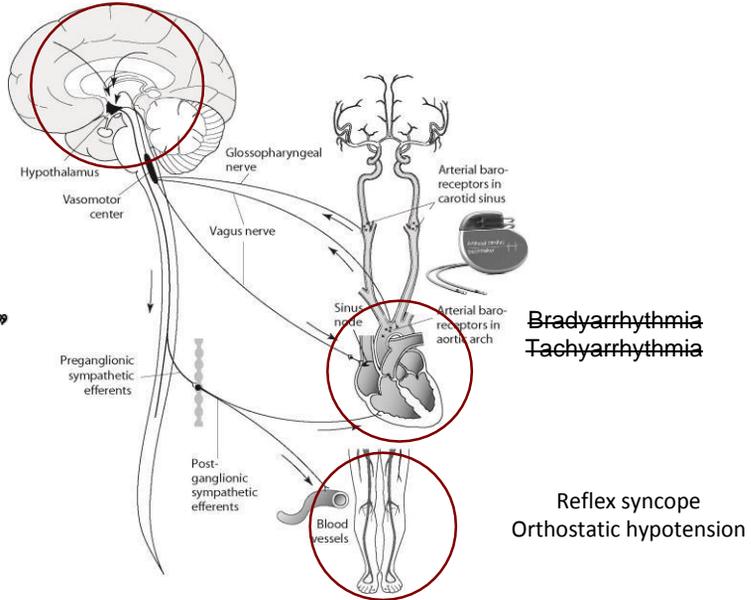
- **Syncope** is a transient loss of consciousness (TLOC), *due to transient global cerebral hypoperfusion*, characterized by rapid onset, short duration *and* spontaneous complete recovery.

Classification of TLOC



Seizures
Psychogenic attacks
Other "brain" disorders

If it is not cardiac,
it used to be "complicated"
for cardiologist

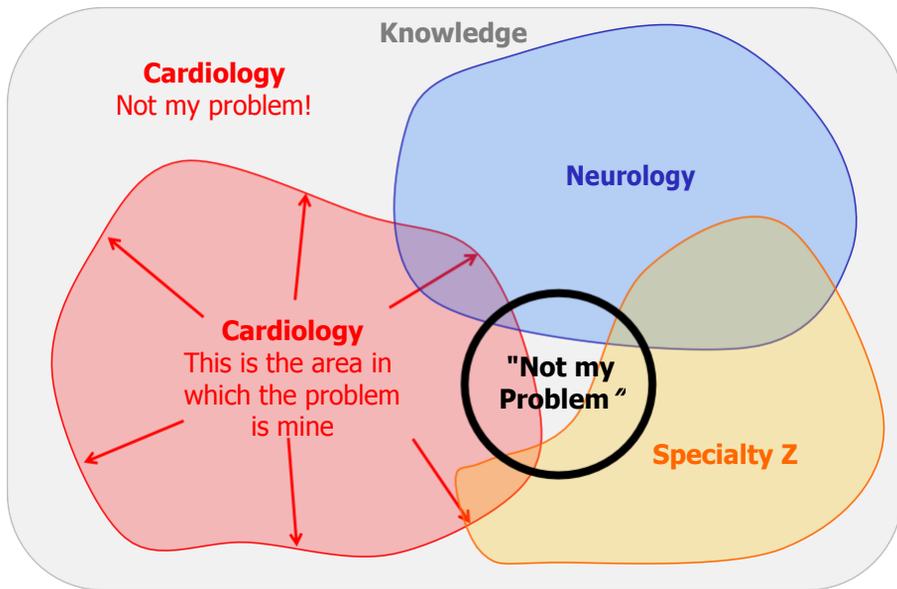


Bradyarrhythmia
Tachyarrhythmia

Reflex syncope
Orthostatic hypotension

Ricci F, De Caterina R, Fedorowski A. JACC 2015; 66(7): 846-60.

Effects of Specialisation (courtesy of Gert van Dijk)



Classification of TLOC

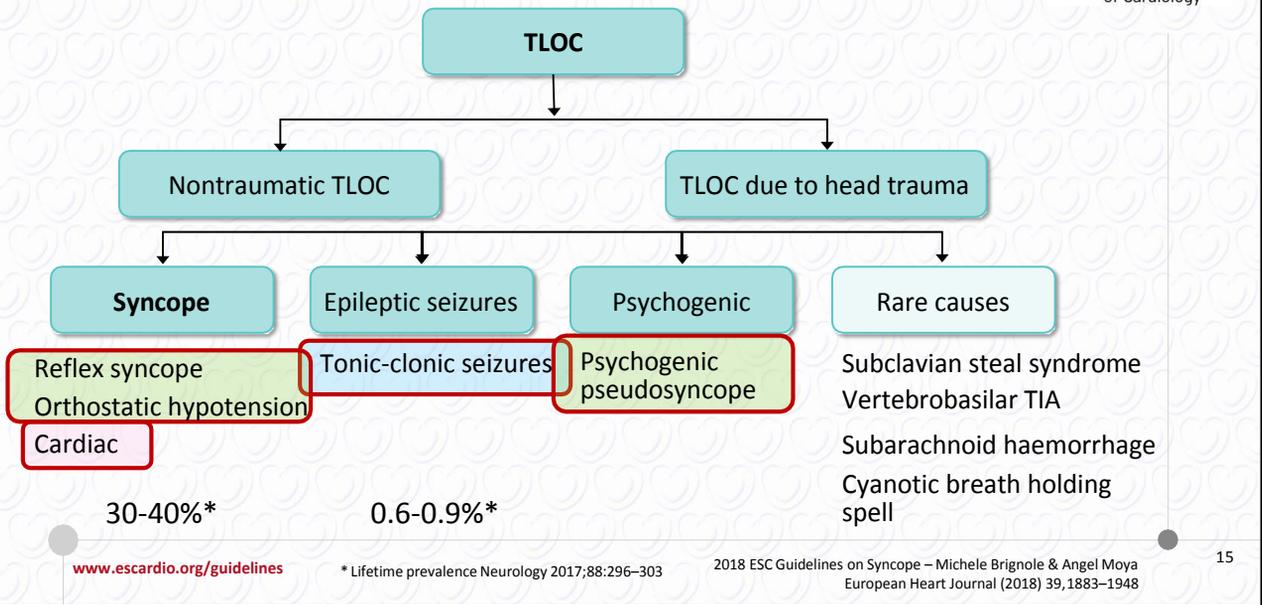


Table 3 Diagnostic journey in POTS patients

	Number (%) or mean (SD)
Misdiagnosed prior to POTS diagnosis	3421 (75%)
POTS diagnosis suggested by patient	1557 (34%)
Number of physicians seen prior to diagnosis	7 (11)
Number of ED visits prior to diagnosis	9 (16)
Specialty of physician who made diagnosis	
Cardiologist	1973 (41%)
Cardiac electrophysiologist	696 (15%)
Neurologist	889 (19%)
Family physician	392 (8%)
Emergency room physician	79 (2%)
Rheumatologist	74 (2%)
Other	711 (15%)

The face of postural tachycardia syndrome – insights from a large cross-sectional online community-based survey

B. H. Shav¹, L. E. Stiles^{2,3}, K. Bourne¹, E. A. Green⁴, C. A. Shihao¹, L. E. Okamoto⁴, E. M. Garland⁴, A. Gamboa⁴, A. Diedrich⁴, V. Raj^{1,5}, R. S. Sheldon¹, I. Biaggioni¹, D. Robertson⁶ & S. R. Raj^{1,4}

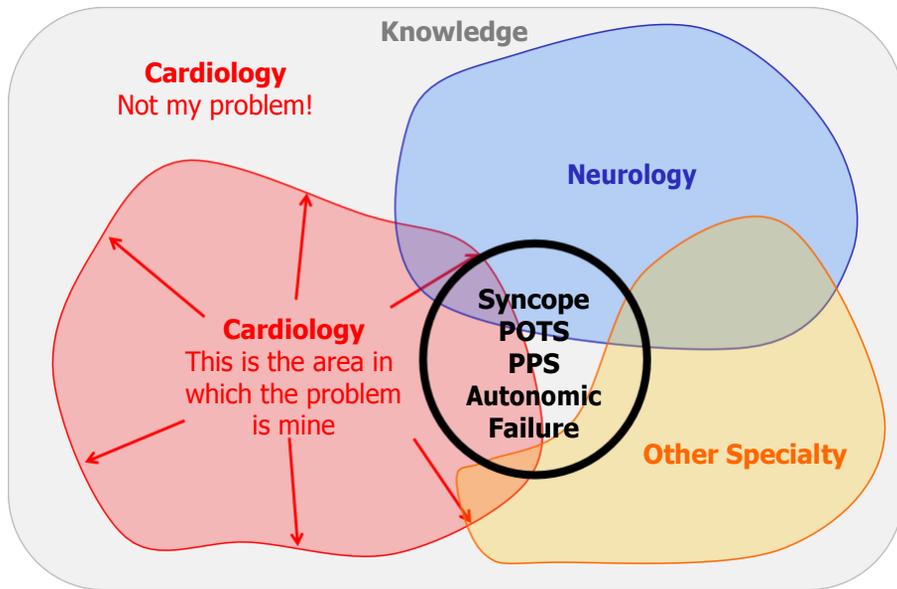
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POTS dx:
typical no man's land

56% cardiologists
19% neurologists

Effects of Specialisation
(courtesy of Gert van Dijk)



MANAGEMENT IN EMERGENCY DEPARTMENT:

- List of low-risk and high-risk features
- Risk stratification flowchart
- Management in *ED Observation Unit* and/or fast-track to *Syncope Unit*

Risk Stratification

NEW / REVISED CLINICAL SETTINGS AND TESTS:

- Tilt testing: concepts of *hypotensive susceptibility*
- Increased role of prolonged ECG monitoring
- Video recording in suspected syncope

CV Autonomic Tests & Prolonged Monitoring

**2018 Guidelines
NEW/REVISED
CONCEPTS
in management
of syncope**

(OUT-PATIENT) SYNCOPE MANAGEMENT UNIT:

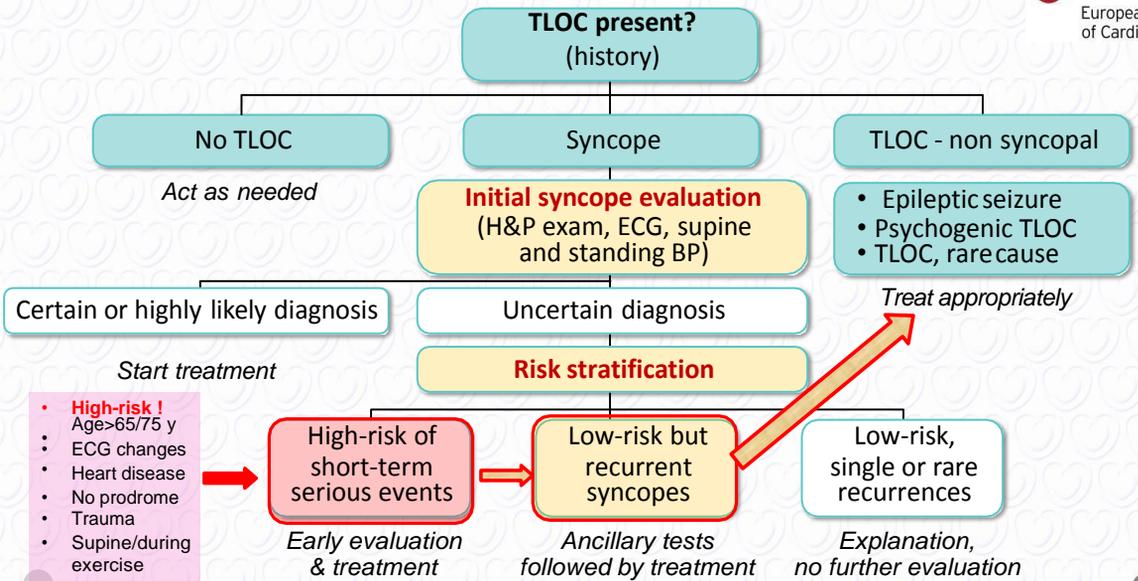
- Structure: staff, equipment, and procedures
- Tests and assessments
- Access and referrals

SYNCOPE UNITS/ EXPERTS

NEW / REVISED INDICATIONS FOR TREATMENT:

- *Reflex syncope*: algorithms for selection of appropriate therapy based on age, severity of syncope and clinical forms
- *Reflex syncope*: algorithms for selection of best candidates for pacemaker therapy
- *Patients at risk of SCD*: definition of unexplained syncope and indication for ICD
- *Implantable loop recorder* as alternative to ICD, in selected cases

Initial presentation & evaluation of syncope



www.escardio.org/guidelines

2018 ESC Guidelines on Syncope – Michele Brignole & Angel Moya
European Heart Journal (2018) 39, 1883–1948

Epidemiology - Frequency of the causes of syncope according to age

Age	Source	Reflex (%)	Orthostatic hypotension (%)	Cardiac (%)	Non syncopal T-LOCs (%)	Un-explained (%)
<40 years	Olde Nordkamp	51	2.5	1.1	18	27
40-60 years	Olde Nordkamp	37	6	3	19	34
<65 years	Del Rosso	68.5	0.5	12	-	19
>60/65 years	Del Rosso	52	3	34	-	11
	Ungar	62	8	11	-	14
	Olde Nordkamp	25	8.5	13	12.5	41
>75 years	Ungar	36	30	16	-	9

www.escardio.org/guidelines

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Risk stratification at the initial evaluation (1)

Low-risk	High-risk (red flag)
Syncopal event	
<ol style="list-style-type: none"> 1. Associated with prodrome typical of reflex syncope (e.g. light-headedness, feeling of warmth, sweating, nausea, vomiting). 2. After sudden unexpected unpleasant sight, sound, smell, or pain. 3. After prolonged standing or crowded, hot places. 4. During a meal or postprandial. 5. Triggered by cough, defaecation, or micturition 6. With head rotation or pressure on carotid sinus (e.g. tumour, shaving, tight collars). 7. Standing from supine/sitting position. 	<p>Major</p> <ol style="list-style-type: none"> 1. New onset of chest discomfort, breathlessness, abdominal pain, or headache. 2. Syncope during exertion or when supine. 3. Sudden onset palpitation immediately followed by syncope. <p>Minor (high risk only if associated with structural heart disease or abnormal ECG):</p> <ol style="list-style-type: none"> 1. No warning symptoms or short (<10 s) <u>prodrome.</u> 2. Family history of SCD at young, 3. Syncope in the sitting position.

Risk stratification at the initial evaluation (2)

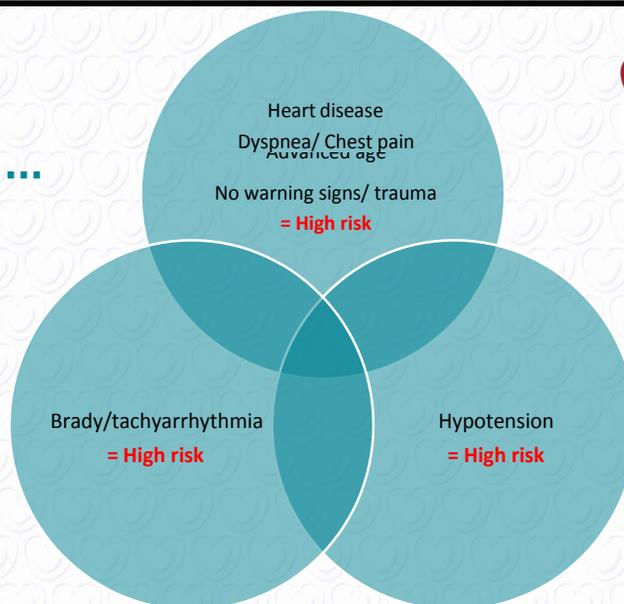
Low-risk	High-risk (red flag)
Past medical history	
<ol style="list-style-type: none"> 1. Long history (years) of recurrent syncope with low-risk features with the same characteristics of the current episode 2. Absence of structural heart disease. 	<p>Major</p> <ol style="list-style-type: none"> 1. Severe structural or coronary artery disease (heart failure, low LVEF or previous myocardial infarction).
Physical examination	
<ol style="list-style-type: none"> 1. Normal examination. 	<p>Major</p> <ol style="list-style-type: none"> 1. Unexplained systolic BP in the ED <90 mmHg. 2. Suggestion of gastrointestinal bleed on rectal examination. 3. Persistent bradycardia (<40 b.p.m.) in awake state and in absence of physical training. 4. Undiagnosed systolic murmur.

Clinical & ECG features that suggest a cardiac syncope

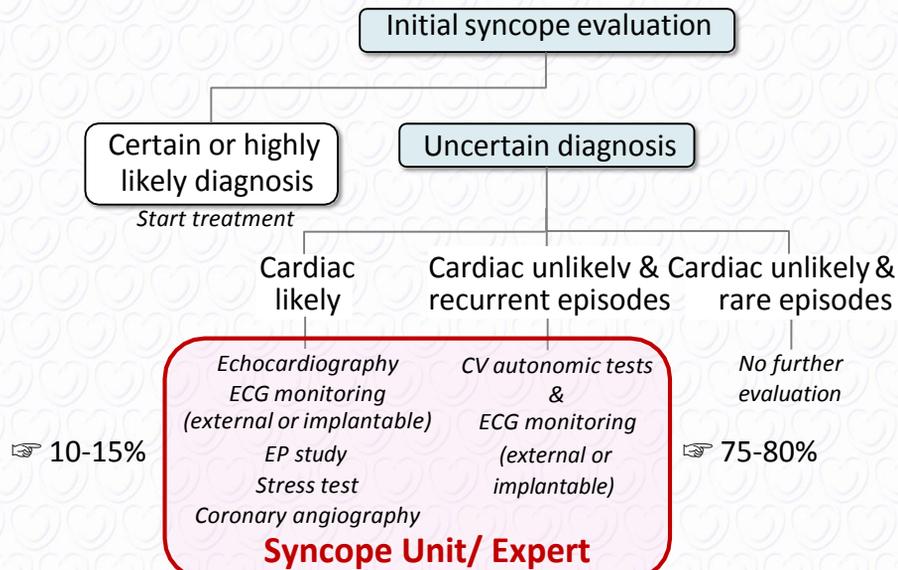
- During exertion or when supine.
- Presence of structural heart disease or coronary artery disease.
- Family history of unexplained sudden death at young age.
- Sudden onset palpitations immediately followed by syncope.
- ECG findings suggesting arrhythmic syncope.

And to summarize ...

in unexplained syncope ...



The diagnostic strategy for unexplained syncope



Organizational aspects: Structure of the SU

Staffing of an SU is composed of:

1. One or more physicians who are **syncope specialists**.
2. A support team comprised of trained professionals.

Equipment:

1. Essential Equipment/tests:

- 12-lead ECG and 3-lead ECG monitoring,
- non-invasive beat-to-beat blood pressure monitor,
- tilt-table,
- Holter monitors,
- external loop recorders,
- follow-up of implantable loop recorders (*),
- 24-hour blood pressure monitoring,
- Basic autonomic function tests.

2. Established procedures for

- Echocardiography
- Electrophysiological studies
- Stresstest
- Neuroimaging tests

3. Specialists' consultancies

(cardiology, neurology, internal medicine, geriatric, psychology), when needed

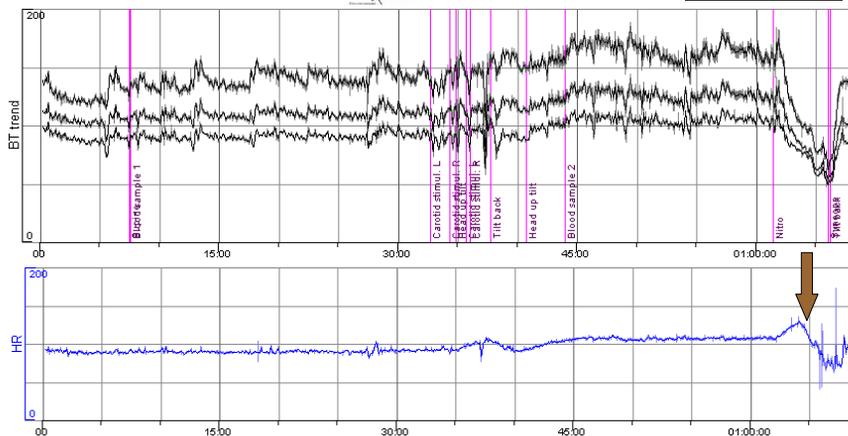
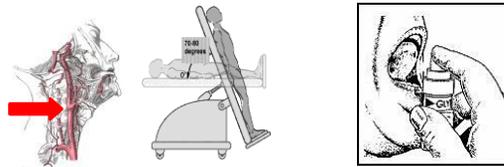
How to find the diagnosis?

=> GPS

- to **Guess it** ⇒ history and examination (such as ECG, supine/standing BP/HR, telemetry, ECHO, biomarkers, angiography)
- to **Provoke it** ⇒ tests (CV AUTONOMIC TESTS: HUT, nitro, CSM etc.)
- to **See it** ⇒ prolonged ECG/BP-monitoring (i.e. **IMPLANTABLE CARDIAC MONITOR**; 24-48 h Holter ECG; external event recorder; 24h ABPM; video EEG; video recording)

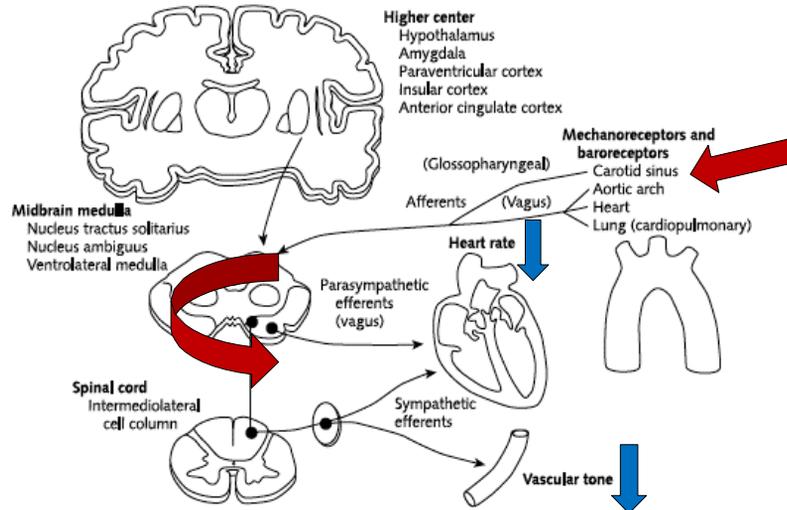
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Head-up tilt test



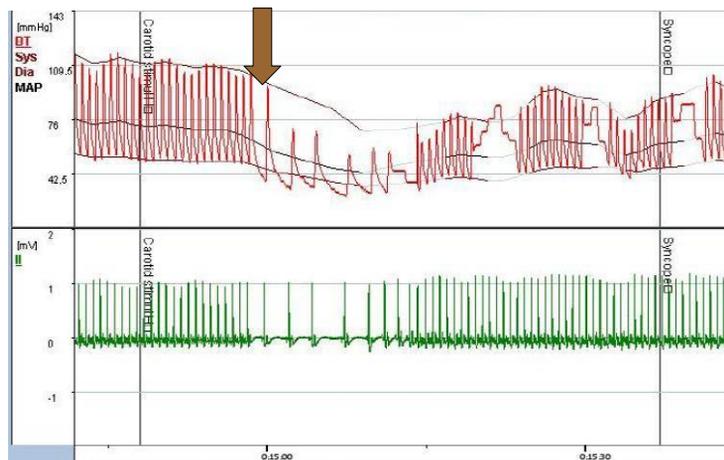
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Carotid sinus reflex: how does it work?



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Carotid sinus hypersensitivity



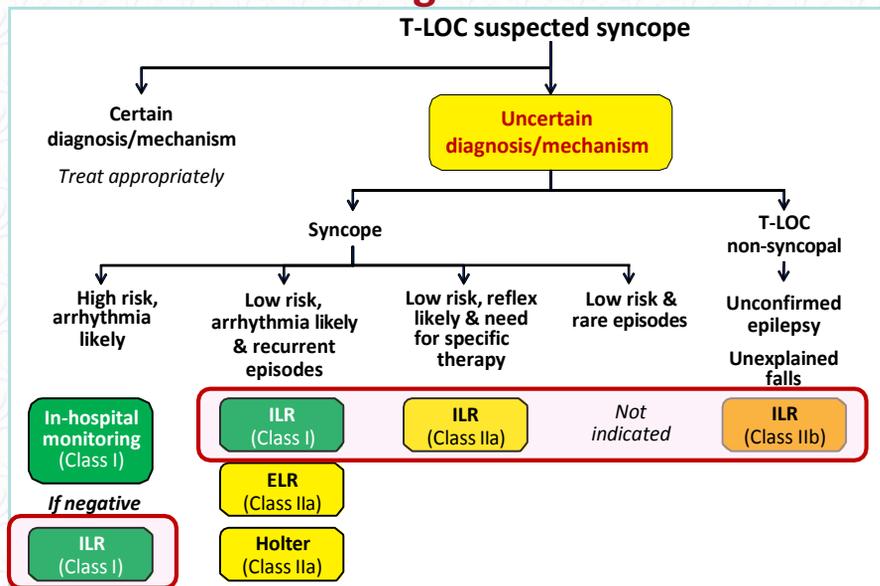
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How to find the diagnosis?

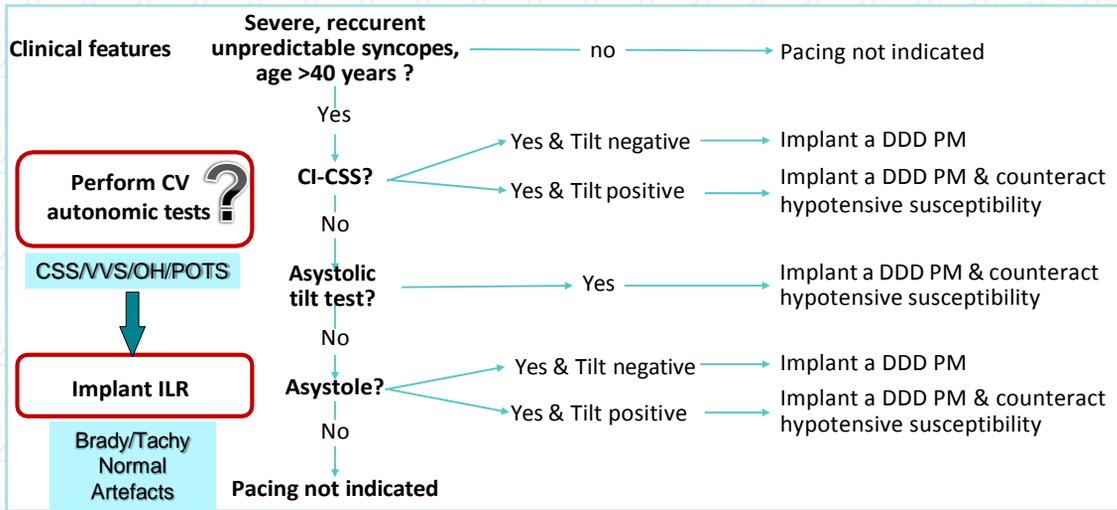
=> GPS

- to **Guess it** ⇒ history and examination (such as ECG, supine/standing BP/HR, ECHO, biomarkers, angiography)
- to **Provoke it** ⇒ tests (**CV AUTONOMIC TESTS: HUT, nitro, CSM etc.**) ???
- to **See it** ⇒ prolonged ECG/BP-monitoring (i.e. **IMPLANTABLE CARDIAC MONITOR**; 24-48 h Holter ECG; external event recorder; 24h ABPM; video EEG, video recording)

ECG monitoring: indications



Pacing for reflex syncope: decision pathway



Case#2

- Man, born -94
- 2009 – LOC, paediatric neurologist: suspected "epilepsy relapse"; treated against epilepsy as a child (4-6 y), however later declared epilepsy-free
- EEG – non-conclusive; brain MRI normal.
- **Feb – 2012 Syncope; ambulatory HUT – after 7 min cardioinhibitory reflex (pause 7 sec) with asymmetric convulsions; dx vasovagal syncope with prodrome;**
- 24 h Holter ECG: normal; EEG: non-conclusive; no intervention.
- Hiatus 2012-2015

Dept. of Cardiology: hospitalization

- Dec – 2015 – convulsive LOC – Brain CT normal/ discharged by neurologist
- Jan – 2016 – "syncope" in sitting position-> admitted to Dept. of Cardiology
- Hx: no LOCs during last few years; from Oct -15 TLOCx3. Always in sitting position. Man observed snoring and lip cyanosis. During the last attack patient was alone; woke up on the floor after about 2 hours. Paramedics reported HR 131 bpm on ECG.
- Admitted to cardiology department.
- Telemetry: sinus tachycardia 100 bpm, unchanged compared with previous ECG. ECHO normal. Patient uncertain whether "syncope" experience was similar to HUT from 2012.

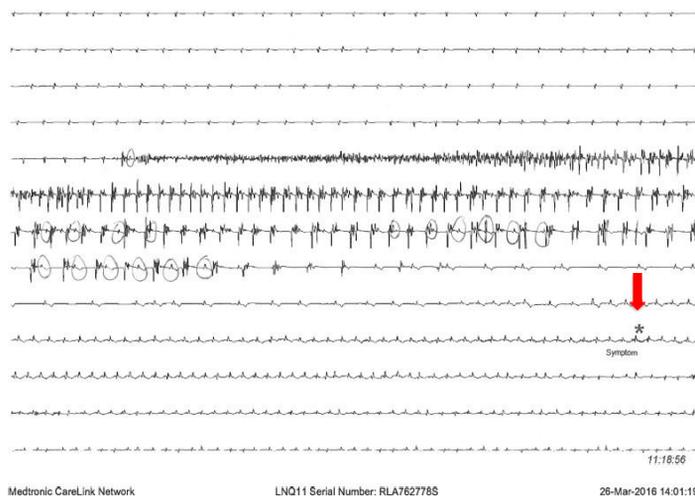
#1 What is the most likely dx?

1. Vasovagal reflex without prodrome
2. Sudden cardiac arrhythmia
3. Epileptic seizure
4. Postural orthostatic tachycardia syndrome with vasovagal syncope

#2 What to do?

1. Electrophysiological study
2. Implantable loop recorder
3. Exercise ECG
4. Video EEG

Implantable loop recorder: diagnosis?



A summary for cardiologist and neurologist

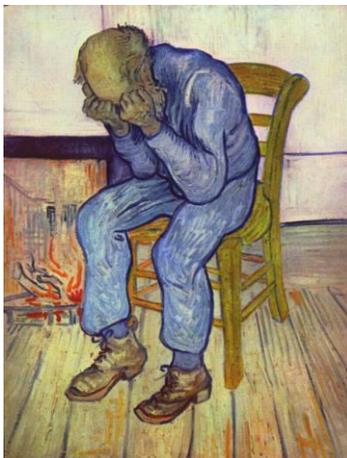
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➤ to **Guess it** ⇒ **HISTORY** (*cardiac disease Hx?*) and **EXAMINATION** (such as **ECG**, supine/standing BP/HR, ECHO, biomarkers, angiography, **EEG**, brain CT/MRI?)

➤ to **Provoke it** ⇒ tests (**CV AUTONOMIC TESTS: HUT, nitro, CSM etc.; SLEEP-DEPRIVED EEG?**)

➤ to **See it** ⇒ prolonged ECG/BP-monitoring (i.e. **IMPLANTABLE CARDIAC MONITOR**; 24-48 h Holter ECG; external event recorder; 24h ABPM; **VIDEO EEG, VIDEO RECORDING**)

"Syncope Expert" = you may become the one !



Should I really talk to a cardiologist ?