

Syncope

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Conflicts of Interest

None

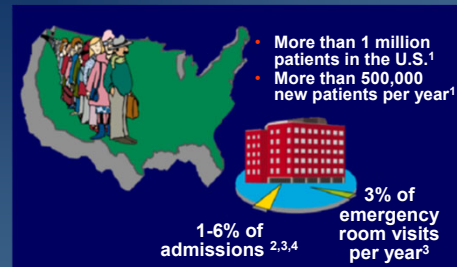


Definition

- Sudden temporary loss of consciousness with spontaneous recovery.
- Happens to 20 - 25 % of patients at some point in their life.
- Typically due to transient hypotension.



Magnitude Of Syncope



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

² Gendelman HE, et al. NY State J Med 1983

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



Quotable Quotes

"Those who suffer from frequent and severe fainting often die suddenly."

Hippocrates, 1000 BC

"The major difference between syncope and cardiac arrest is that in one of them you don't usually wake up."

Anonymous



Syncope : Risks

- The most important task is to separate high-risk syncope from the great majority of syncope which is low-risk.
- High-risk syncope is often associated with structural heart disease or arrhythmia. The first steps in the evaluation are to exclude these.
- Even medically low-risk syncope can result in significant injury. Capacity to predict and prevent full collapse must also be evaluated.



Syncope or Fall ?



- 1) Premonitory symptoms
- 2) Urgency to escape
- 3) Near collapse
- 4) Full collapse
- 5) Recovery



Evaluation - History

Of all tests for the evaluation of syncope, a thorough H&P has the highest diagnostic yield.



Evaluation - History

- Circumstances: time of day, situation, onset, witnesses
- Symptoms – Nausea, diaphoresis, pallor, palpitation, rotation
- Recovery – confusion, amnesia, fatigue
- Presence of Heart Disease / age of patient. Family history
- Previous events - trauma, procedures / surgery, military service.
- Bodily Injury.



Evaluation - Tests

- Echocardiography
- Holter monitoring
- Event monitoring
- Tilt Table Testing
- Carotid Sinus Massage
- Exercise Tolerance Testing
- Electrophysiology Studies
- Neurological Studies
- ENT evaluation
- Implantable Loop Recorder (ILR)



Etiologies of Syncope

- Cardiac (structural)
 - Mechanical:
 - HOCM
 - AS, MS, Myxoma
 - PE, PS, Pulm HTN
 - Electrical
 - Brugada syndrome
 - Tachycardia
 - LQTS
 - Aborted SCD
- Non-Cardiac
 - Orthostatic
 - Neurological
 - Carotid Sinus
 - Pseudosyncope
 - Neurally mediated
 - Cough
 - Neurocardiogenic
 - Micturition ("syncopee")
 - Deglutition syncope



Conventional Diagnostic Methods

Test/Procedure	Yield	Monitoring Duration
History & Physical	49-85% ^{1,2}	NA
ECG	2-11% ²	15 minutes
Holter/Event Monitor	5-20%*	1-30 days
Electrophysiology Study (without SHD)	11% ³	NA
Tilt Table Test	11- 87% ^{4,5}	20 – 40 min
Electrophysiology Study (with SHD)	49% ³	NA
Insertable Loop Recorder	65 - 88% ^{6,7}	Up to 24 months

¹ Kapoor, et al N Eng J Med, 1983.

² Kapoor, JAMA, 1992

³ Kapoor, Am J Med, 1991.

⁴ Krahn, Circulation, 1995

⁵ Linzer, et al. Ann Int. Med, 1997.

⁶ Krahn, Cardiology Clinics, 1997.

⁷ Kapoor, Medicine, 1990.



Neurocardiogenic Syncope

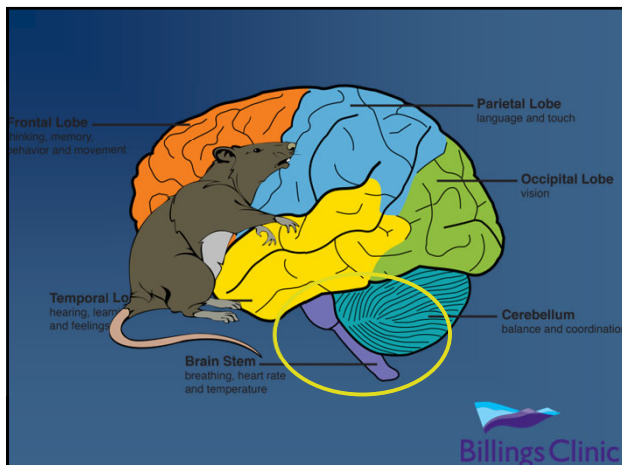
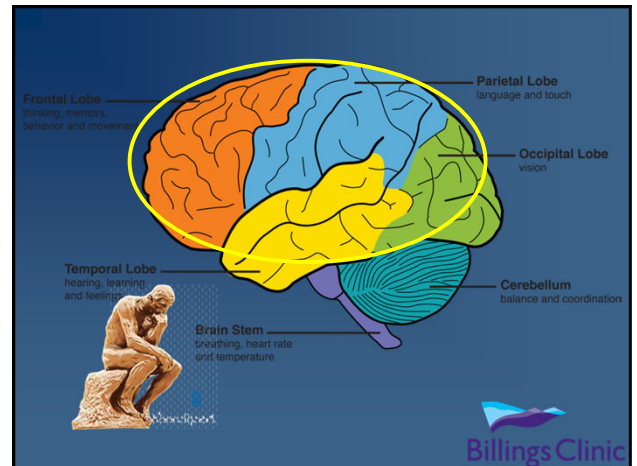
- Typical situations: anxiety, bathroom, church, dining
 - prolonged standing
 - dehydration (diarrhea, vomiting, sweating)
 - fasting / poor eating habits
 - any bathroom activity
 - getting up in the middle of the night
 - stressful periods (finals, death in family)
 - Needlesticks, sight of blood

- Accounts for 50-80 % of unexplained syncope.

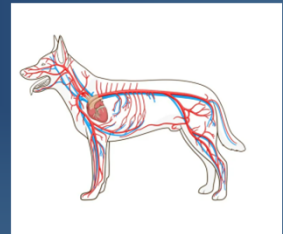


Neurocardiogenic Syncope

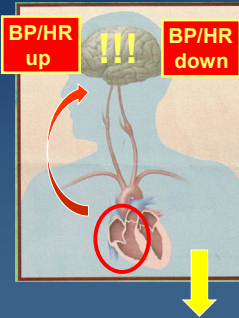
- Typical symptoms:
 - Palpitation
 - Shortness of Breath
 - Diaphoresis
 - Chest Pain
 - Flushing
 - Quick recovery
 - Pallor - "like a ghost"
 - Persistent Fatigue - "drained"



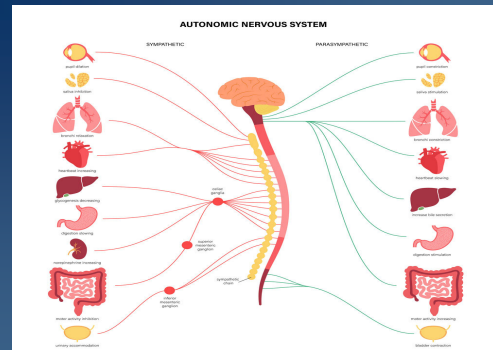
Gravity - based



Neurocardiogenic Physiology



1. Sequestration of volume
2. C-fibers - mechanoreceptors
3. Parasympathetic response
4. Hypotension / hypoxia
5. Sympathetic response *****
6. Syncope



Neurocardiogenic Syncope

- Typical symptoms:
 - Palpitation
 - Shortness of Breath
 - Diaphoresis
 - Diminished sensorium
 - Flushing
 - Quick recovery
 - Pallor - "like a ghost"
 - Persistent Fatigue - "drained"



POTS Criteria

- Sustained heart rate increase of >30 beats per minute (bpm) within 10 minutes of standing.
- No significant hypotension (systolic blood pressure does not drop more than 20 mmHg).
- Symptoms must be present for at least 6 months.



Neurocardiogenic Syncope criteria

- NCS is diagnosed based on clinical history or a specific reaction during a Tilt Table Test:
- A sudden, precipitous crash in blood pressure (vasodepressor).
- Accompanying bradycardia or cardiac standstill (cardioinhibitory).
- Immediate recovery of consciousness and orientation upon sitting or lying down flat.



So, is it POTS or is it NCS ???

- Postural Orthostatic Tachycardia Syndrome (POTS) and Neurocardiogenic Syncope (NCS) are both forms of dysautonomia (autonomic nervous system dysfunction)
- Part of the popularity of POTS is the simplicity of the acronym. The difference is largely semantic – artificial
- POTS is defined by an excessive heart rate increase upon standing without a significant drop in blood pressure
- NCS is an episodic reflex that causes a sudden drop in blood pressure and heart rate, leading to fainting



SO, which one is it ???

- They are both expressions of the same neural loop, with POTS being an intermediate state and NCS the extreme result.
- Tilt Table Testing is notorious for its poor reproducibility
 - A positive test that faithfully reproduces the presenting symptoms is useful – it verifies the root cause.
 - A negative test means very little – it may be positive some other day and in no way negates a compatible history
 - A positive test that presents unfamiliar symptoms to the patient is clinically NEGATIVE



Tilt Table Testing



Tilt Table Testing - History



Prolonged upright posture has been used from early recorded history as a means of punishment and torture

One of the most significant recorded instances of crucifixion occurred during the 6th century BC when the Persian Emperor Darius I ordered the crucifixion of 3,000 political prisoners in Babylon.



Tilt Table Testing

- Current Protocols:
 - 70° - 80° tilt
 - Baseline (no drug) for 10-30 min.
 - Drug stimulation for a comparable time
 - Isoproterenol
 - Nitroglycerin
 - Test over once the clinical symptoms replicated



Tilt Table Testing

- | | |
|--------------------------------------|--------------------------------------|
| • Advantages: | • Disadvantages: |
| → Safe | → Time-consuming |
| → Easy to administer | → Variable reproducibility |
| → Symptom reproduction | → Use of drugs decreases specificity |
| → Relatively inexpensive | → Must bring transportation |
| → Use of drugs increases sensitivity | |



Baseline



Upright



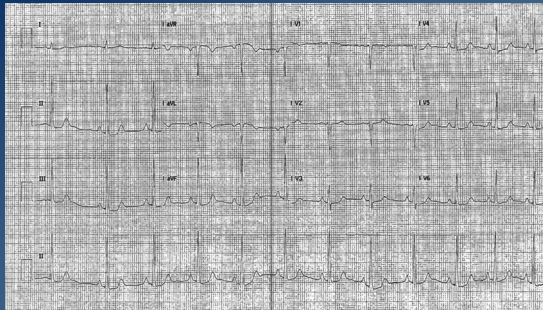
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Early symptoms – POTS ??



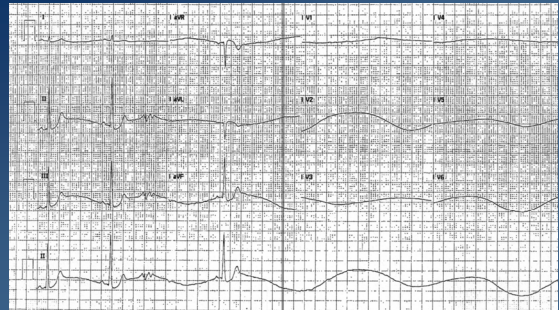
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Advancing symptoms



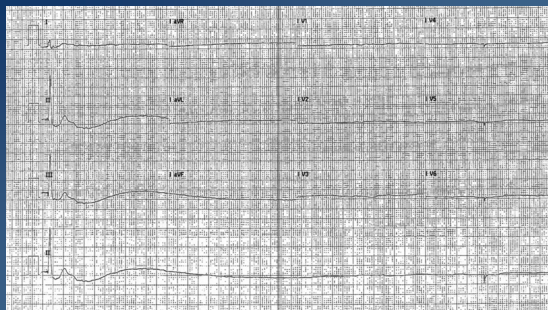
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Diagnostic Response



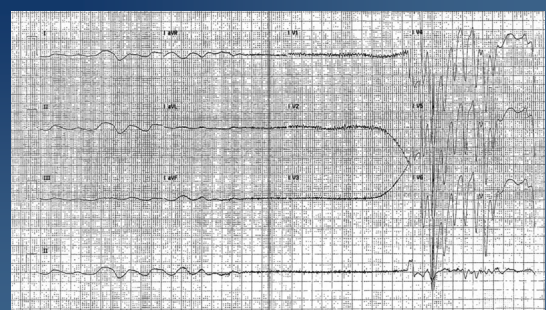
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Supine



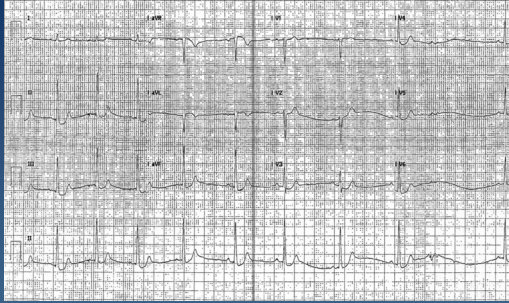
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Continued hypotension



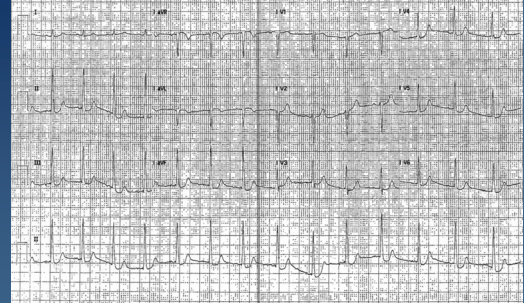
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Recovery: JR to SR



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Back to Baseline



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Neurocardiogenic Syncope - Rx

- Non-pharmacological
 - Salt and water
 - FIRST LINE THERAPY
 - Compression garments
 - Pacing
 - partially effective at best.
 - SBR / Rate Drop resp.
- Pharmacological
 - fludrocortisone
 - midodrine
 - metoprolol
 - theophylline
 - scopolamine
 - disopyramide
 - SSRI's
 - Clonidine – patch
 - Cardioneuroablation

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J. Robert Cade, MD
1927-2007

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Orthostatic Syncope

- Very different from NCS. It is the absence of a autonomic response to postural changes.
- Seen in the elderly, severe neuropathies and other states of denervation.
- α - agonists (midodrine) may help.

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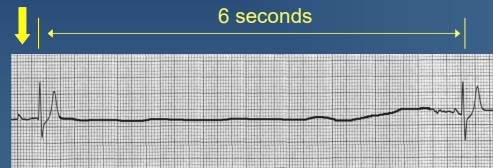
Carotid Sinus Hypersensitivity

- Defined as pauses of > 3 sec + dizziness in response to gentle carotid sinus massage.
- May be cardioinhibitory (pauses or block), vasodepressor (hypotension) or mixed.
- Can present with suggestive Hx.



Carotid Sinus Hypersensitivity

Massage should be 5 seconds long



Carotid Sinus Hypersensitivity

- Pacemaker indicated for recurrent syncope with pauses >3 sec by massage in the absence of SAN / AVN depressants.
- Usually seen in older patients.
- Pacer may not fully protect if vasodepressor response is strong.



Conduction System Disease

- SA node dysfunction : Usually unmasked by tachyarrhythmias (Tachy-Brady syndrome)



- Symptoms occur when the SA node fails to restart after a salvo of tachycardia



Conduction System Disease

- AV node disease : Usually presents with symptomatic Wenckebach 2° AV block in the presence of a narrow QRS.
 - Easily worsened by common medications.
- Infra-His disease : Presents with high-degree AV block in the presence of a wide QRS.



Conduction System Disease

- Treatment :
 - Almost always dependent on symptoms, rather than on numbers.
 - EP study is merely confirmatory in most cases.
 - Drugs should be stopped prior to deciding whether or not to implant a pacemaker.

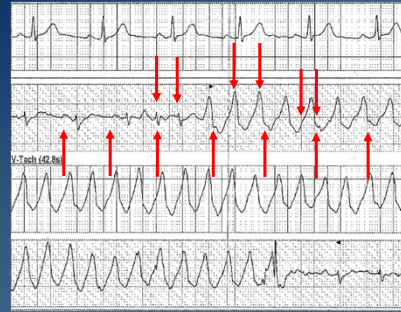


Tachyarrhythmias

- It is uncommon for SVT to cause syncope.
- VT is one of the major causes of mortality in syncope
- Wide complex tachycardia is VT ...
 - 95 % of the time if patient has any cardiac Hx.
 - 98 % of the time if previous MI.
- Long-QT presents with recurrent syncope.



VT or SVT ?



QRS at 100 bpm, 200 bpm, 300 bpm



LQTS – Torsade de Pointes



Neurological Syncope

- Much less frequent than previously thought.
- Syncope is a posterior circulation symptom (RAS), and can't be explained by carotid dz.
- When neurologically mediated, there usually are lateralizing signs.



Neurological Syncope

- Usually due to characteristic syndromes:
 - Trigeminal neuralgia
 - Glossopharyngeal neuralgia
 - Basilar migraine
 - Seizure disorder - **careful** if:
 - EEG is negative
 - Treatment-resistant
 - Vertebrobasilar arterial disease



Seizures & Syncope: Manchester Study¹

88 patients with

- 2 or more episodes
- Diagnosed as epileptic



Tilt Table with

- Video EEG monitoring
- Carotid sinus massage

49% had Non-Epileptic Causes

- 29% cardiac causes (26/88)
- 19% psychogenic causes (17/88)

¹ Zaidi A, et al. Presented at NASPE, May 1999.



Psychiatric Illnesses

- Be aware of the possibility, but very careful in jumping into this conclusion. NCS is far more common than psychiatric syncope.
- Many patients with bonafide syncope have been branded with psychiatric diagnoses at one time or another.
- May be documented by symptoms in the absence of hypotension during Tilt Test.



Implantable Loop Recorder

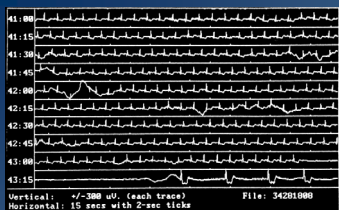
- When episodes are infrequent and
- Other avenues have been exhausted and
- Diagnosis is still elusive



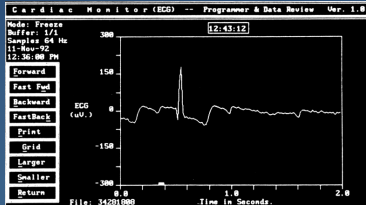
... then an ILR may be the best choice.



ILR Recording



AV Block



Krahn AD, Klein GJ, et al.
Circulation. 1995;92:1819-1824.



Prognosis

- Non-cardiac syncope is generally benign.
- Cardiac syncope carries a 20-30% one-year mortality.

BUT ...

We live in a dangerous world



Evaluation - History

Of all tests for the evaluation of syncope, a thorough H&P has the highest diagnostic yield.



Case #1 – Escape from California



Case #1 – Escape from California

- 64 y/o WM with extensive cardiac history:
 - S/P bioprosthetic AV 2019
 - S/P Medtronic DDDR pacemaker 1/2021
 - S/P AF ablation in Newport Beach, CA 6/2021
- Decides to move to Montana and around Salt Lake City is involved in a one-vehicle rollover accident with his pickup and U-Haul trailer.
- Wakes up in hospital with no recollection of events. Relates to staff he has not slept or eaten in over 24 hrs.



Case #1

- Somehow escapes major injury and is soon discharged from hospital. Flies to Denver on way to Billings and again wakes up in hospital near DEN. Is informed he passed out at gate and bystanders reported body jerks as he fell to floor.
- Again, has no recollection of events.
- Hospital evaluation unremarkable. Started on new medication but fails to fill it and finally arrives in Billings.
- Presents in clinic after a third event at home.



Case #1

- Seen in neurology clinic and restarted on levetiracetam 750BID, which was his discharge medication in CO. Is upset at his diagnosis and requests cardiology evaluation.
- Evaluation in clinic reveals atrial fibrillation. Pacemaker analysis shows AF burden of 36% but otherwise normal thresholds and function and no high-rate ventricular detections.



Case #1

- Lack of history
 - Medical records
 - Witness accounts
 - Recordings from pacemaker
- Extensive cardiac history
- Need for activity restriction



Case #1

Diagnoses

Seizure disorder
Normal pacemaker function
Atrial fibrillation, recurrent post ablation
Normal prosthetic aortic valve function

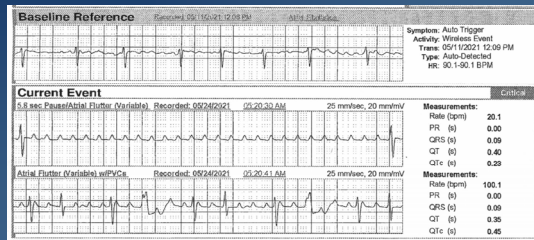


Case #2 – Billings Gazette

- 68 y/o WM with HTN and AF.
- Seen in clinic and event monitor ordered
- Critical report received from monitoring center
- No previous history of events.



Case #2 – Billings Gazette



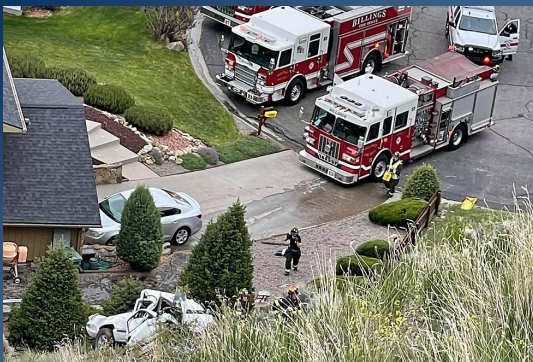
6 sec pause at 5:20 AM

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Case #2 – Billings Gazette



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Case # 2

- Patient sleeping at time of recorded event. Wife reports he snores loudly
- Denies loss of consciousness (ever)
- Involved in accident on Zimmerman trail : Pickup truck nearly rammed him into precipice, but he was able to stay on road. Police report later confirms the truck driver was attempting suicide.

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Case #2

- Diagnoses:
 - Atrial fibrillation
 - Sleep Apnea

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Case #3

Shopping at Sears

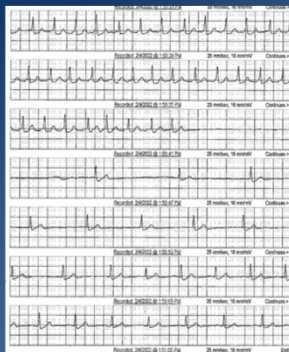
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Case #3

- 75 yo WF with HTN, PAF and occasional dizzy spells
- Evaluation ongoing:
 - Echocardiogram – normal LV function, enlarged LA
 - Normal laboratories
 - Event monitoring pending
- Has been instructed not to drive due to a recent fall without injury. "But I only drive to the store and back..."



Case #3



In AF/RVR at 140bpm with spontaneous conversion,

resulting in a 5 second pause

followed by junctional bradycardia

with eventual return to sinus rhythm



Case #3

Diagnosis

- Tachycardia bradycardia syndrome
- Atrial fibrillation
- Syncope due to post-conversion pause

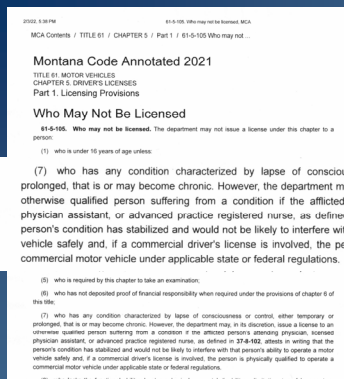
Treatment:

Permanent pacemaker



Social Aspects

- Driving restrictions – Best Guidelines come from AHA/HRS
 - "It must be recognized that the goal of a zero-percent risk is unattainable. Indeed, society already accepts certain degrees of risk by allowing the young and elderly to drive."
 - "Sometimes the degree of risk lies on a continuum..." (referring to legally allowable levels of impairment)
 - In general, commercial driving is subjected to the same recommendations as piloting, while personal driving restrictions are somewhat more liberal.



Driving Restrictions – FL State Law

- "Any physician, person or agency who knows of any licensed driver's or applicant's mental or physical disability to drive or need to obtain or to wear a medical identification bracelet is authorized to report this to the DHSMV."
- Medical conditions - "Because every medical condition is different, the best option is to contact our Medical Review Section at 850/488-8982. Each case will be evaluated and you'll be advised of the necessary procedures."

