Heart Rhythms: The Slow, The Fast, The Ugly

APAA Boot Camp 2020

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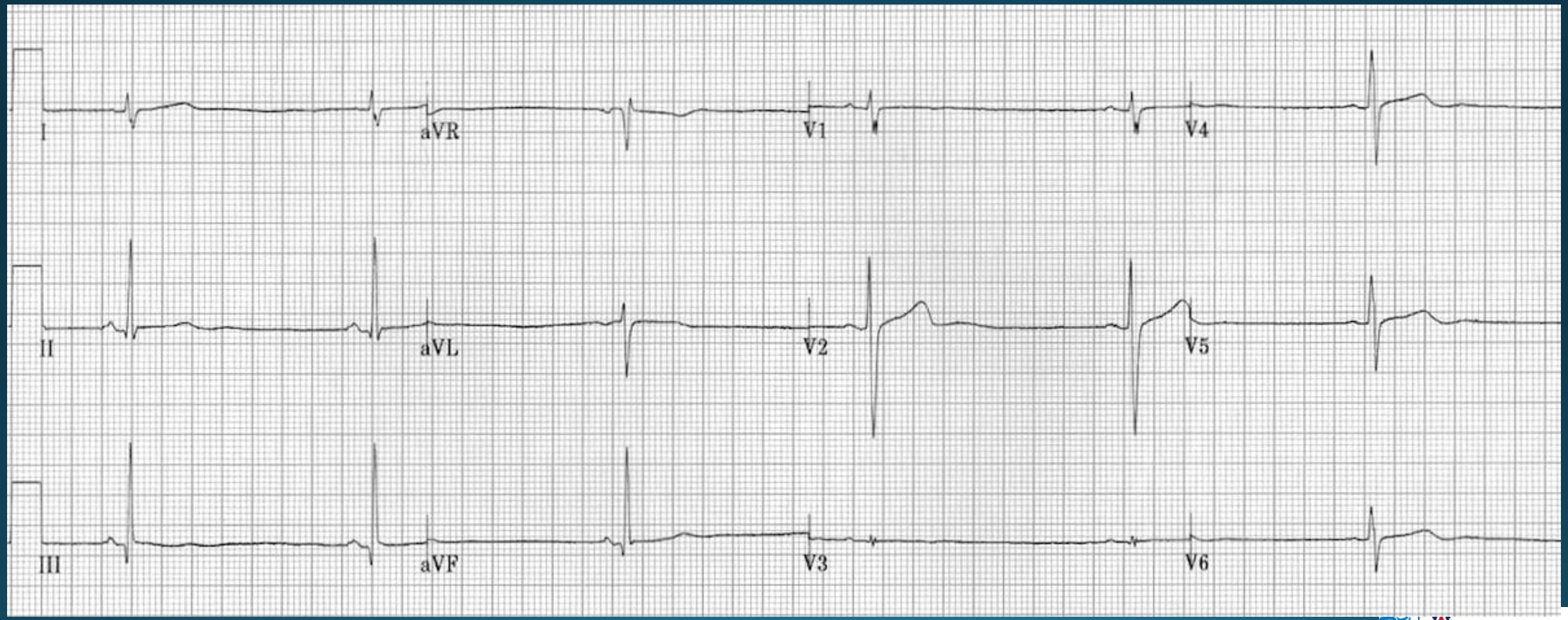
Educational Objectives

- Provide a broad overview of the care of patients with heart rhythm disorders
- At the conclusion of this session, participants should be able to:
  - Perform basic evaluation and management of patients with Bradycardic (slow rhythm) disorders
  - Perform basic evaluation and management of patients with Tachycardic (fast rhythm) disorders
  - Identify emergencies needing immediate care

Mrs. Jones

- 73 yo female
- Hypertension and obesity
- Referred to your clinic for fatigue and HR measured as 36 on her home BP cuff
- Began feeling fatigued about 1 month ago. HR readings in the 40s occasional at first and now persistently so.
- Denies syncope, chest pain, TIA/Stroke symptoms. Has some shortness of breath with exertion as well as fatigue and exercise intolerance

Mrs. Jones EKG



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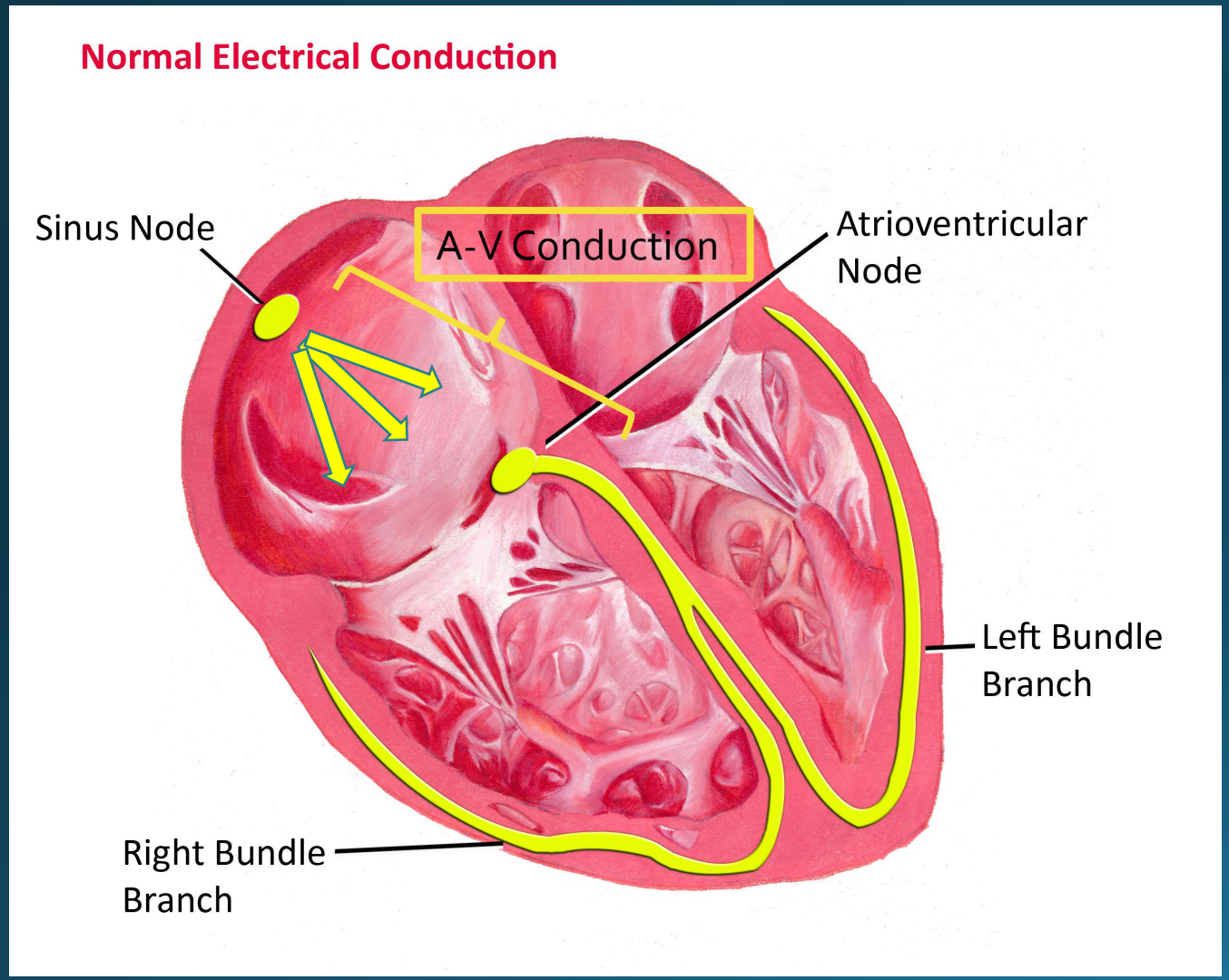
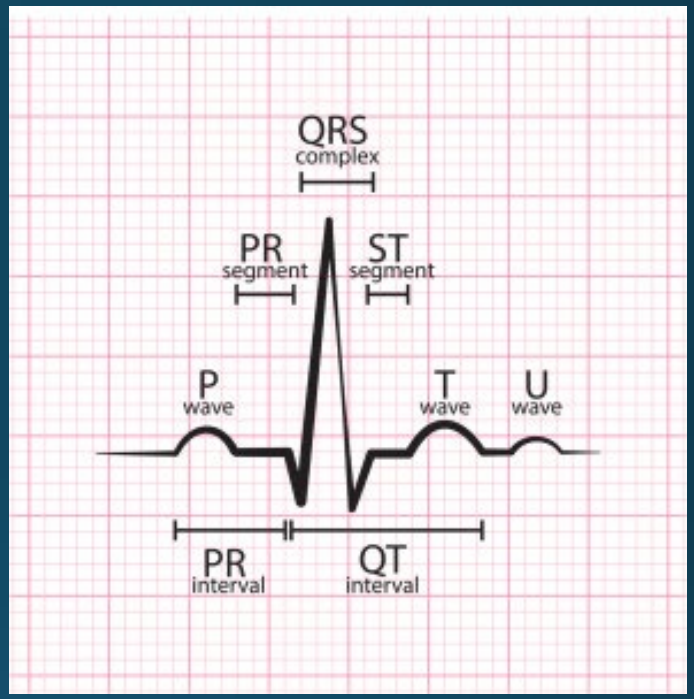
Cardiac Electrical Conduction





- Sinus node function
  - Underlying sinus rate
- Atrio-Ventricular Conduction
  - Is there AV block?

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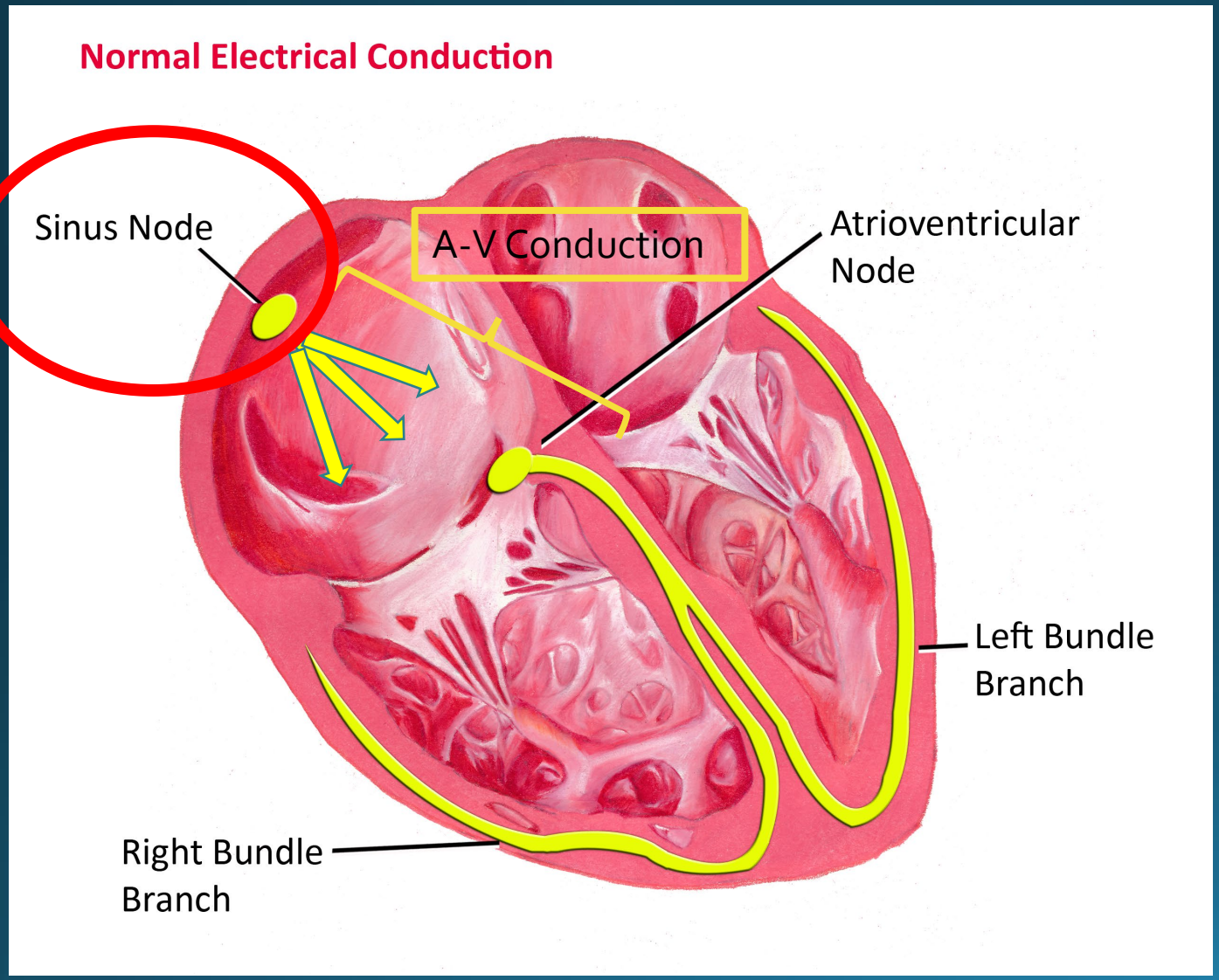
Cardiac Electrical Function



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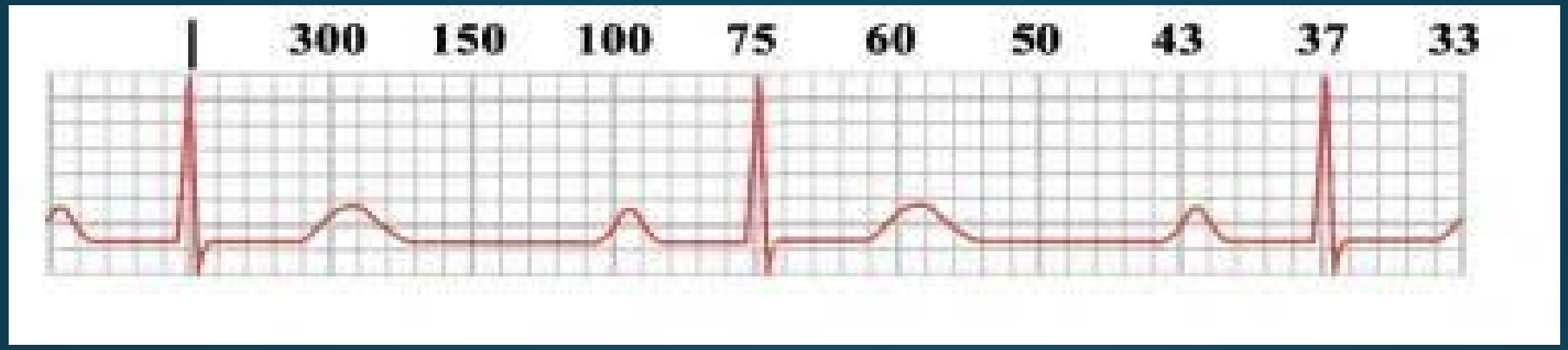
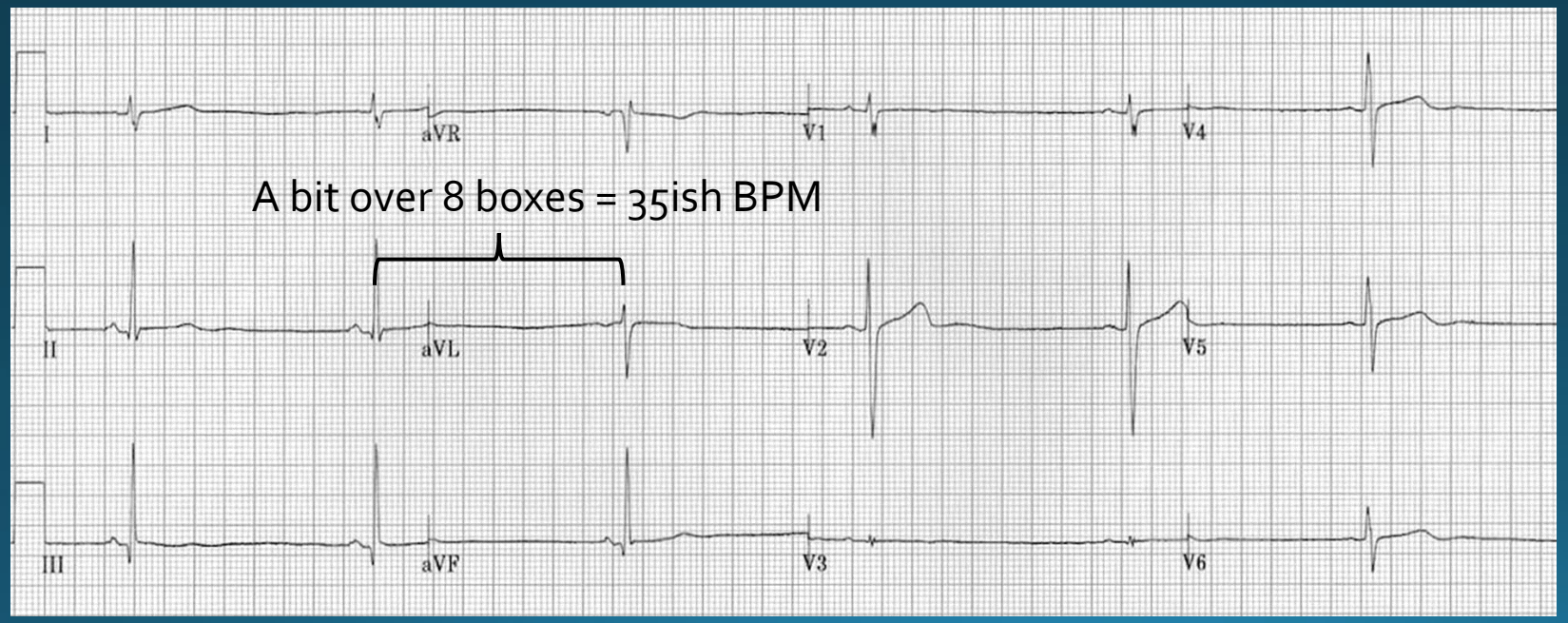
How to quickly figure Heart Rate

- Count the Boxes! (Make sure paper speed is 25mm/sec!)





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Bradycardia involving the sinus node

- Primary Sinus Node Disorder
  - Sick sinus syndrome
    - Slow sinus rate
    - Sinus pauses

- Secondary causes of slow sinus activity
    - Sleep Apnea – evaluate EVERYONE!
    - High vagal tone (i.e. aerobic conditioning, vaso-vagal episode)
    - Hypothyroid, electrolytes
    - Medications (i.e. B-Blockers)

Workup for Sinus Bradycardia

- History and Physical
- EKG
- If symptomatic consider ambulatory monitor (Holter or Event Recorder)
- Appropriate lab work (Thyroid, Electrolytes)
- Strongly consider sleep apnea evaluation
- Consider cardiac imaging (Echo) and or exercise stress test

Sinus Bradycardia: Pearls for Management

- Key Question: " Is heart rate too slow for the patient and what they are doing?"
  - Definition of sinus bradycardia: <50 BPM has little clinical utility by itself
  - Unless syncope is unlikely to be dangerous – focus on quality of life
  - Decide if HR is slow enough to affect quality of life
    - Slow resting HR may not mean slow HR with activity
      - Athlete may have resting HR in the 35 BPM and max exercise 200 BPM = they are fine
      - Older patient may have resting HR 70 BPM and max exercise HR 75 BPM with fatigue and exercise intolerance = they are NOT fine
  - Do NOT treat if NOT symptomatic: "There is no such thing as asymptomatic sinus bradycardia or sinus pause that needs treatment"

Treat the patient not the numbers!

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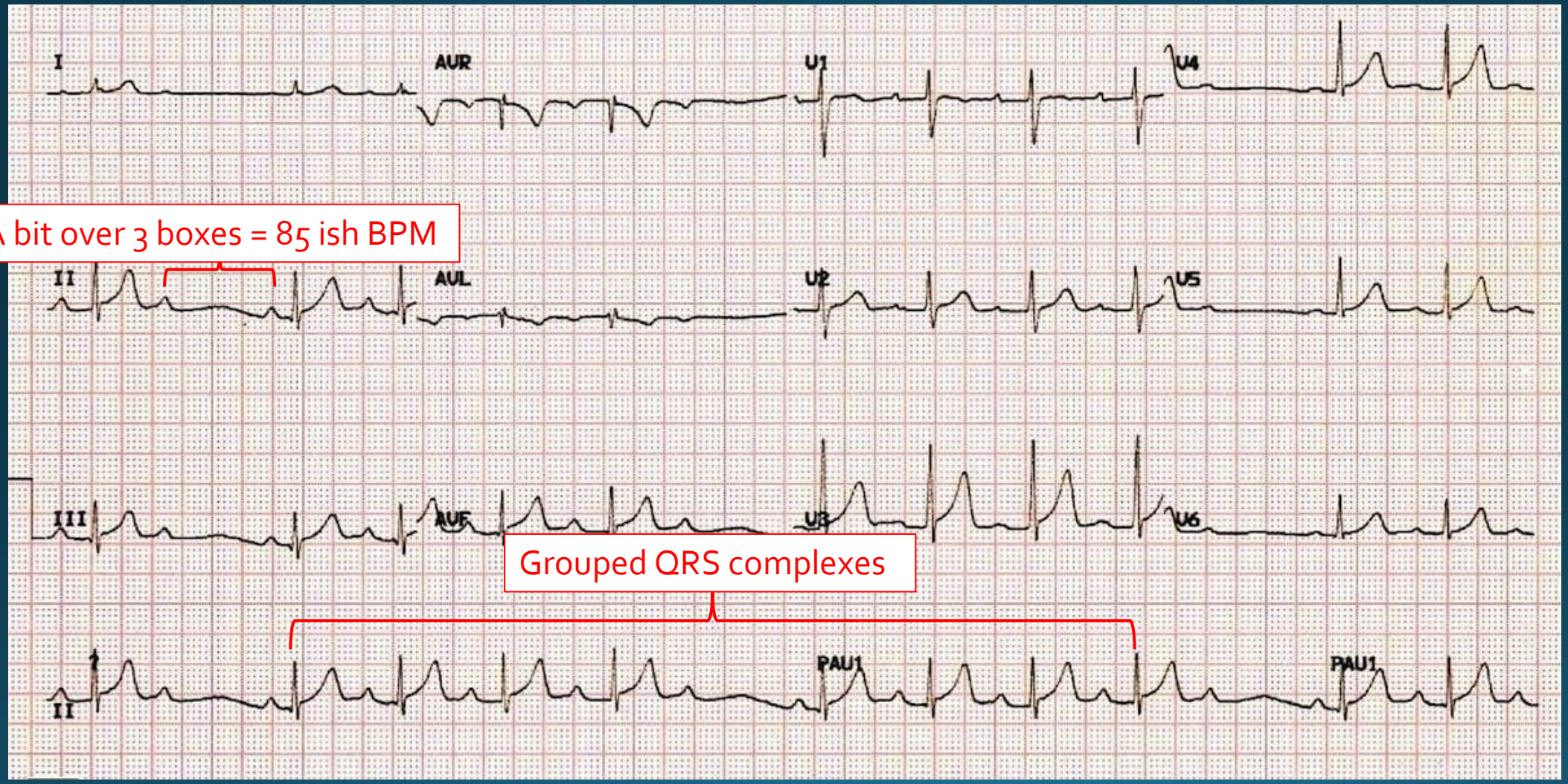
Mr. Thomas

- 68 yo male
- Referred due to finding irregular heart rate while feeling his pulse. Thinks he is "missing a beat"
- Denies significant fatigue or exercise intolerance, usually notices while at rest
- Denies chest pain, stroke symptoms, or heart failure symptoms such as orthopnea, PND or LE edema
- He is overweight but has no significant other comorbidities or cardiac medications

Mr. Thomas EKG



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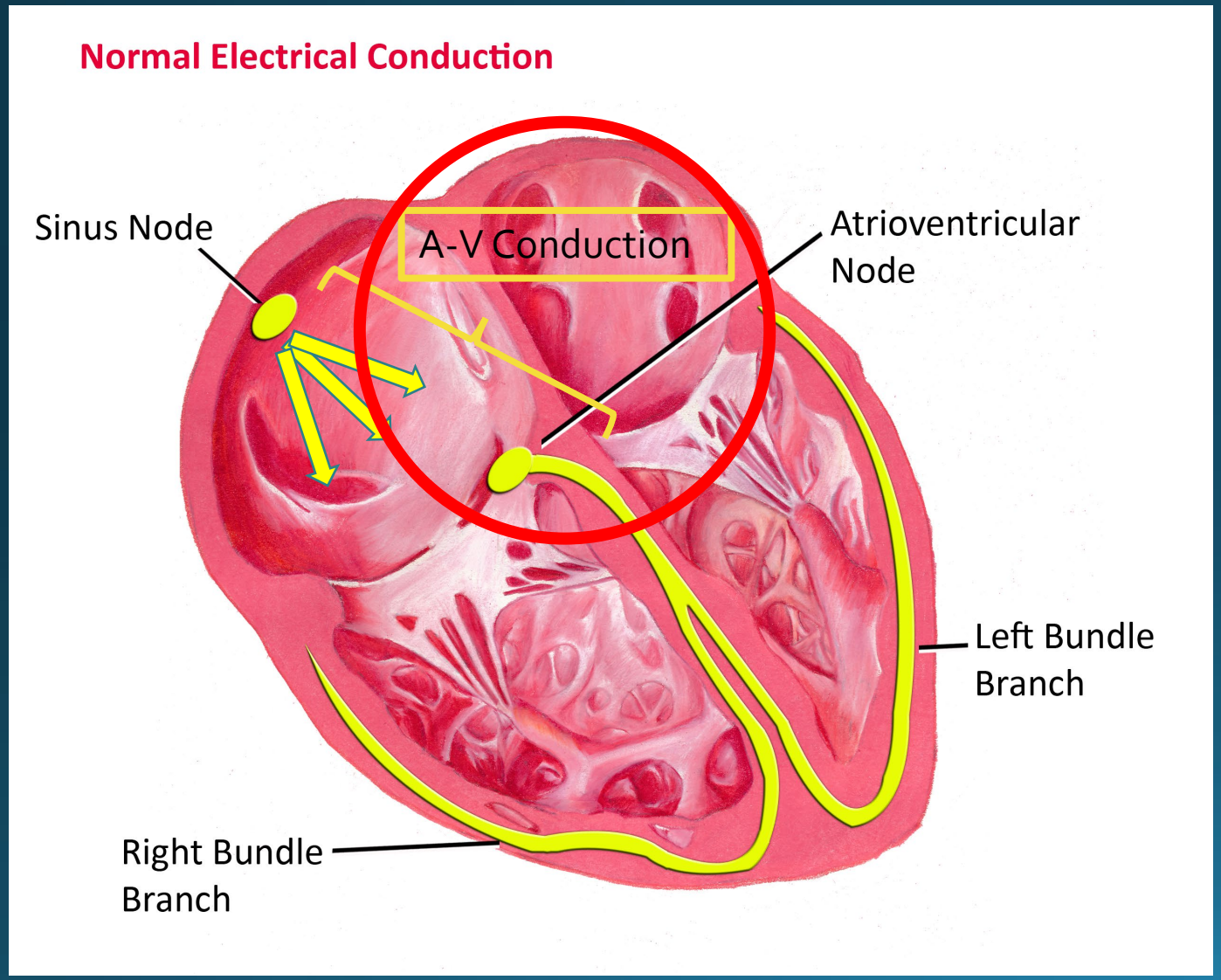
Cardiac Electrical Function



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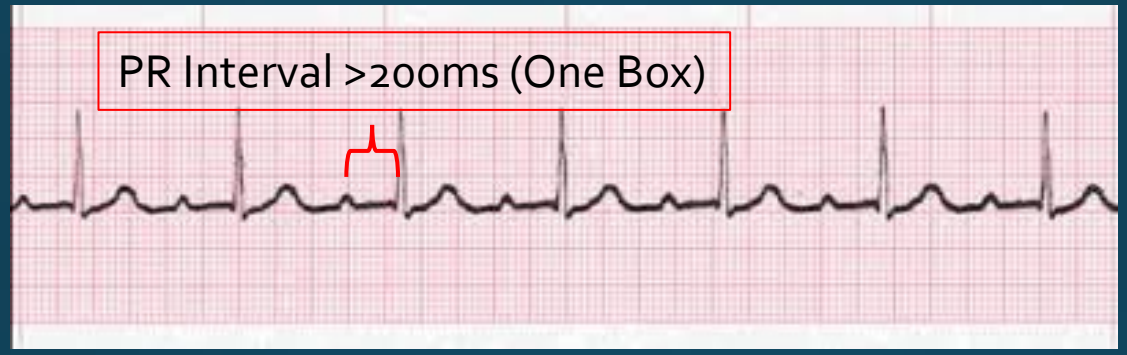
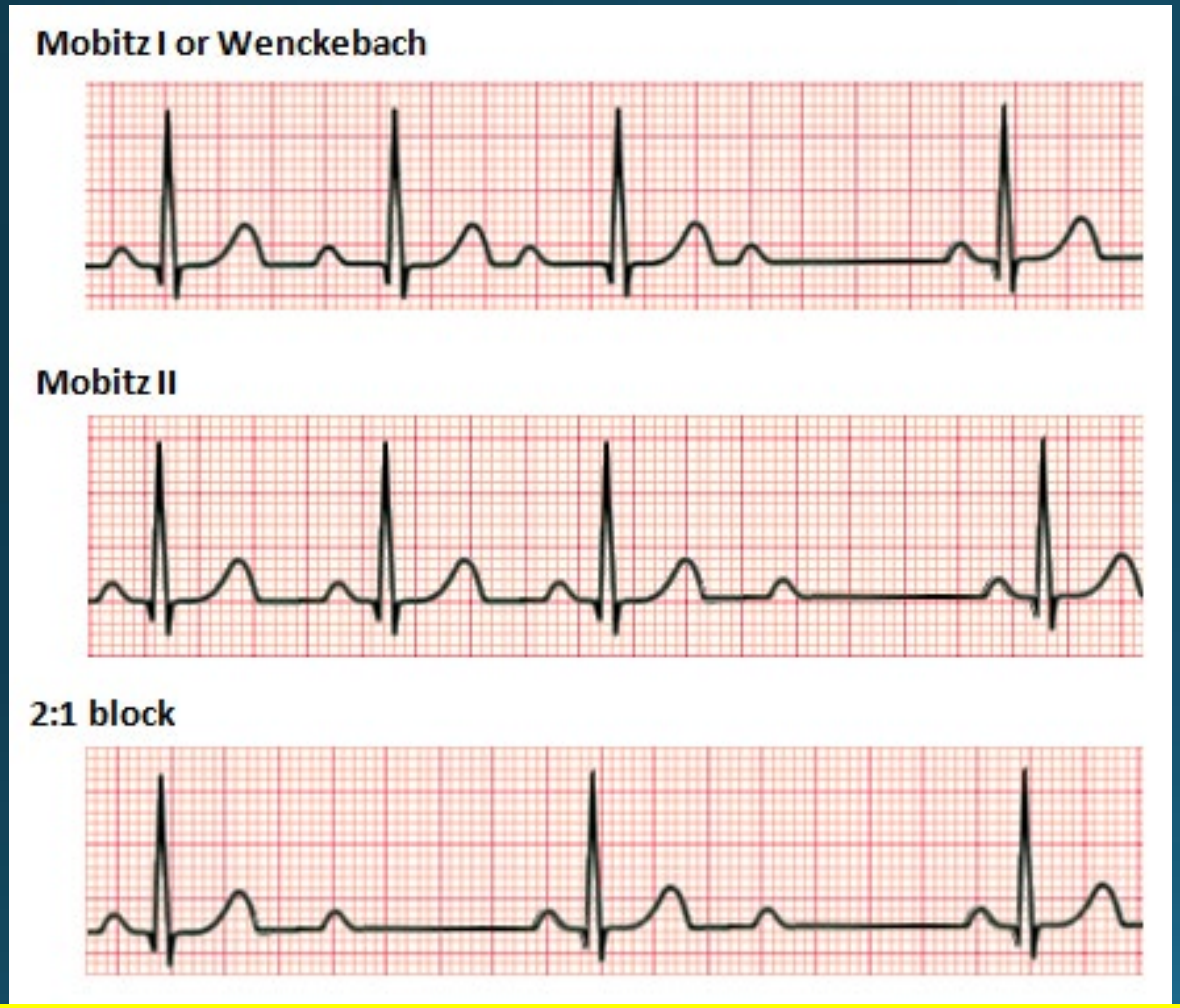
Impaired Atrio-Ventricular Conduction

- First Degree AV Block ("Delay"): Clinically benign, asymptomatic, sign of early poor conduction



- Second Degree AV Block, Mobitz Type I "Wenckebach"
  - With successive beats, A-V Conduction gets more "tired" and eventually fails for a beat, then recovers.

Second Degree AV Block



- Wenckebach, if asymptomatic, may not require treatment
- Mobitz II: Sudden loss of AV conduction without prolonging PR interval: More worrisome
- 2:1 could be either Mobitz I or Mobitz II. Worry more if normal PR interval and wide QRS (>120ms)

In Second Degree AV Block or Higher, look for consistent P waves, and that P waves outnumber QRS complexes

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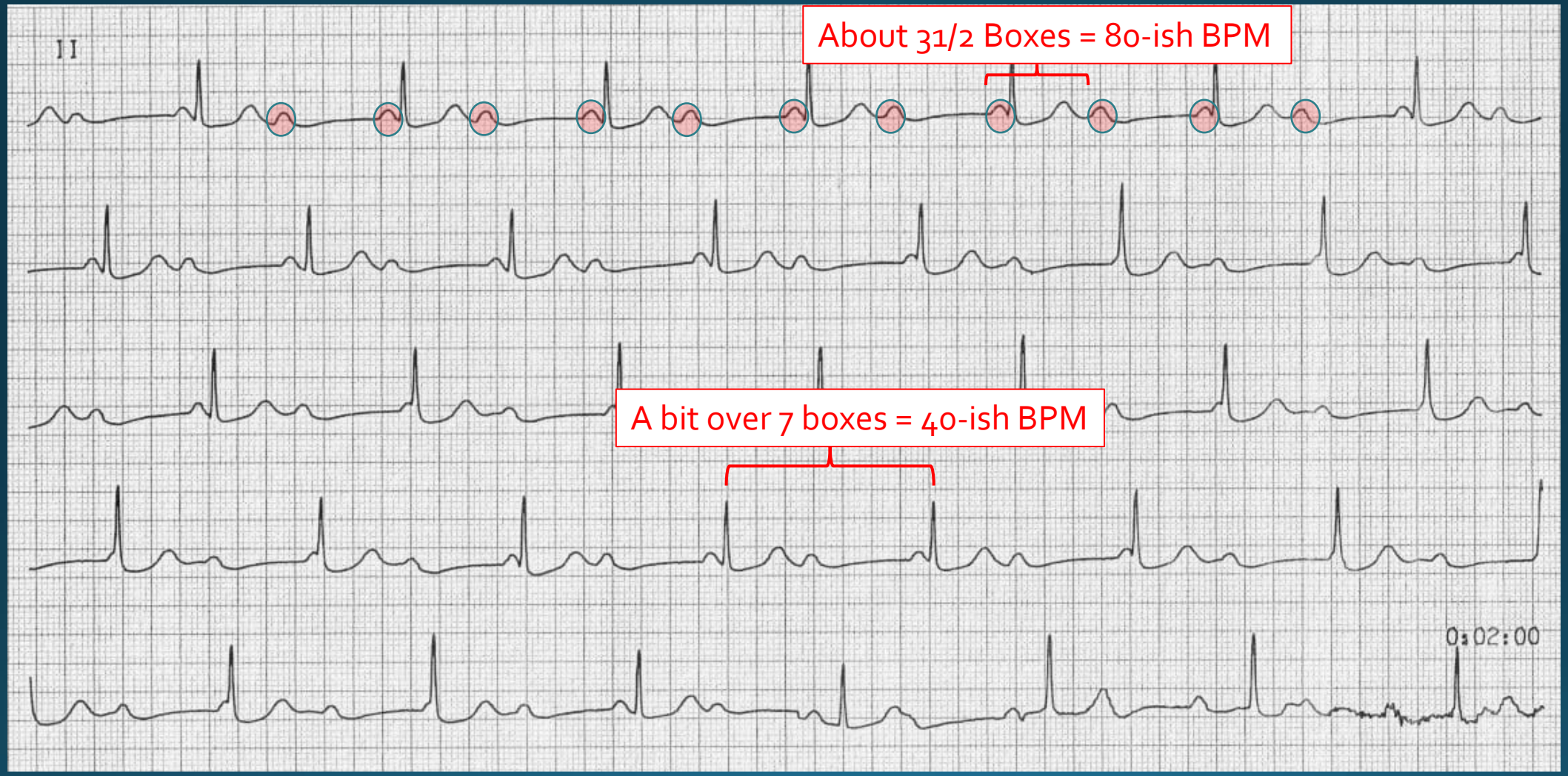
Workup for Second Degree AV Block

- History and Physical including screen for Sleep Apnea
- EKG
- If symptomatic consider ambulatory monitor (Holter or Event Recorder)
- Appropriate lab work (Thyroid, Electrolytes)
- Strongly consider sleep apnea evaluation
- Consider cardiac imaging (Echo) and or exercise stress test
- If Mobitz II and or Wide QRS (>120ms):
  - Close evaluation for CAD or other Cardiomyopathy
  - Can progress to Third Degree AV Block and therefore requires early referral for definitive management

Mr. Smith

- 82 yo male with history of CAD and HTN
- Brought to you by his son due to bruising from several falls over the past few weeks.
- The patient is not sure if has lost consciousness but feels weak most of the time, and on occasion momentarily dizzy.
- Denies chest pain, TIA/Stroke symptoms, and heart failure symptoms such as orthopnea or PND. Occasional lower extremety edema.
- In your office HR on exam is 42

Mr. Smith EKG



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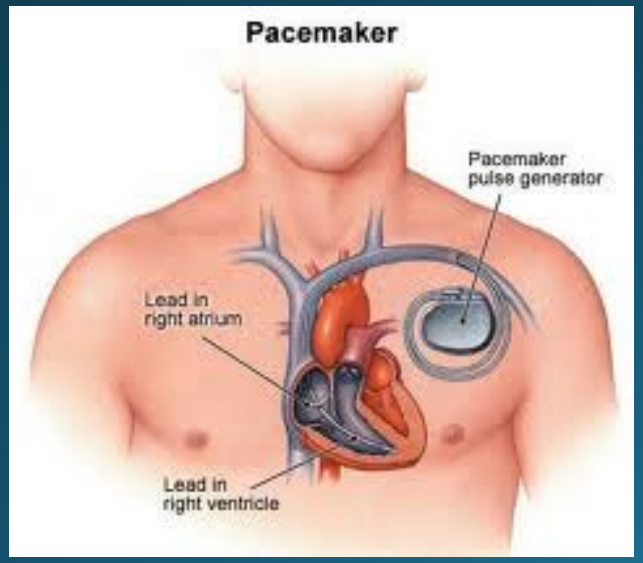
Third Degree "Complete" AV Block

- There is NO relationship between Atrial and Ventricular activity
  - P waves have NO relationship to QRS complexes
  - As with second degree AV block, there are more P waves than QRS complexes
  - Ventricular activation (QRS complex) comes from an independent site below the AV node
    - Regular rate of the QRS
    - May be narrow "Junctional Escape" or wide "Ventricular Escape" complex
    - "Escape" because without that, there would be nothing – "Escape Death?"
- Workup is similar but accelerated:
    - While may occasionally be secondary, majority require rapid evaluation and treatment. This is the "Ugly" Bradycardia and can be life threatening.

Treatment of Bradycardia

- No Treatment if Asymptomatic and Low Risk
  - Sinus Bradycardia, First degree AV block, Asymptomatic Wenckebach
  - No need for referral
- If Symptomatic and low risk:
  - Treat possible secondary causes
  - Consider referral for treatment
- If High Risk, consider referral more urgently



While medications such as Theophylline may be in the guidelines, the use of a Pacemaker is typically definitive and highly successful treatment.

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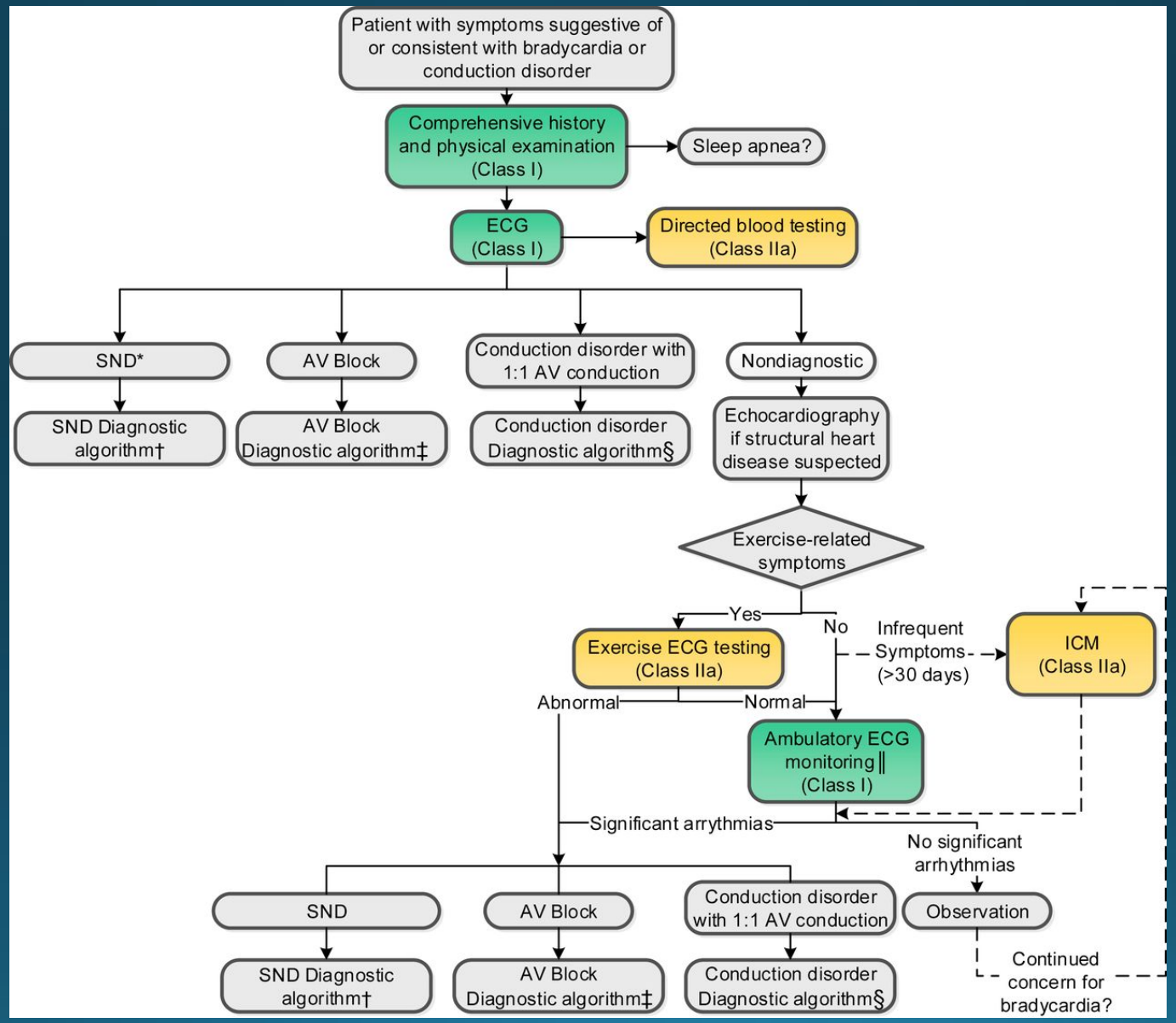
Guideline: Evaluation of Bradycardia



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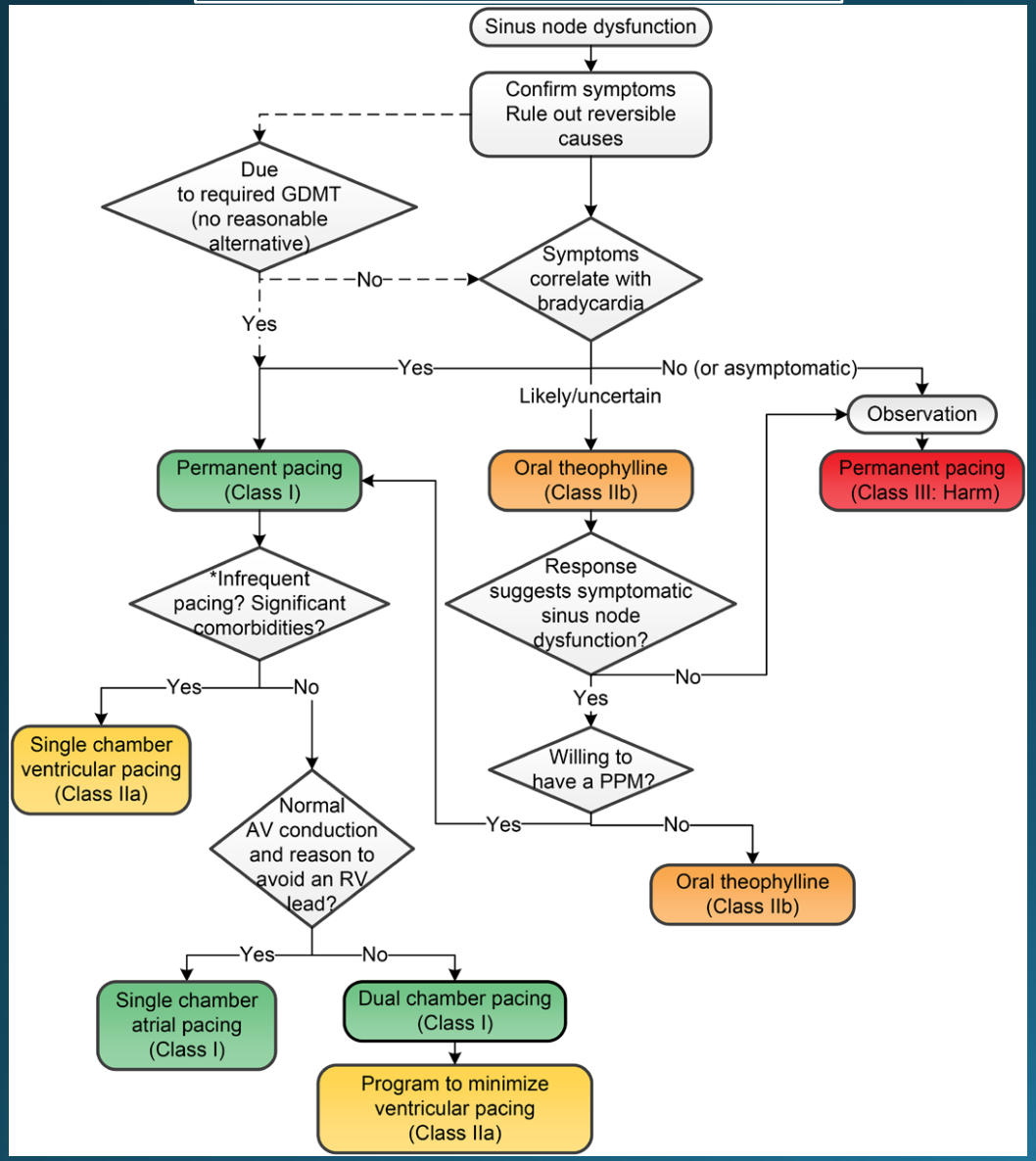
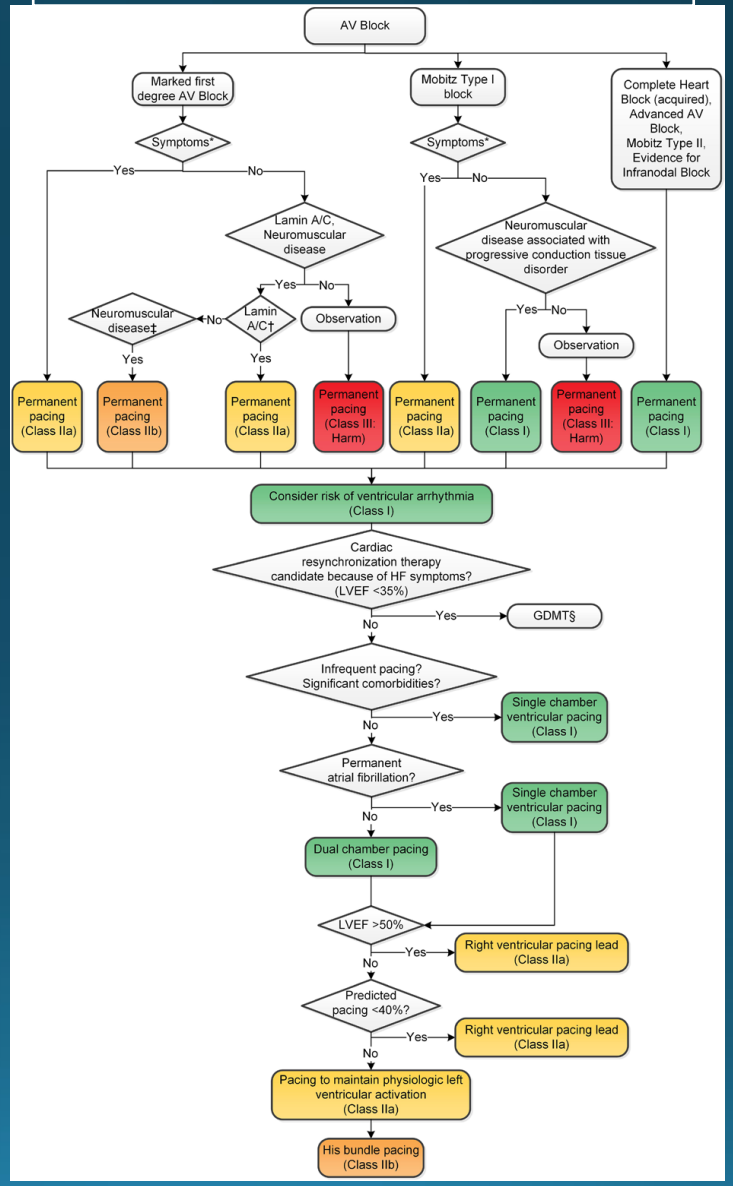
Guideline: Management of Bradycardia

Sinus Bradycardia Algorithm



AV Block Algorithm



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Circulation

ACC/AHA/HRS GUIDELINE

2018 ACC/AHA/HRS Guideline on the Evaluation and Management of Patients With Bradycardia and Cardiac Conduction Delay

A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society

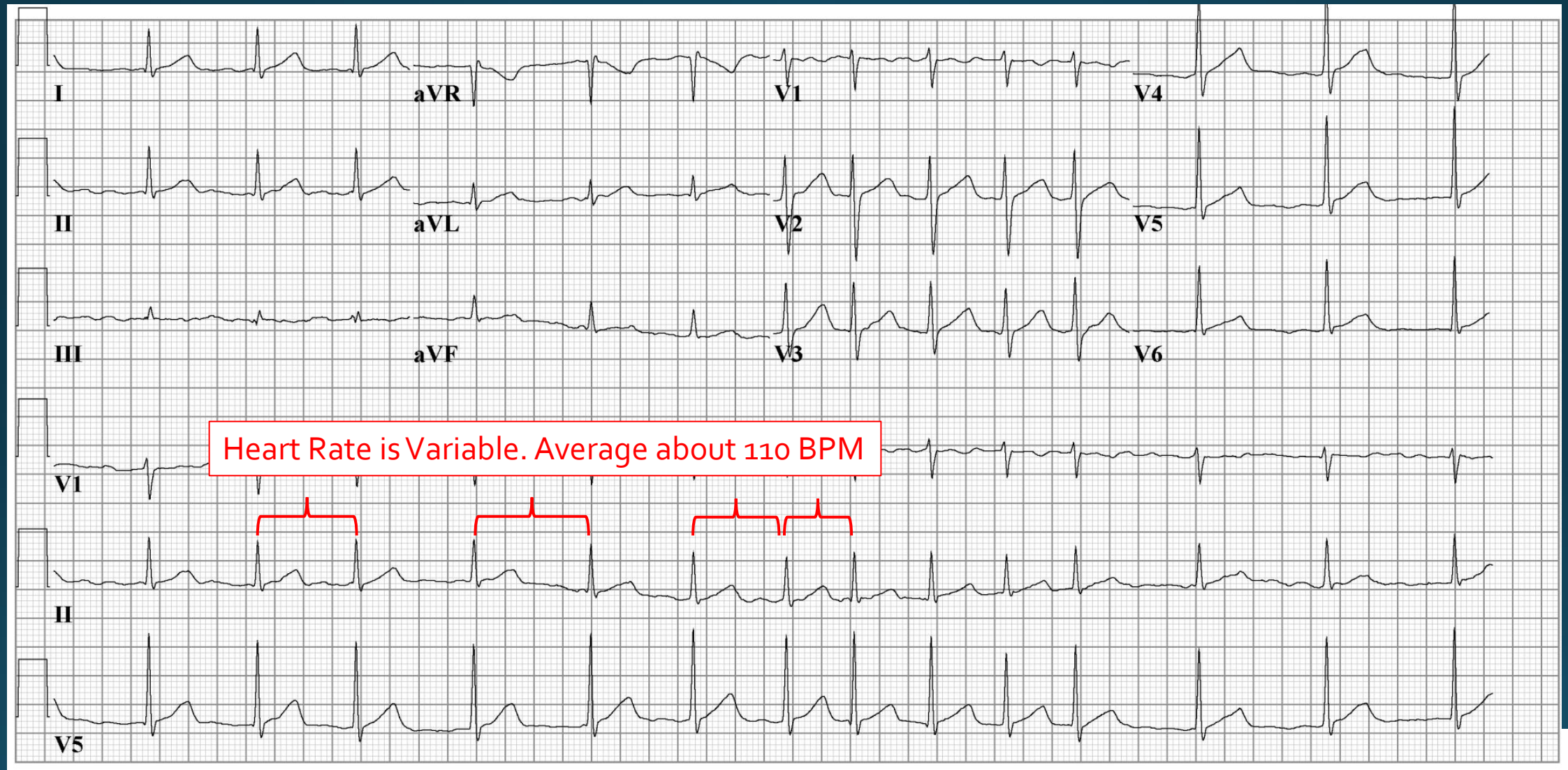
The American Heart Association requests that this document be cited as follows: Kusumoto FM, Schoenfeld MH, Barrett C, Edgerton JR, Ellenbogen KA, Gold MR, Goldschlager NF, Hamilton RM, Joglar JA, Kim RJ, Lee R, Marine JE, McLeod CJ, Oken KR, Patton KK, Pellegrini C, Selzman KA, Thompson A, Varosy PD. 2018 ACC/AHA/HRS guideline on the evaluation and management of patients with bradycardia and cardiac conduction delay: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society. *Circulation*. 2019;140:e382–e482. DOI: 10.1161/CIR.0000000000000628

https://www.ahajournals.org/doi/pdf/10.1161/CIR.0000000000000628

Mrs. Johnson

- 76 yo female
- Not aware of any palpitations, but fatigued and short of breath for the last 2 months, especially with climbing stairs.
- Has HTN and notes at times HR on her home BP cuff is about 120 but bounces around and there is a blinking heart that seems very irregular.
- Has been diagnosed with sleep apnea and uses CPAP. Is on Lisinopril for HTN. Has been taking and aspirin for years.

Mrs. Johnson EKG



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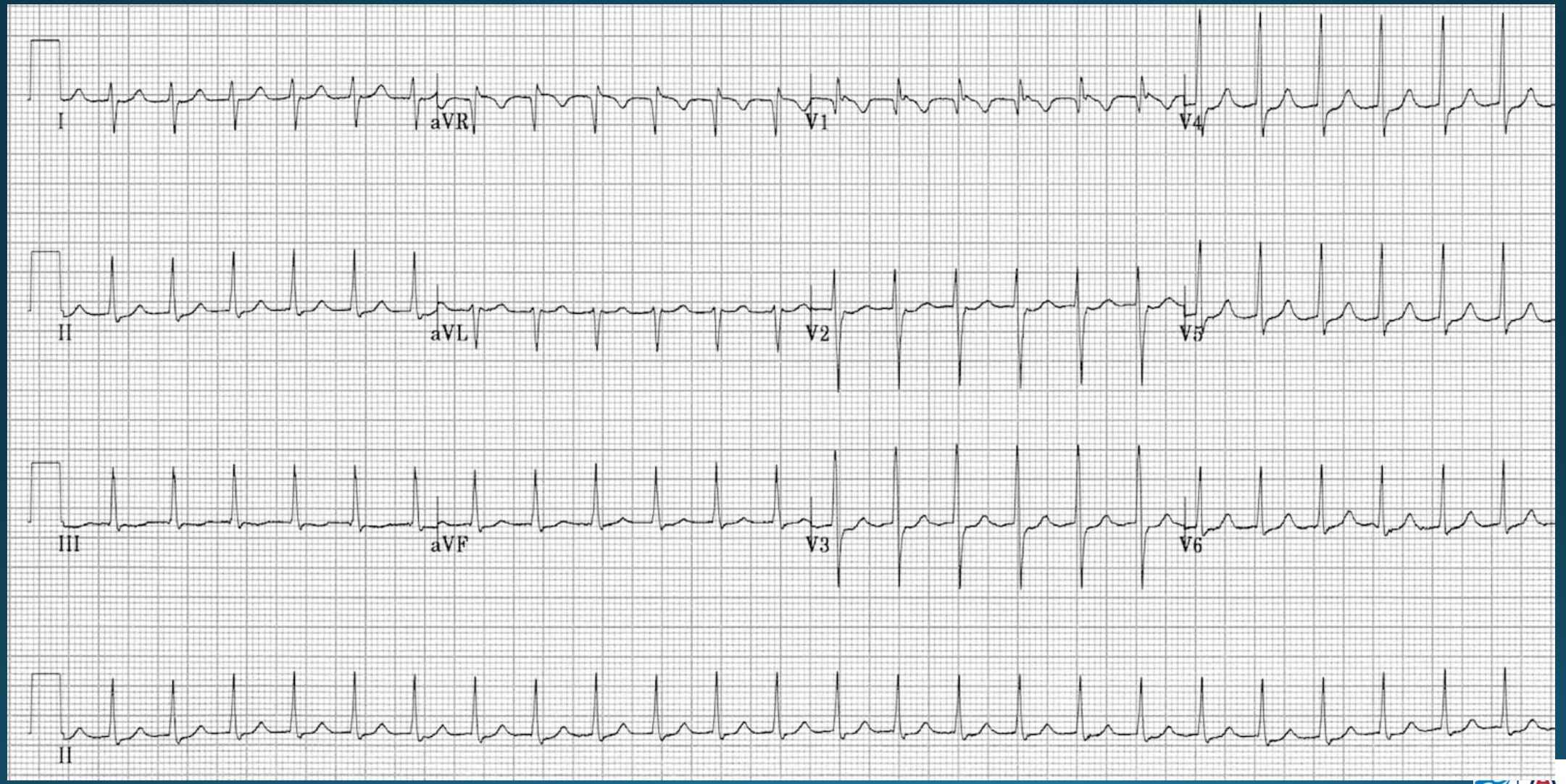
Mr. Anderson

- 26 yo referred for palpitations
- Intermittent with sudden onset and offset. Feels racing heart but no syncope.
- Can end episodes by taking a deep breath
- Has had one visit to the ER during an episode where they gave an IV injection that took his breath away but ended the palpitations
- No prior medical history, no medications

Mr. Anderson EKG



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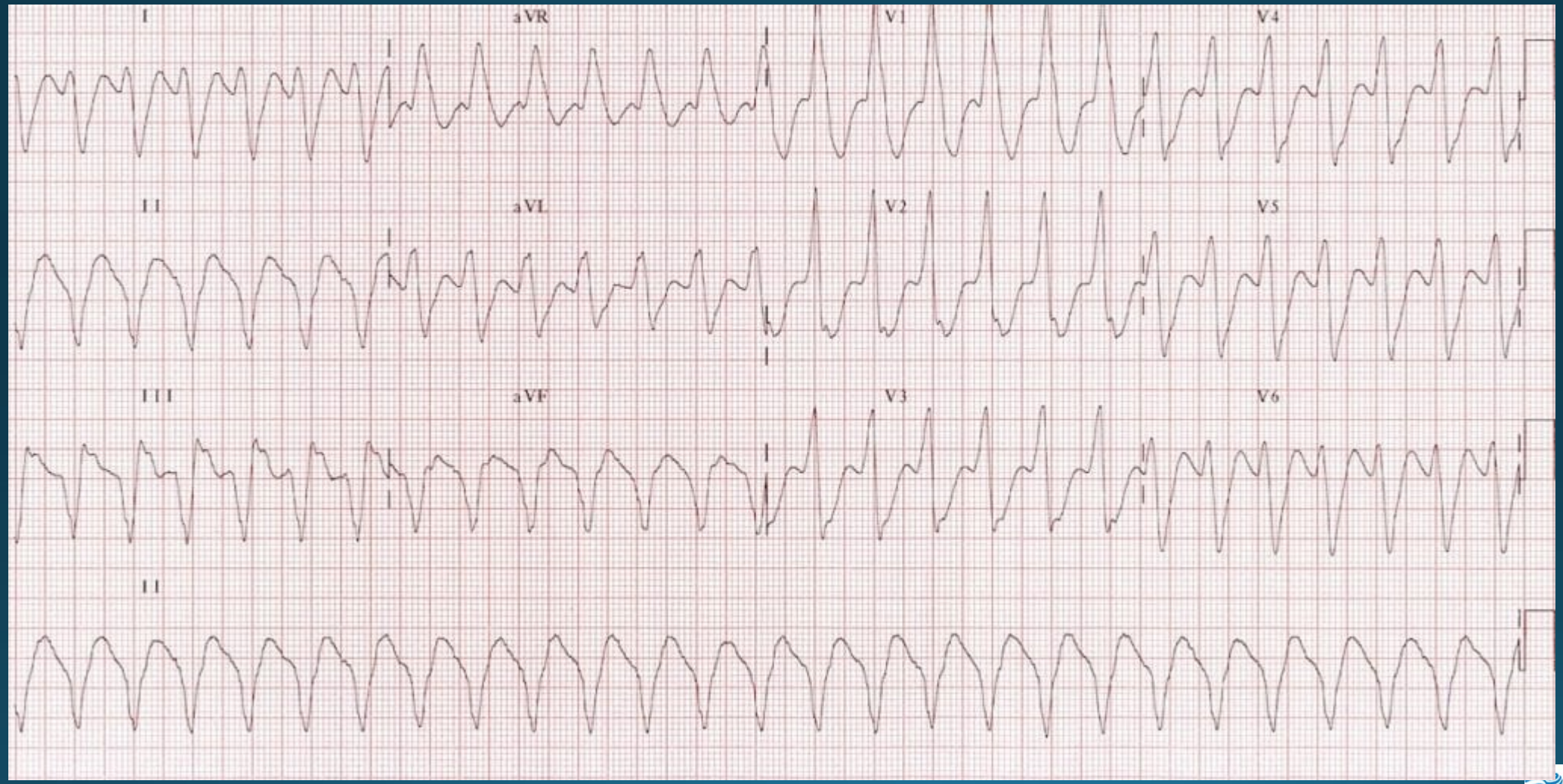
Mr. Adams

- 78 yo male
- Sudden severe weakness and palpitations. Thinks he may have passed out for a few moments.
- Called 911 and is seeing you in the Emergency Department
- History of CAD, CABG x3 in 2009, Chronic systolic heart failure with Ejection Fraction 27%, NYHA III symptoms including shortness of breath with 2 flight of stairs and mild lower extremity edema.
- When seen he is pale and a bit short of breath at rest with HR 160 BPM and BP 96/51

Mr. Adams EKG



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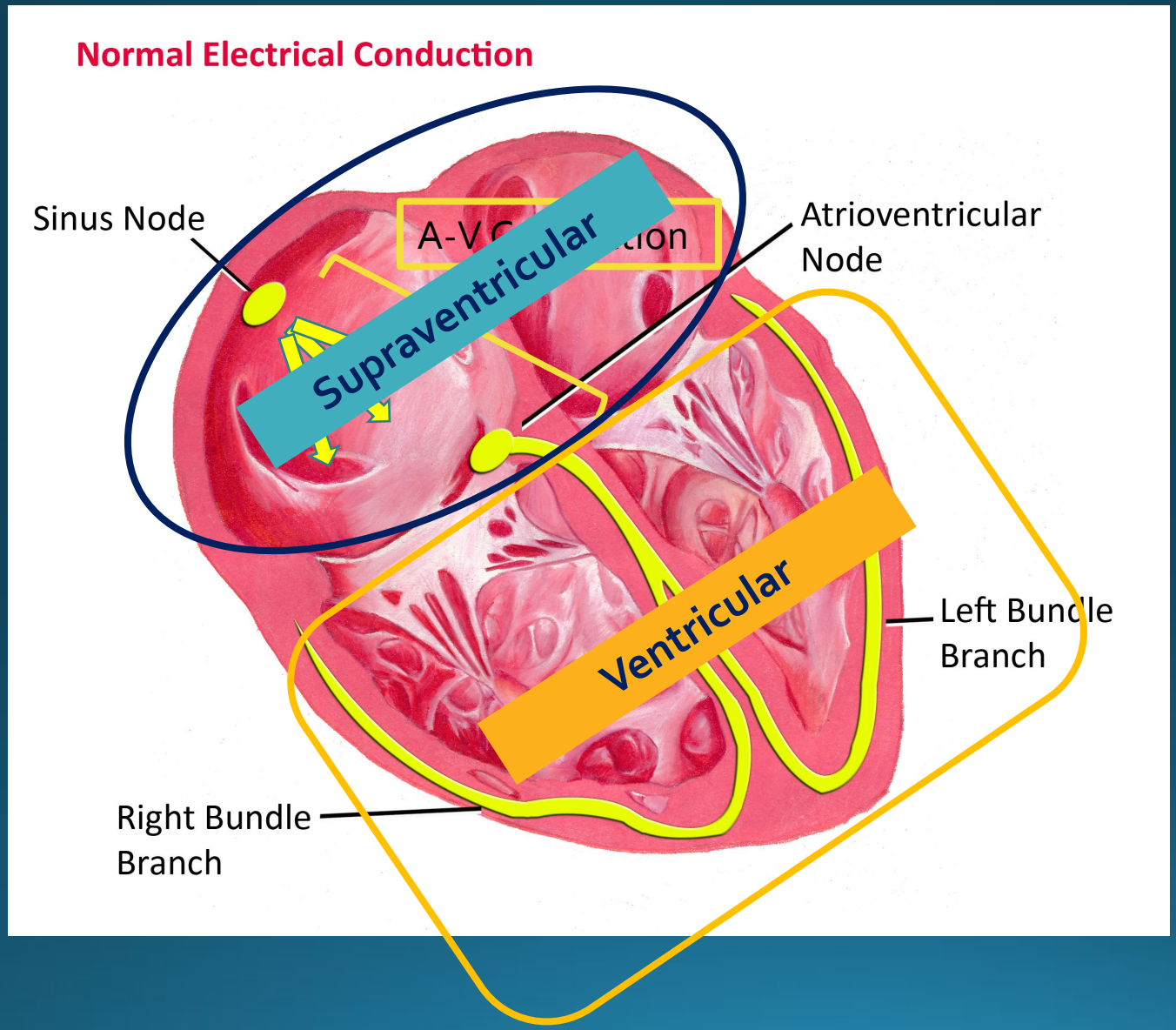
Tachycardia

- Defined as HR >100 BPM
- Often classified by width of QRS on EKG
  - Narrow Complex (<120ms)
  - Wide Complex (>120ms)
- However: Also useful to consider where the arrhythmia originates
  - Supraventricular: "Above the Ventricles" = Atrial
  - Ventricular: "Within the Ventricles"
  - While Ventricular arrhythmias are almost always Wide Complex, Supraventricular Arrhythmias can be either
    - Depends on AV conduction if Supraventriclar

Cardiac Anatomy

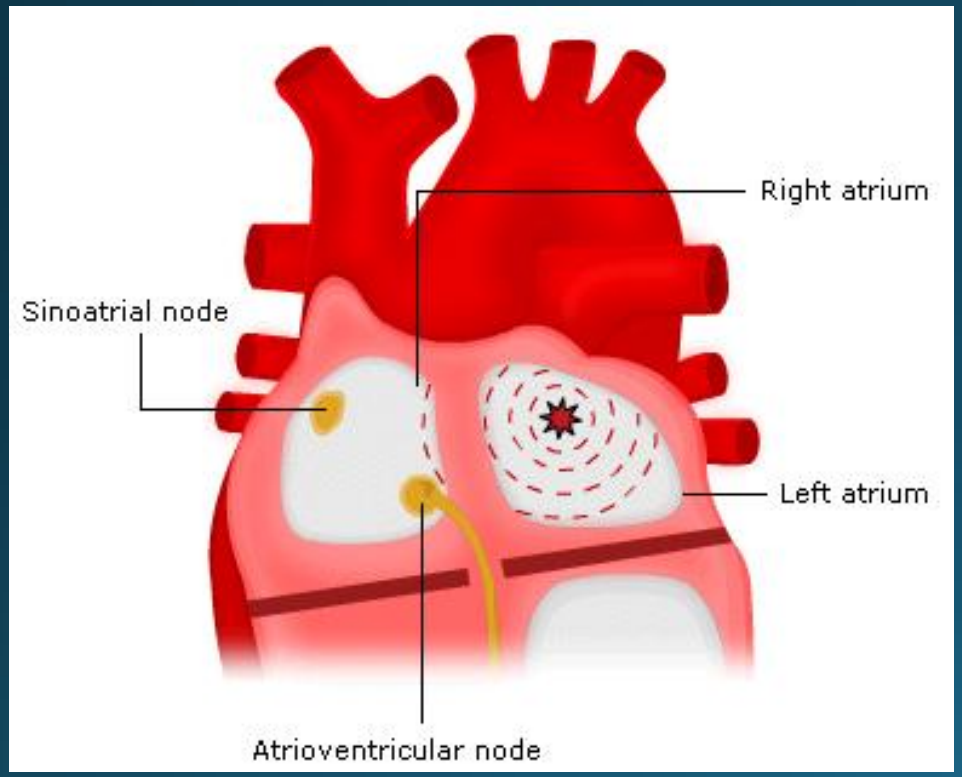


Narrow Complex: Supraventricular Tachycardias

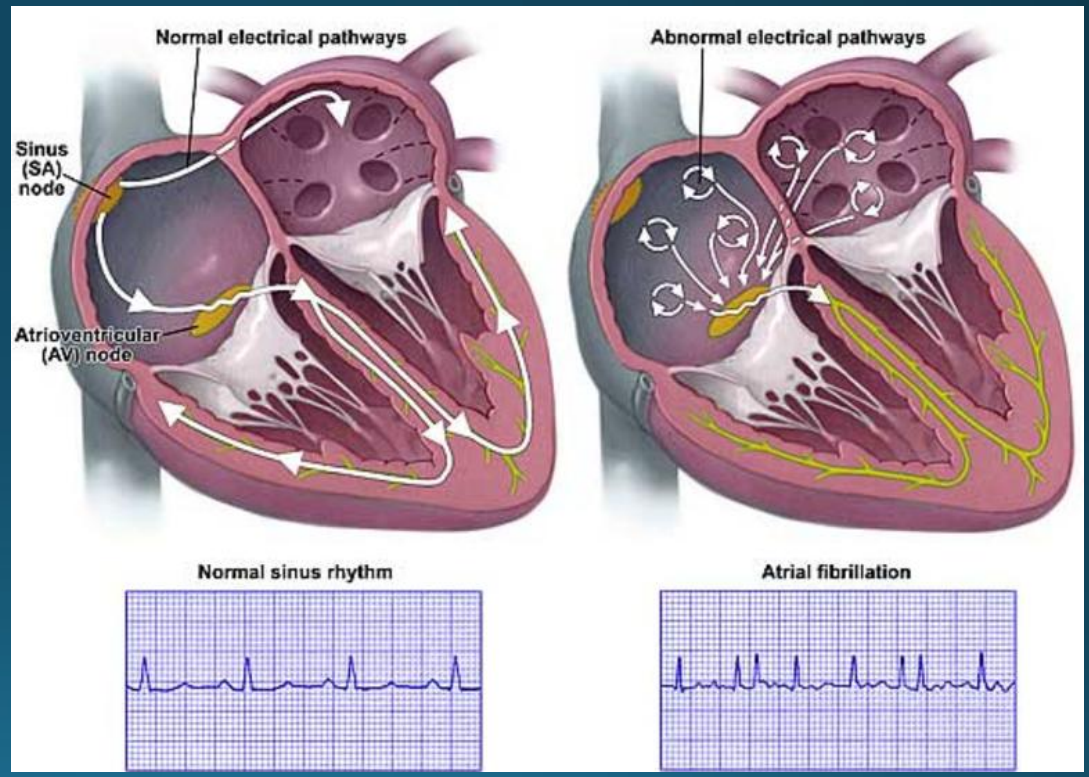
- Sinus Tachycardia
  - Physiologic, often secondary
    - Fever, hyperthyroid, anemia, anxiety…. The list is long!
    - Treat the underlying condition
- Ectopic Tachycardias- Spontaneous from a site other than the Sinus Node:
  - Ectopic Atrial Tachycardia- One spot firing off
  - Atrial Fibrillation- Electrical chaos usually initiated by ectopic atrial activity from the Left Atrium
- Re-entrant or Circuit related Tachycardias- Contiguous activity around a circuit perpetuated by a "short circuit" or area of abnormal conduction
  - Atrial Flutter
  - Traditional "PSVT", including A-V Nodal Reentrant Tachycardia "AVNRT", and Atrio-Ventricular Reentrant Tachycardia "AVRT"
    - Wolf-Parkinson-White Syndrome "WPW" is a special case of AVRT

Ectopic Atrial Arrhythmias

Ectopic Atrial Tachycardia



Atrial Fibrillation



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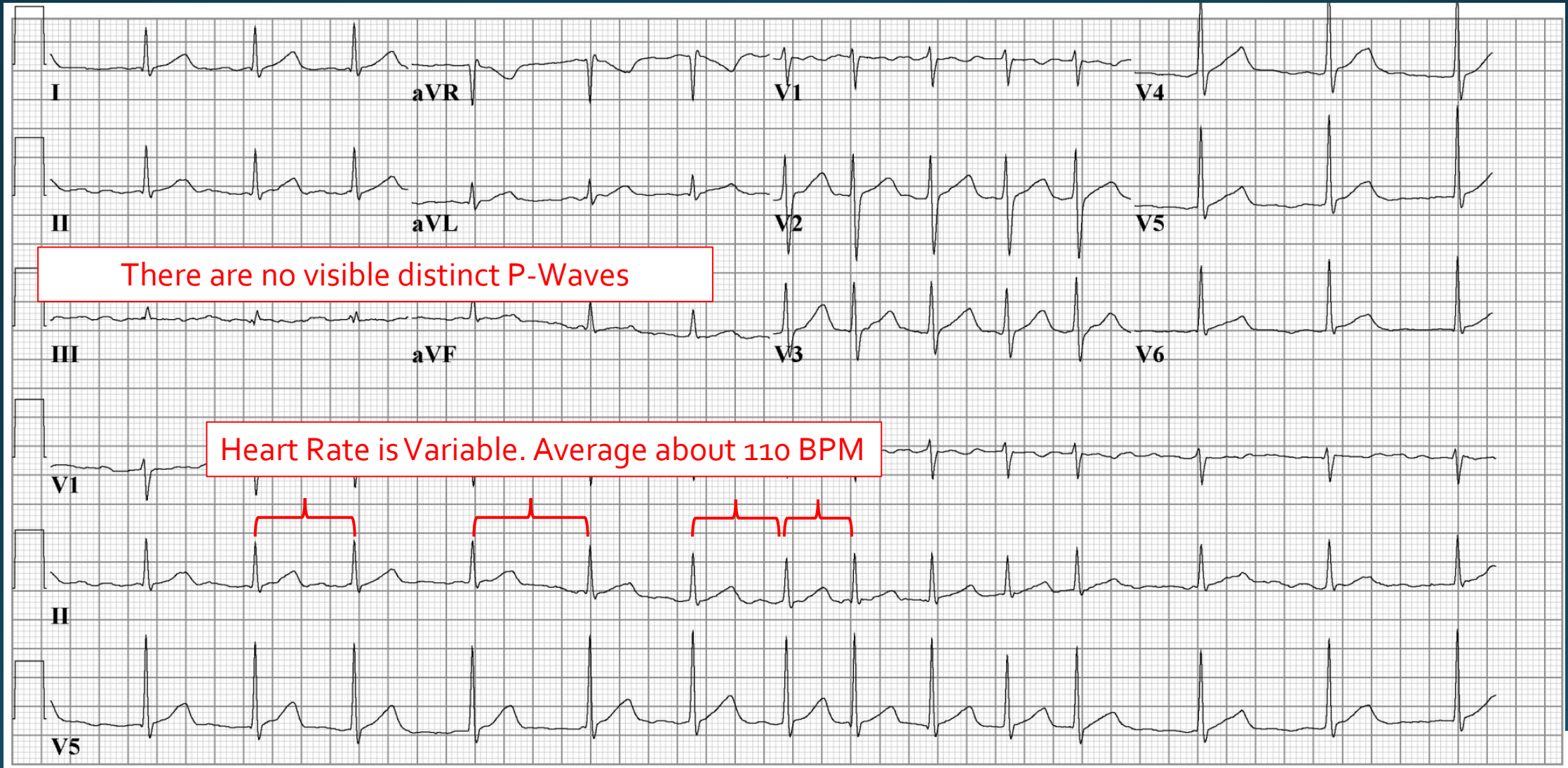
Mrs. Johnson EKG



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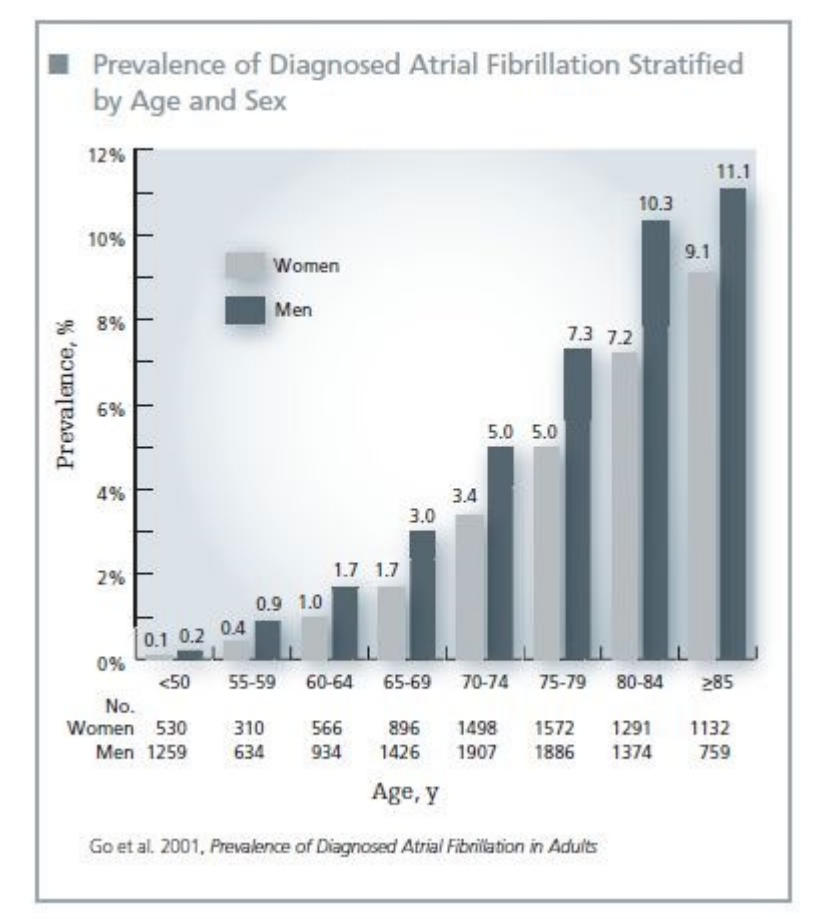
Pearls on Atrial Fibrillation

Most Common Arrhythmia



Major Risk Factor For Stroke

Risk factors	Score	CHADS2-VASc score and Annual stroke risk (%)
Congestive heart failure	1	Score 1 = 1.3
Hypertension	1	2 = 2.2
Age > 75 years	2	3 = 3.2
Diabetes mellitus	1	4 = 4
Stroke/TIA/systemic embolism	2	5 = 6.7
Vascular disease	1	6 = 9.8
Age 65 to 74 years	1	7 = 9.6
Sex (female)	1	8 = 6.7
		9 = 15.2

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Pearls on Atrial Fibrillation

- Rate and Rhythm Management
  - Patient do not die of Atrial Fibrillation
    - Atrial Fibrillation is hardly ever an emergency
      - Rarely need:
        - Send to the ER
        - IV medications, especially for rate control. Use oral rate control!
        - Hospital admission: Outpatient management issue
  - If the Afib is new within 48 hours or the patient is on consistent oral anticoagulation, cardioversion to sinus rhythm is preferred
  - If the patient is unstable there is usually another underlying issue that needs to be addressed

- Stroke Prevention
  - CHADS2-VASc score guides
    - Males ≥ 2 should be on oral anticoagulation
    - Females ≥ 3 should be on oral anticoagulation
    - CHADS2-VASc of 0 do NOT need OAC
    - CHADS2-VASc of 1 (male) and 2 (female) are at discretion of patient and provider
    - Aspirin is NOT effective for stroke prevention in Afib
    - Newer "DOAC" meds preferred over Warfarin except for mechanical heart valves

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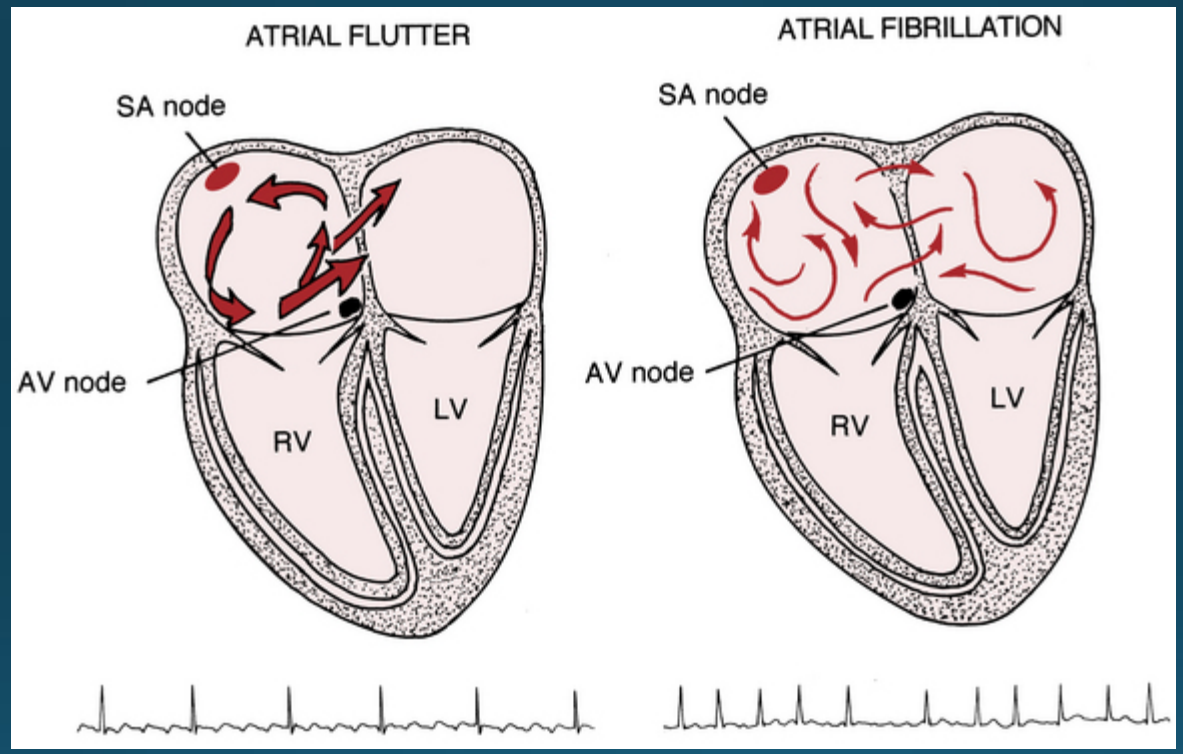
What to do for Mrs. Johnson

- Evaluation including H&P, basic labs etc. Consider ambulatory monitor to establish chronicity of Afib and heart rate. Consider imaging such as Echo
  - Do not forget Sleep Apnea!
- Begin Oral Anticoagulation: CHADS2-VASc = 4 (Age 2, Gender 1, HTN 1)
  - Prefer DOAC, Stop Aspirin
- Begin oral rate control
  - B-Blocker or Non-Dihydropyridine Ca Channel Blocker (Diltiazem/Verapamil)
  - Do not use Digoxin
- Refer as outpatient to Cardiology/Electrophysiology for treatment including discussion of long-term rate vs. rhythm control strategy
  - Afib is not likely "Curable" but can be "Controlled" well in most patients to maximize quality of life and reduce associated risks of heart failure and stroke.

Atrial Flutter and Atrial Fibrillation



- While Atrial Flutter is an organized circuit arrhythmia, it often is associated with Atrial Fibrillation
- Treatment is essentially the same regarding medical management

AHA/ACC/HRS Practice Guideline

2014 AHA/ACC/HRS Guideline for the Management of Patients With Atrial Fibrillation

A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the Heart Rhythm Society

January CT, Wann LS, Alpert JS, Calkins H, Cigarroa JE, Cleveland JC Jr, Conti JB, Ellinor PT, Ezekowitz MD, Field ME, Murray KT, Sacco RL, Stevenson WG, Tchou PJ, Tracy CM, Yancy CW. 2014 AHA/ACC/HRS guideline for the management of patients with atrial fibrillation: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the Heart Rhythm Society. Circulation 2014;130:e199–e267

https://www.ahajournals.org/doi/pdf/10.1161/CIR.0000000000000041

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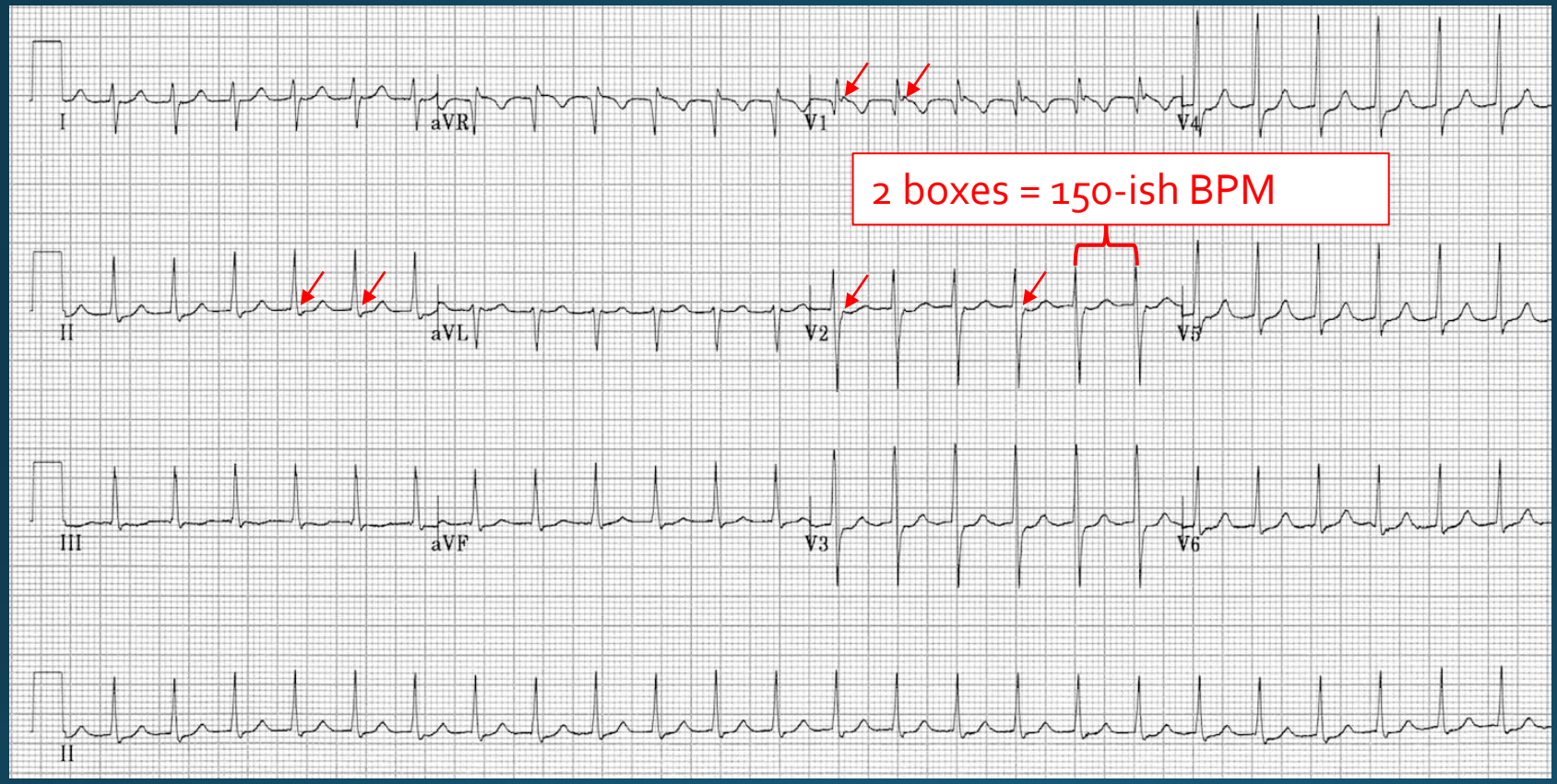
Mr. Anderson: Paroxysmal SupraVentricular Tachycardia



- Sudden onset and offset, response to vagal maneuvers, and response to adenosine infusion are strongly suggestive
- Regular, usually narrow QRS Tachycardia
- P waves may or may not be visible, typically 1:1 P-waves to QRS-waves

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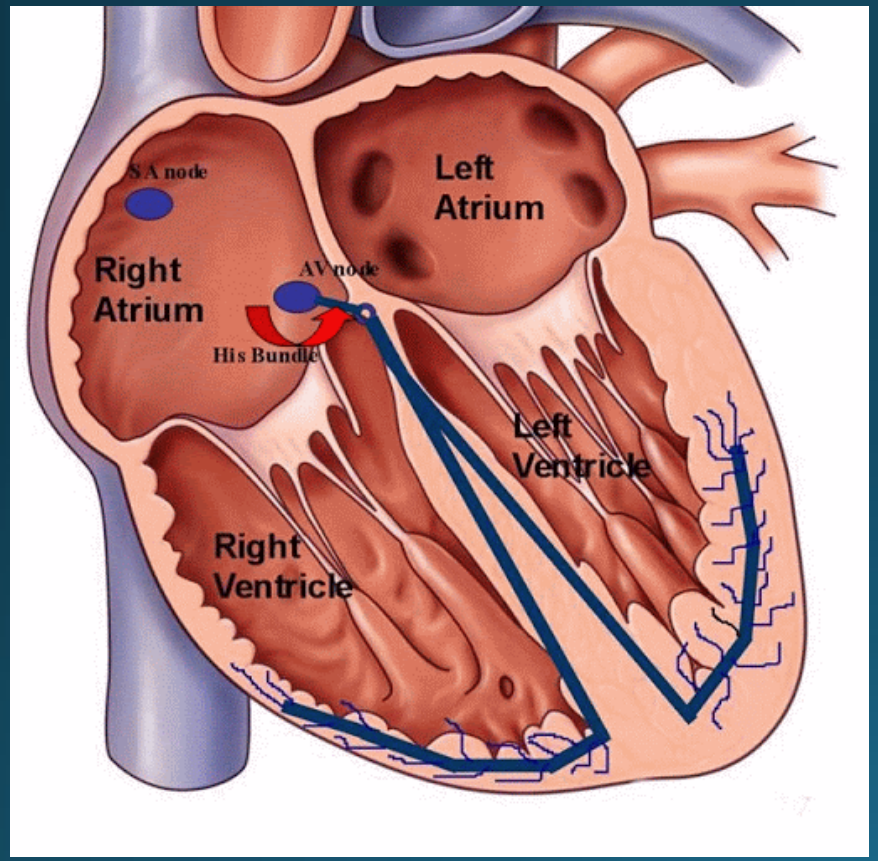
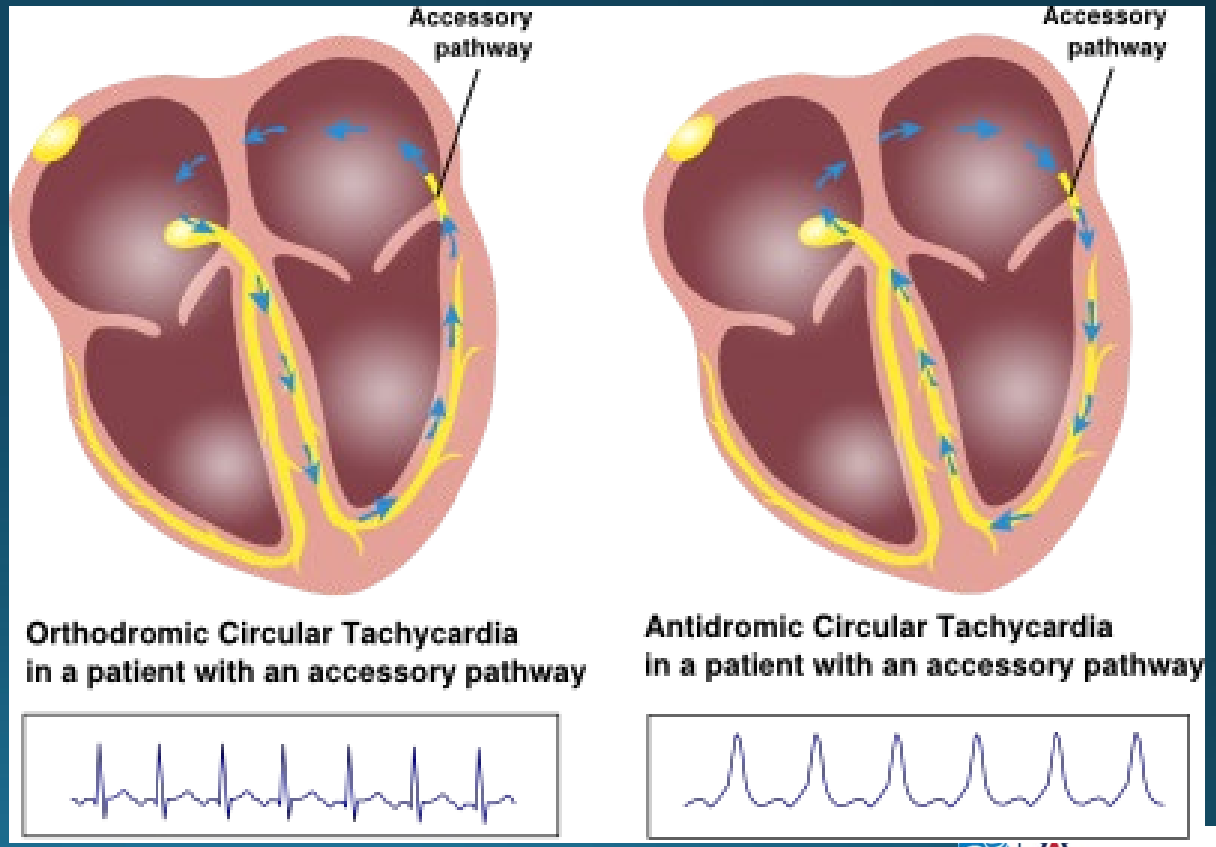
PSVT: AVNRT and AVRT/WPW

AV Nodal Reentrant Tachycardia



Atrio-Ventricular Reentrant Tachycardia and WPW



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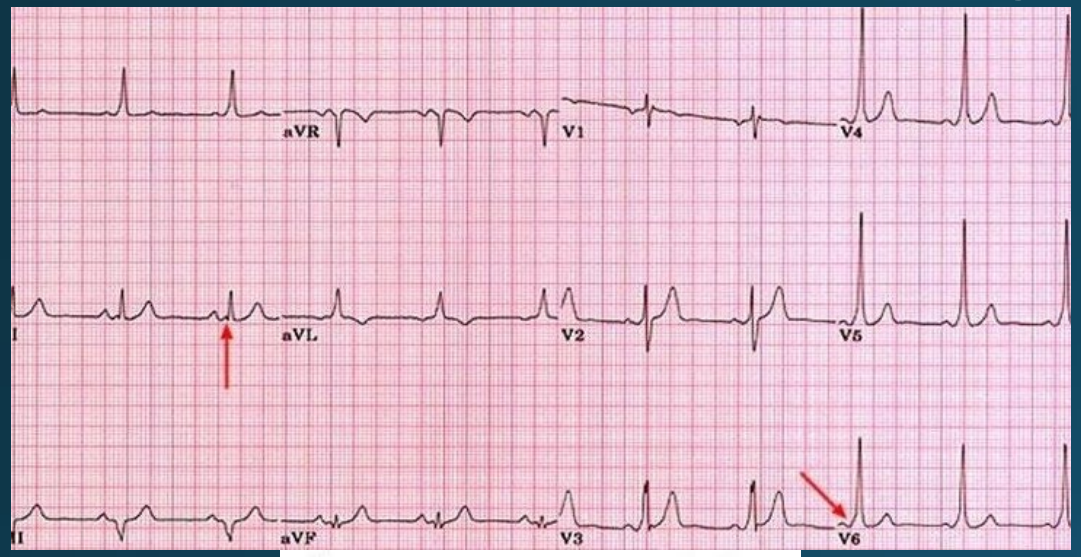
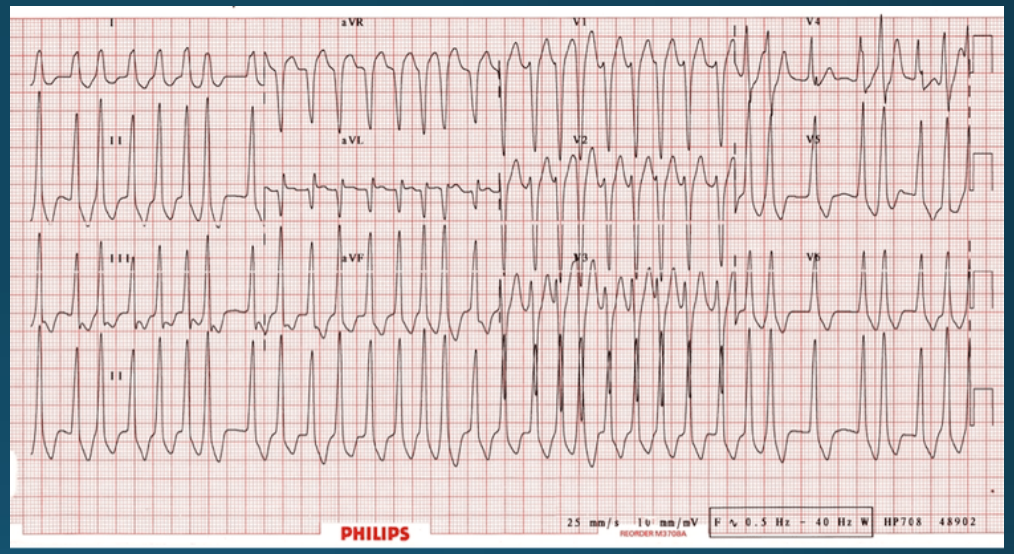
Pearls on PSVT

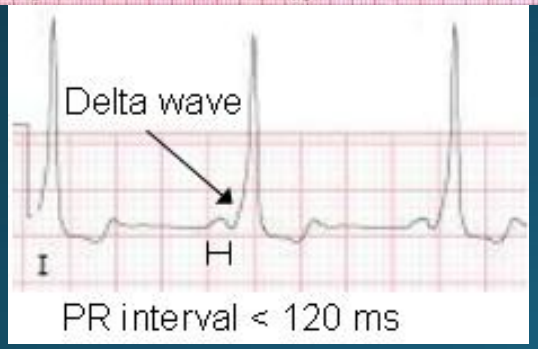
- Often younger patients, but there are exceptions
- Pathways are Congenital, but not commonly Genetic
- Can be treated medically with rate control medications or antiarrhythmic medications
- Electrophysiology Study and Catheter Ablation is offered as First Line Therapy due to high success rate (Greater than 90%) with low rate of complications (1%)
  - Preferred by most patients. Reasonable to refer after single episode or with highly suggestive patient history even without EKG documentation

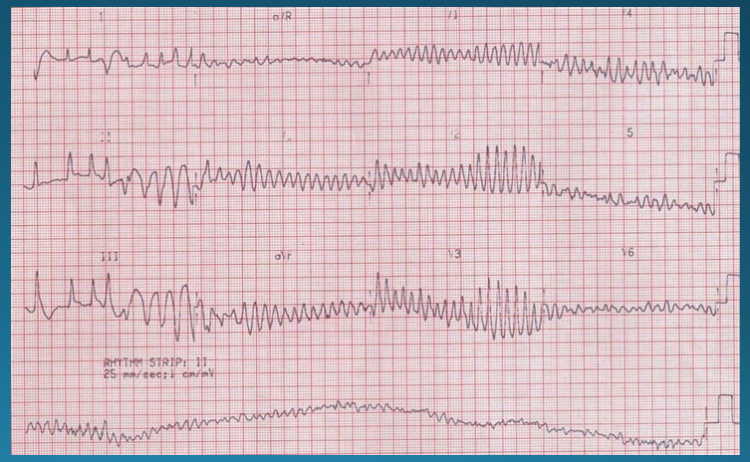
Pearls on PSVT

- Almost never life threatening
  - Exception is WPW with small (1:10,000) chance of Afib with extremely rapid conduction leading to Ventricular Fibrillation: Refer Early!









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ACC/AHA/HRS Guideline

2015 ACC/AHA/HRS Guideline for the Management of Adult Patients With Supraventricular Tachycardia

A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society

Page RL, Joglar JA, Caldwell MA, Calkins H, Conti JB, Deal BJ, Estes NAM 3rd, Field ME, Goldberger ZD, Hammill SC, Indik JH, Lindsay BD, Olshansky B, Russo AM, Shen W-K, Tracy CM, Al-Khatib SM. 2015 ACC/AHA/
HRS guideline for the management of adult patients with supraventricular tachycardia: a report of the American College of Cardiology/American Heart Association
Task Force on Clinical Practice Guidelines and the Heart Rhythm Society. *Circulation*. 2016;133;e506-e574. doi: 10.1161/CIR.0000000000000311.

https://www.ahajournals.org/doi/full/10.1161/cir.0000000000000311

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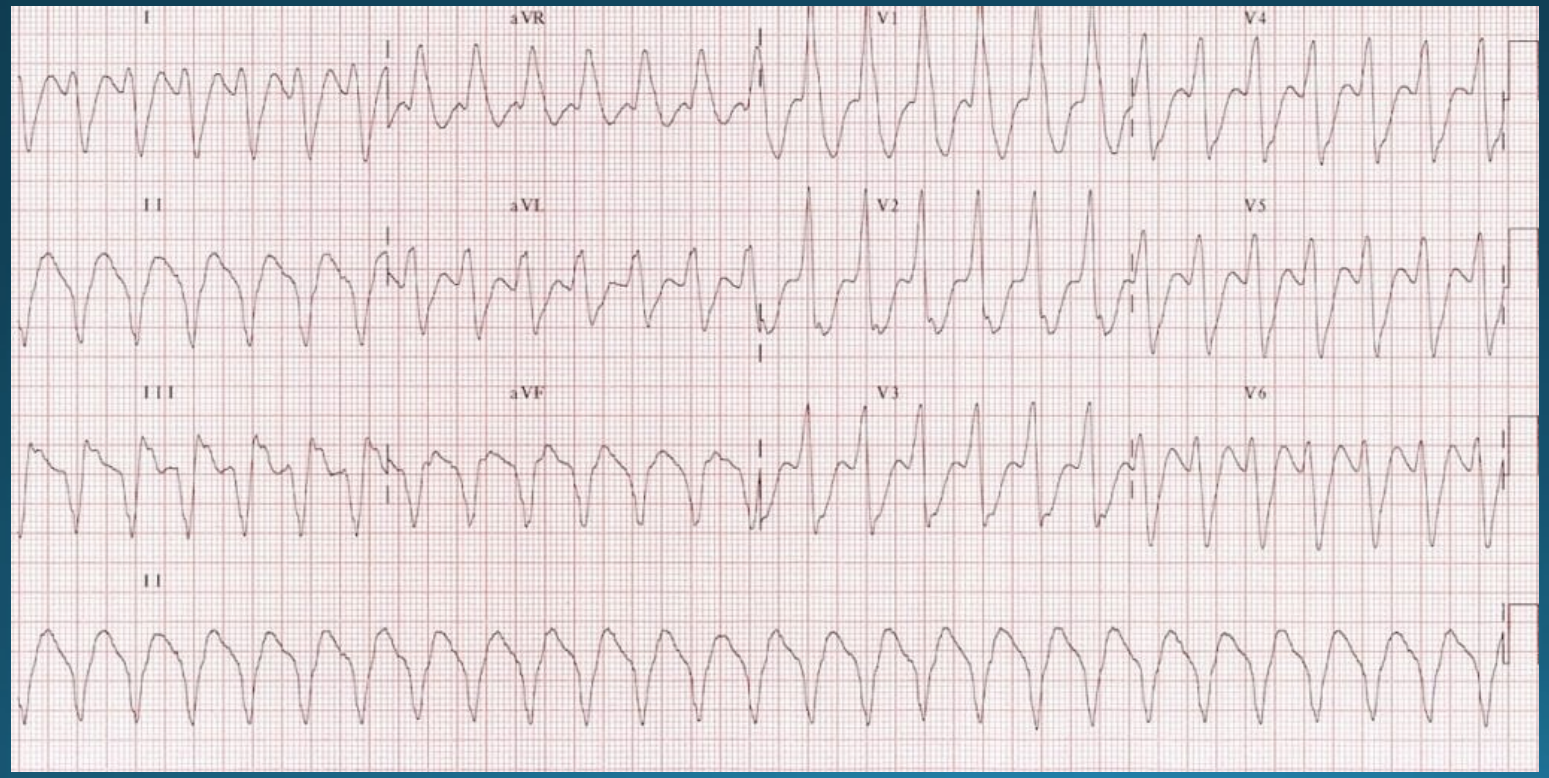
Wide Complex Tachycardia

- The Basics:
  - "Tachycardia": Faster than 100 BPM
  - "Wide": QRS wider than 120ms
- Other Considerations:
  - Regular vs Irregular
  - Patient stability
  - Clinical History

Mr. Adams:

- 78 yo male
- Sudden severe weakness and palpitations. Thinks he may have passed out for a few moments.
- Called 911 and is seeing you in the Emergency Department
- History of CAD, CABG x3 in 2009, Chronic systolic heart failure with Ejection Fraction 27%, NYHA III symptoms including shortness of breath with 2 flight of stairs and mild lower extremity edema.
- When seen he is pale and a bit short of breath at rest with HR 160 BPM and BP 96/51



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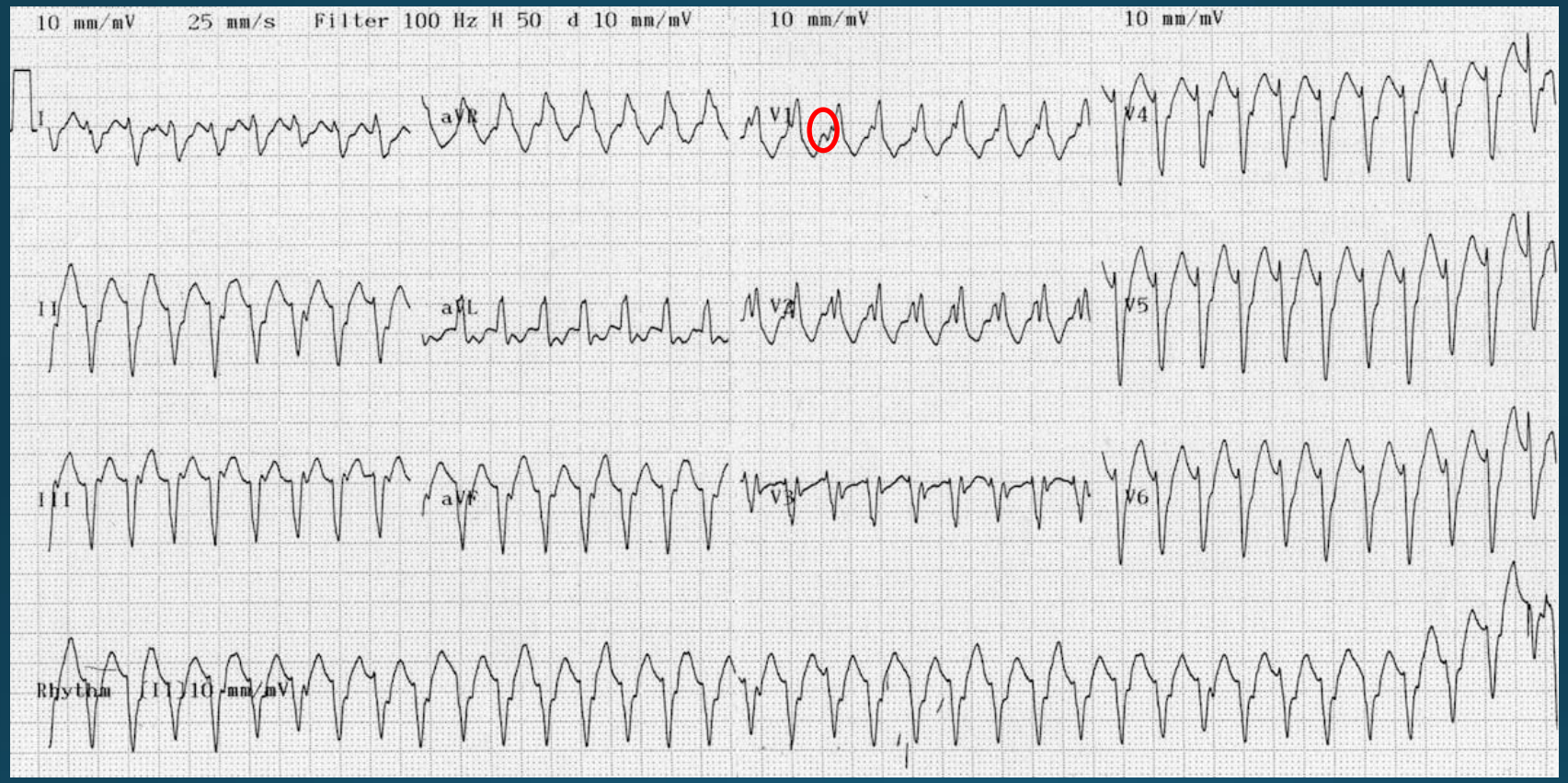
WCT – Main Mechanisms

- Ventricular tachycardia (VT)
- Supraventricular tachycardia (SVT) with an aberrant conduction
  - preexisting bundle-branch block
  - functional bundle-branch block induced by the fast heart rate.
- SVT with an accessory pathway (WPW).
- Paced rhythm
- Electrolyte abnormality
- Drug effects

WCT Diagnosis: History and Physical

- Overall approximately 80% of WCT will be VT
- Combined history of prior MI, Heart Failure, and recent symptoms of angina has positive predictive value of greater than 95% for VT
- Age greater than 35- 90% PPV for VT.
- Consider family history, prior EKGs with BBB or WPW, history of tachycardia responsive to adenosine or vagal maneuvers
- However:
  - CV signs/symptoms, vital signs, clinical status key to management choices

Some EKG Clues



- AV dissociation, with superimposed P waves visible in V1
- Bizarre QRS that does not look like typical RBBB or LBBB
  - Especially with very negative lead V6
  - Very negative Leads I and aVF “Northwest Axis”
- Entirely Positive aVR

There are several algorithms for identifying VT. Based on History&Physical and EKG assume is VT and focus on the patient!

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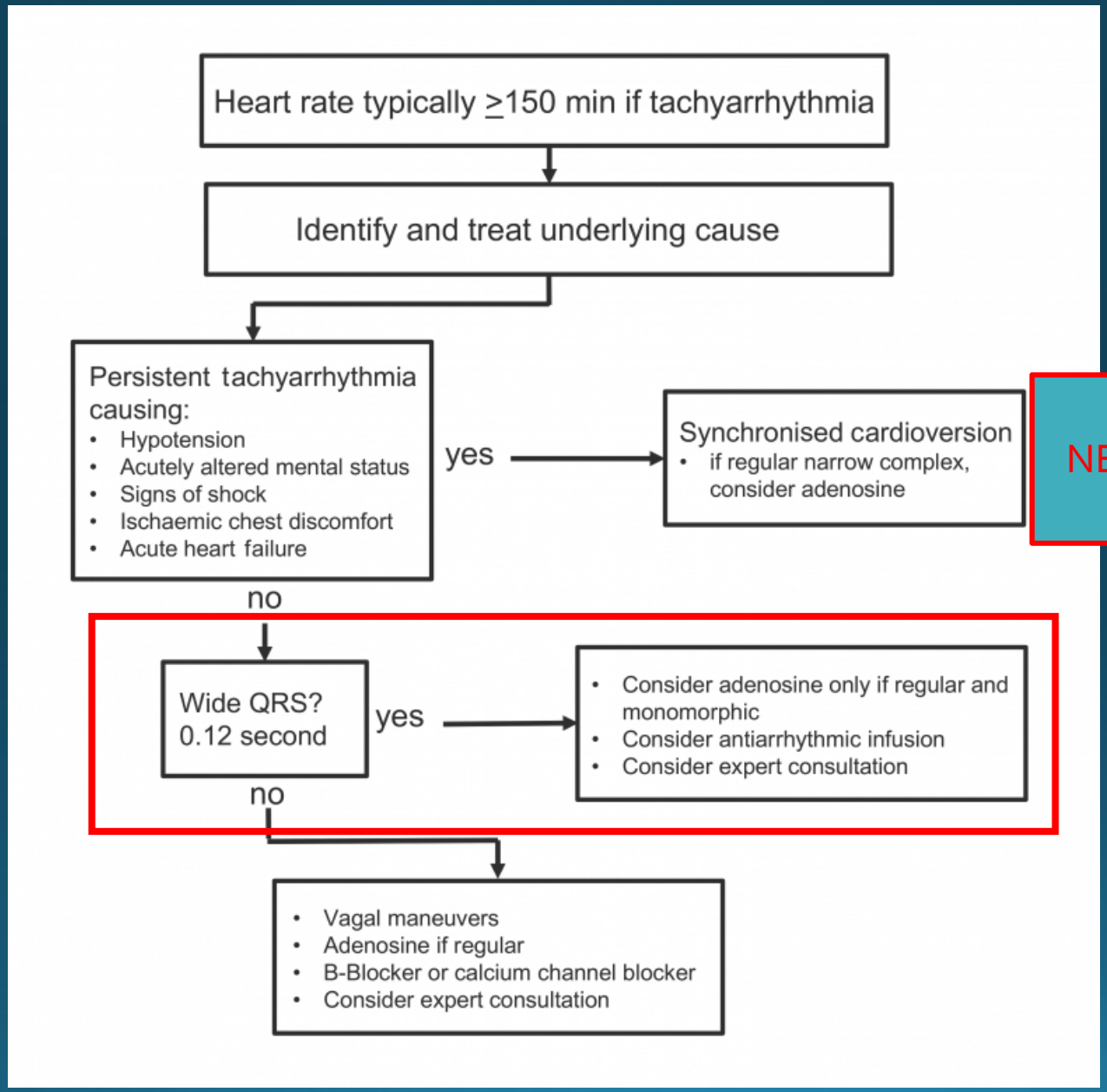
What to do?



With Sedation!
NEVER Shock an Awake Patient!

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Circulation

AHA/ACC/HRS GUIDELINE

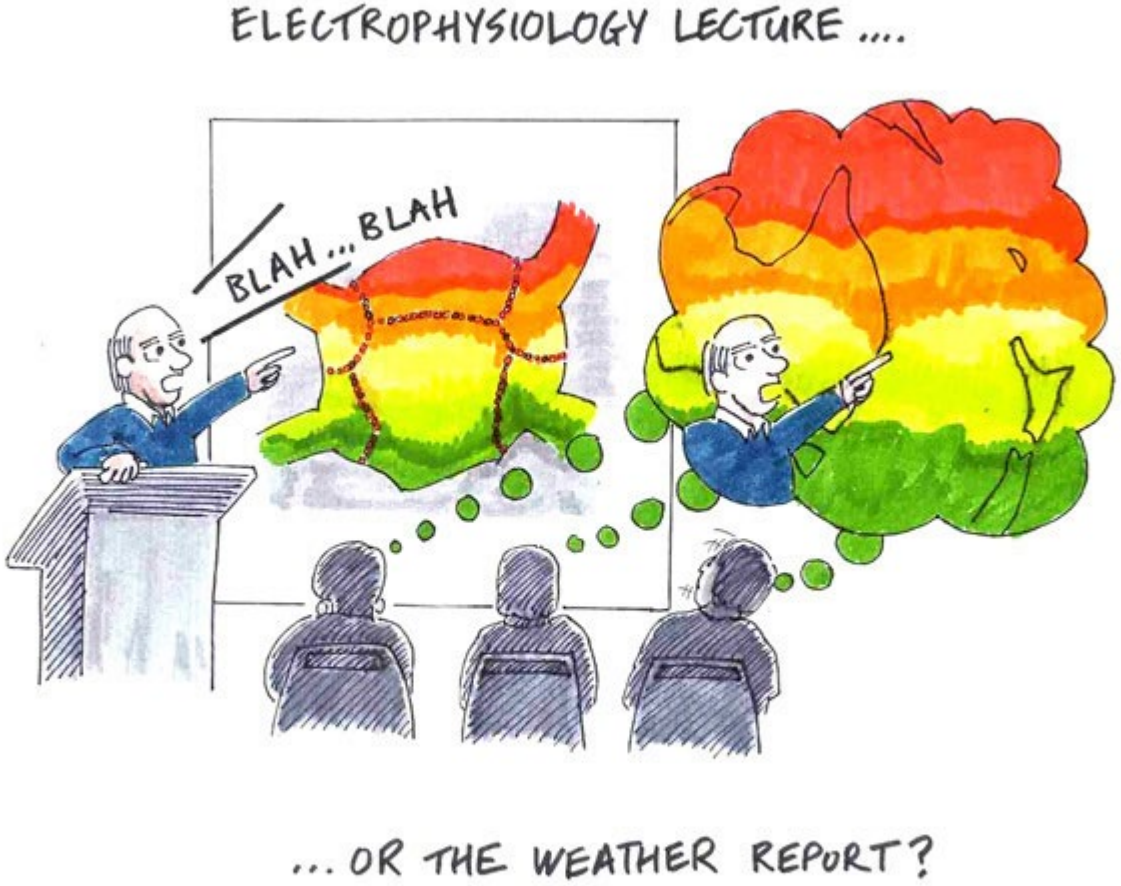
2017 AHA/ACC/HRS Guideline for Management of Patients With Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death

A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society

Al-Khatib SM, Stevenson WG, Ackerman MJ, Bryant WJ, Callans DJ, Curtis AB, Deal BJ, Dickfeld T, Field ME, Fonarow GC, Gillis AM, Granger CB, Hammill SC, Hlatky MA, Joglar JA, Kay GN, Matlock DD, Myerburg RJ, Page RL. 2017 AHA/ACC/HRS guideline for management of patients with ventricular arrhythmias and the prevention of sudden cardiac death: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society. *Circulation*. 2018;138:e272–e391. doi: 10.1161/CIR.0000000000000549.

https://www.ahajournals.org/doi/10.1161/CIR.0000000000000549

Then…. Get an EP Consult!



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Thank You!