



# Updates in Arrhythmia Management

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# Disclosure

- None relevant

# Simple Classification of Arrhythmias

## Slow (brady)

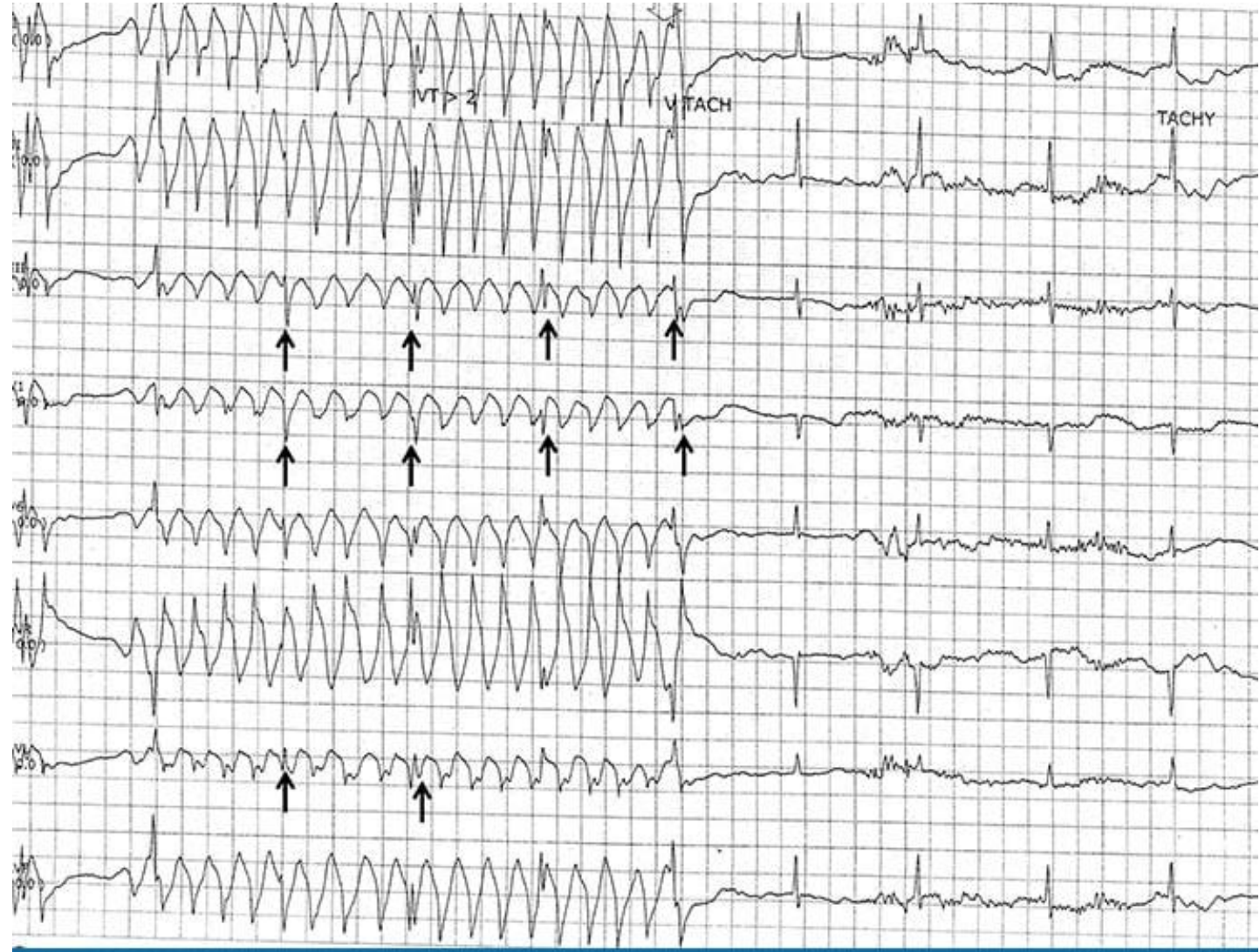
- Sinus Node Issues
- AV block (heart block)

## Fast (Tachy)

- Supraventricular (rarely life threatening)
  - SVT
  - Atrial Fibrillation
  - Atrial Flutter
  - Sinus Tachycardia
- Ventricular (can be life threatening)
  - Monomorphic VT
  - VF/Polymorphic VT/Torsades
  - PVC

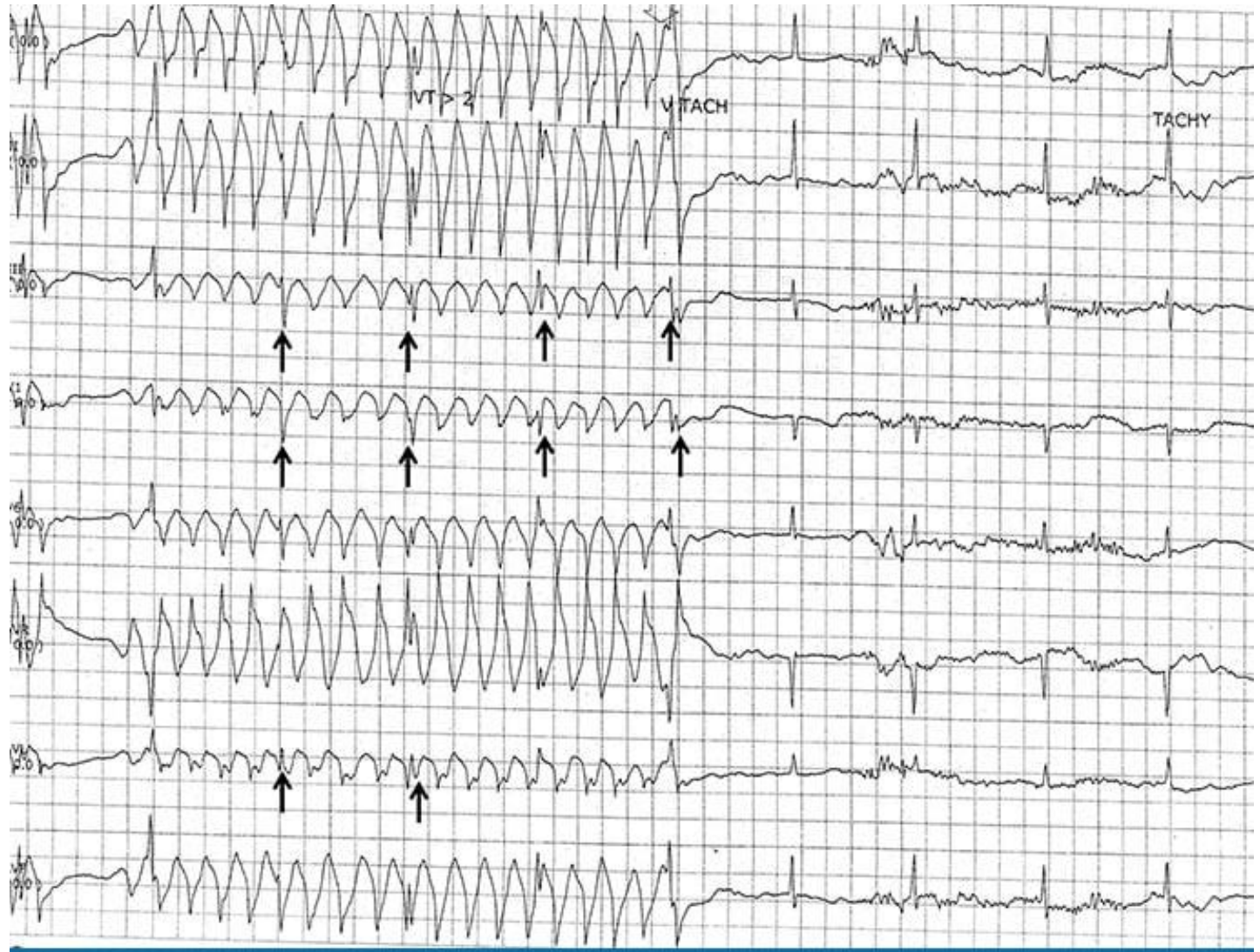
# Case 1

- 57 year old man admitted with decompensated heart failure requiring diuresis
- Telemetry alarm at 7:05 AM
- Next steps?



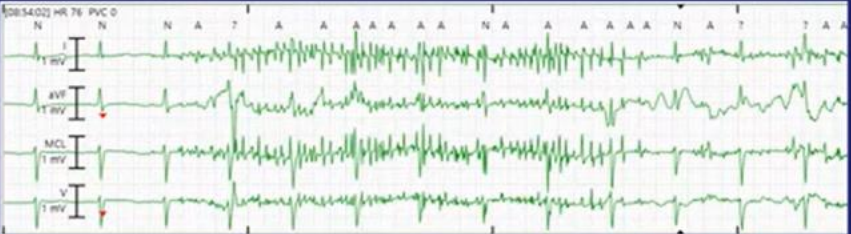
# Next Step?

- A. Coronary angiogram
- B. Check Electrolytes
- C. Amiodarone
- D. Do nothing

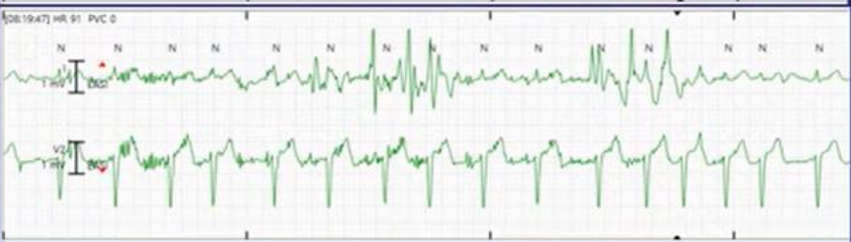


# What % of Patients Have Artifact on Tele?

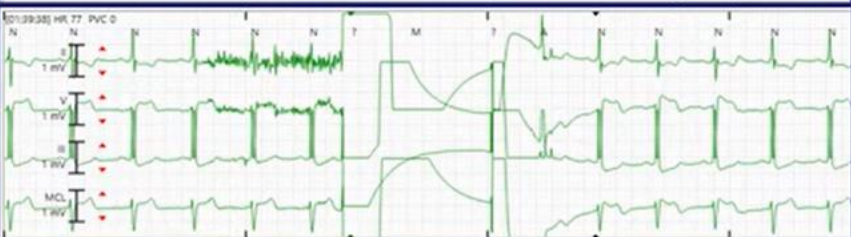
Gen Med



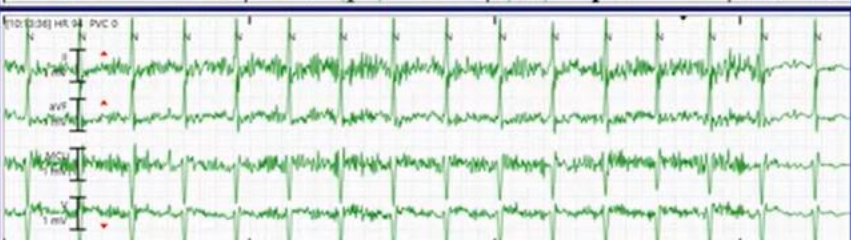
Card Unit



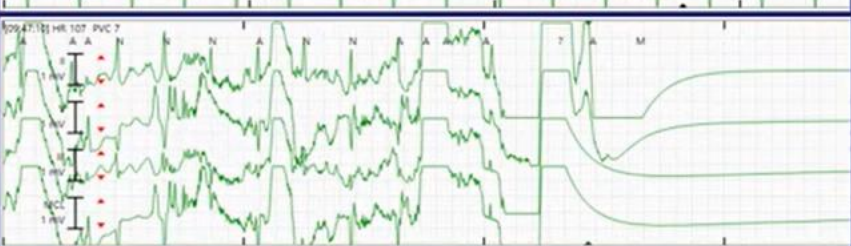
CHF/PH



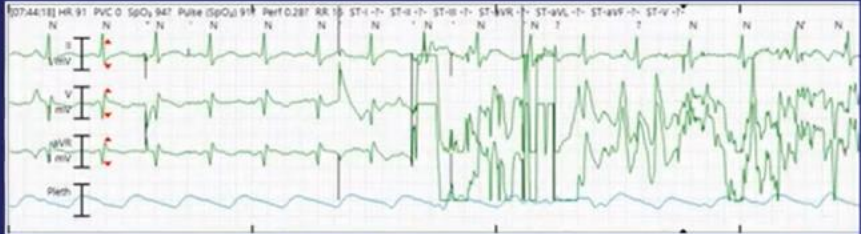
Hospitalist



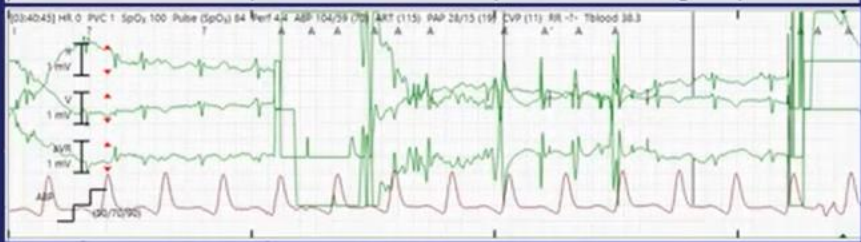
Neuro



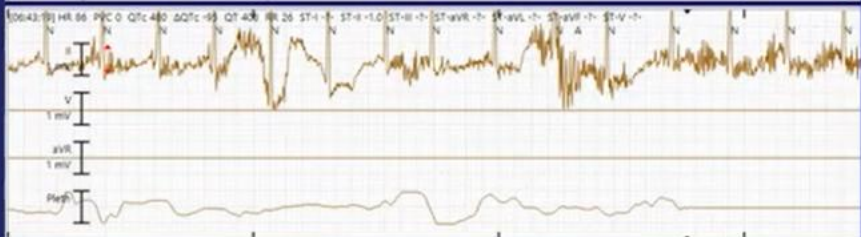
BICU



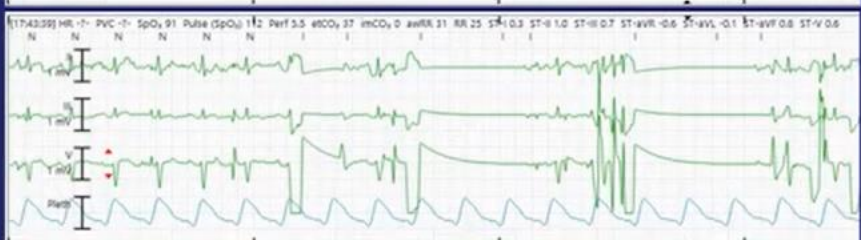
CICU



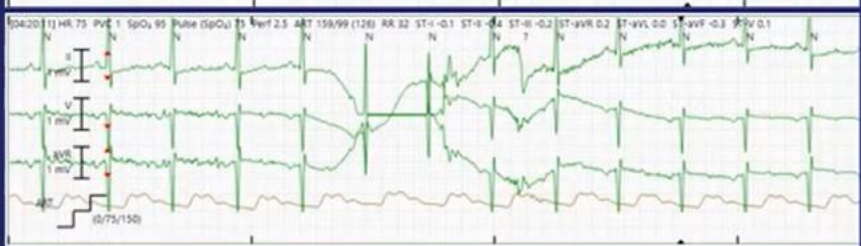
ED Unit



MRICU

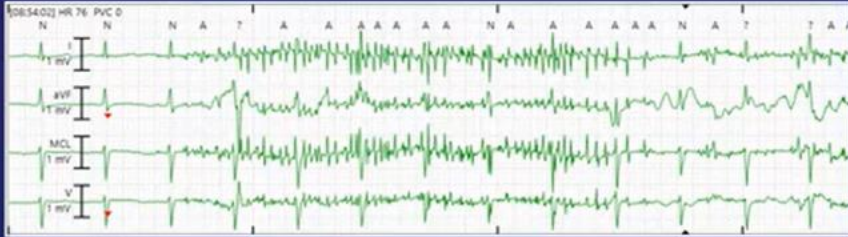


NSICU

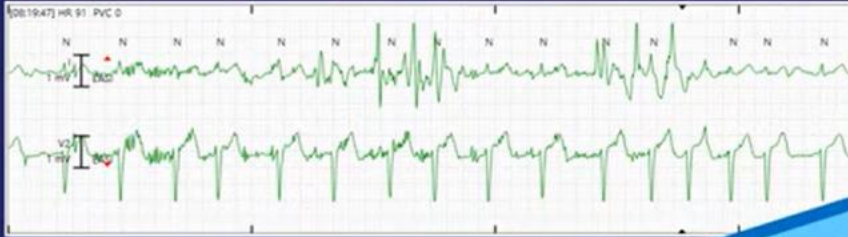


# What % of Patients Have Artifact on Tele?

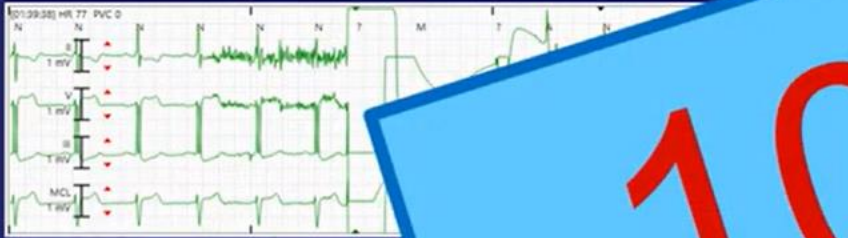
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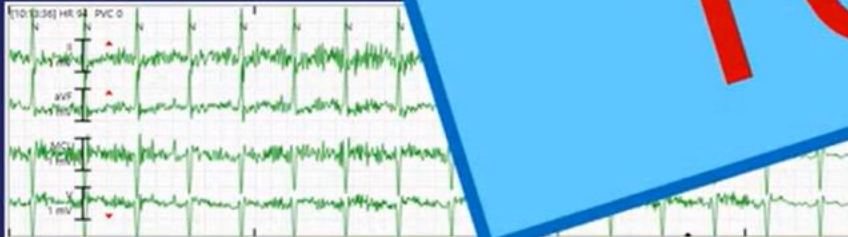
Card Unit



CHF/PH



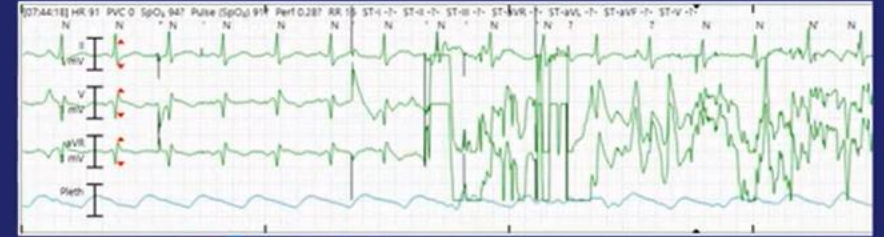
Hospitalist



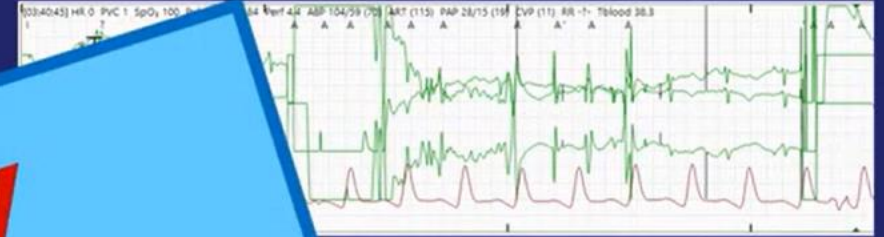
Neuro



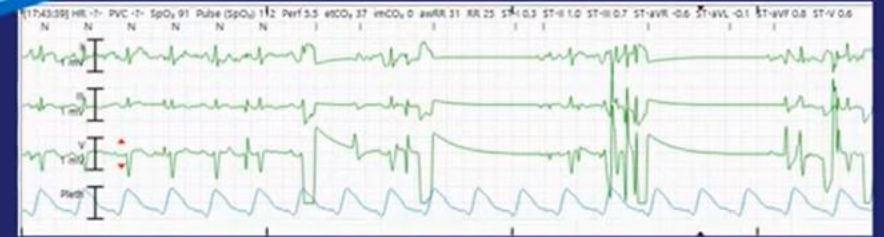
BICU



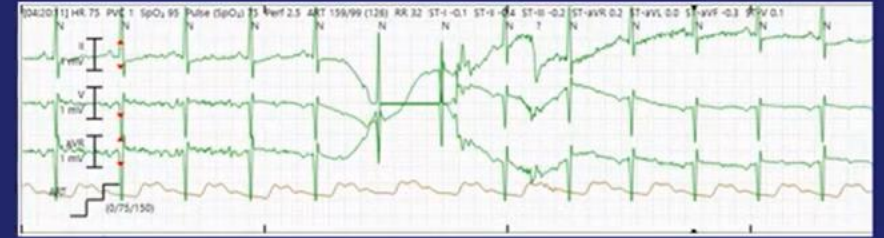
CICU



MRICU



NSICU

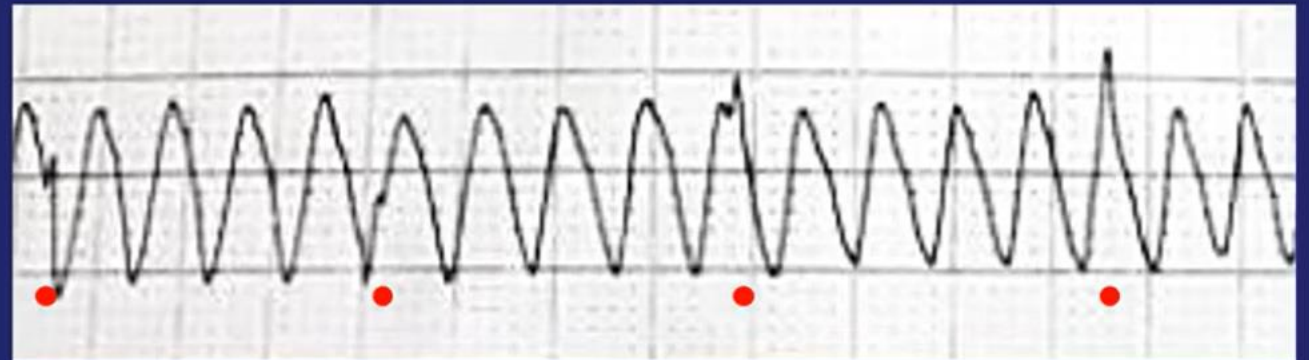


100%

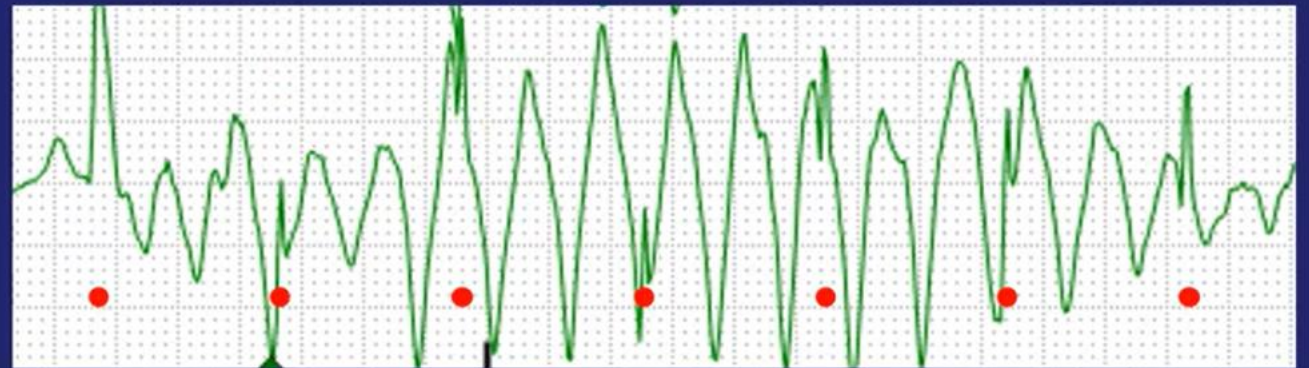
Can artifact look like SVT?



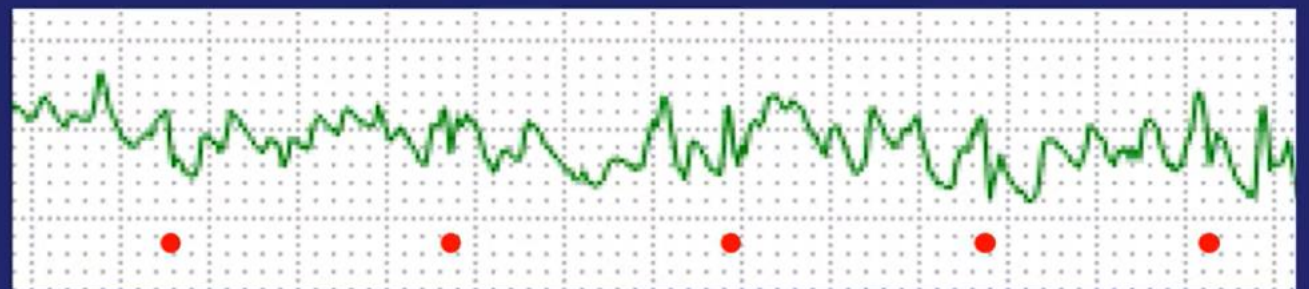
Can artifact look like MMVT?



Can artifact look like PMVT?



Can artifact look like VF?



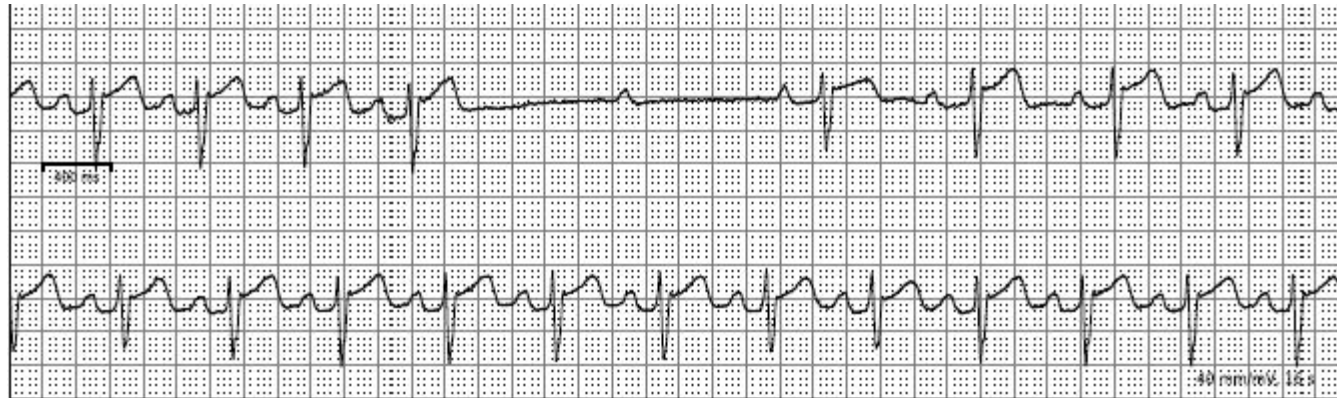


# Things to remember

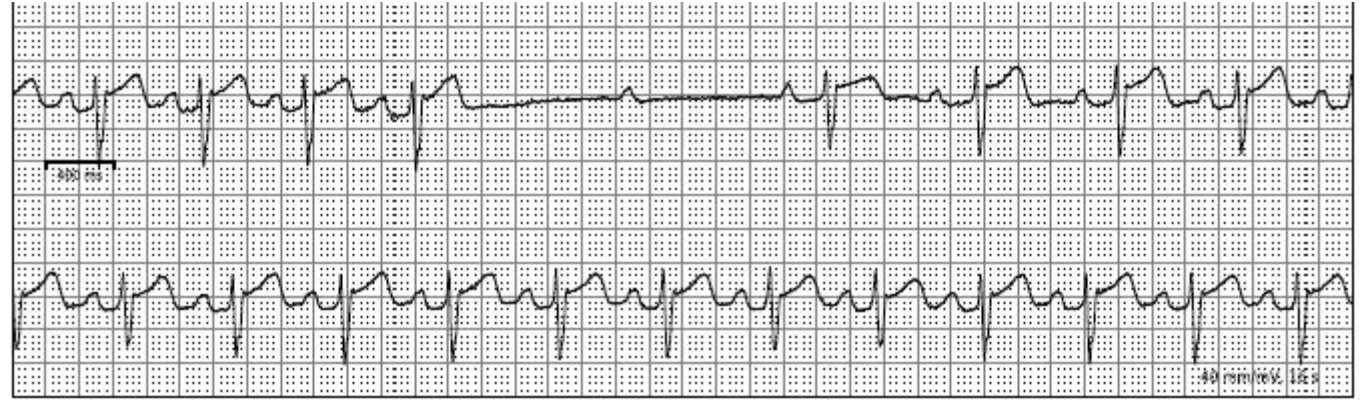
- Use all information including symptoms, other leads, BP, pulse ox
- Heart can only do 1 thing at a time- cannot have normal sinus rhythm & VF at the same time
- Look for consistent p waves, QRS complexes- use calipers especially in the beginning and at the end

# Case 2

- 22 year old with h/o asthma admitted with viral pneumonia
- Recurrent pauses on telemetry
- Pacemaker? A. Yay or B. Nay

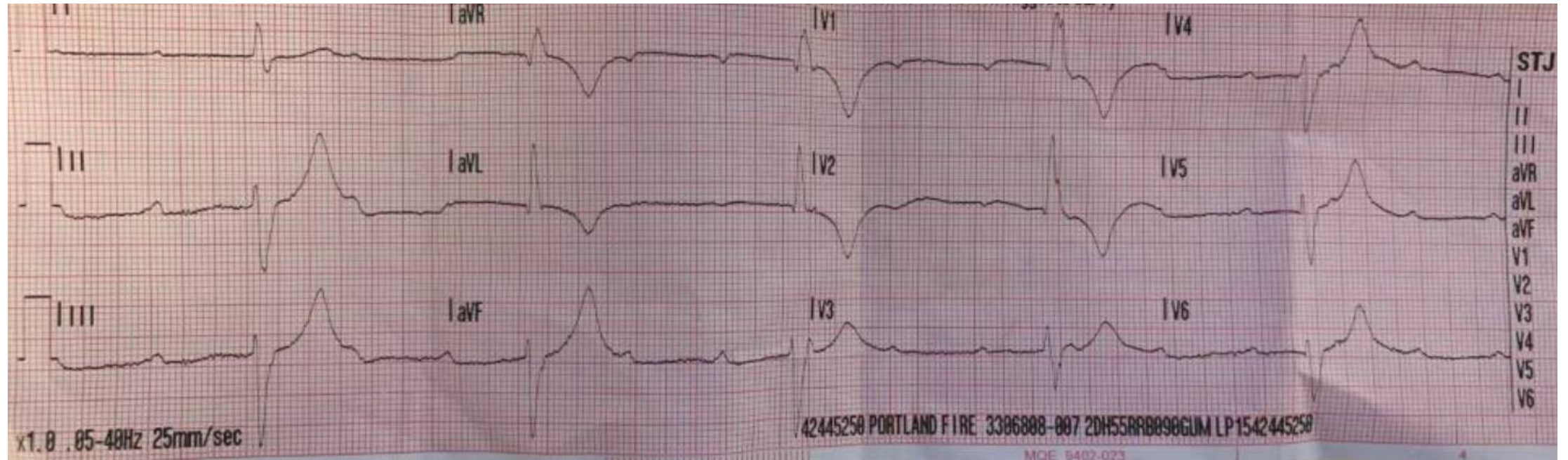


# Vagal Pauses

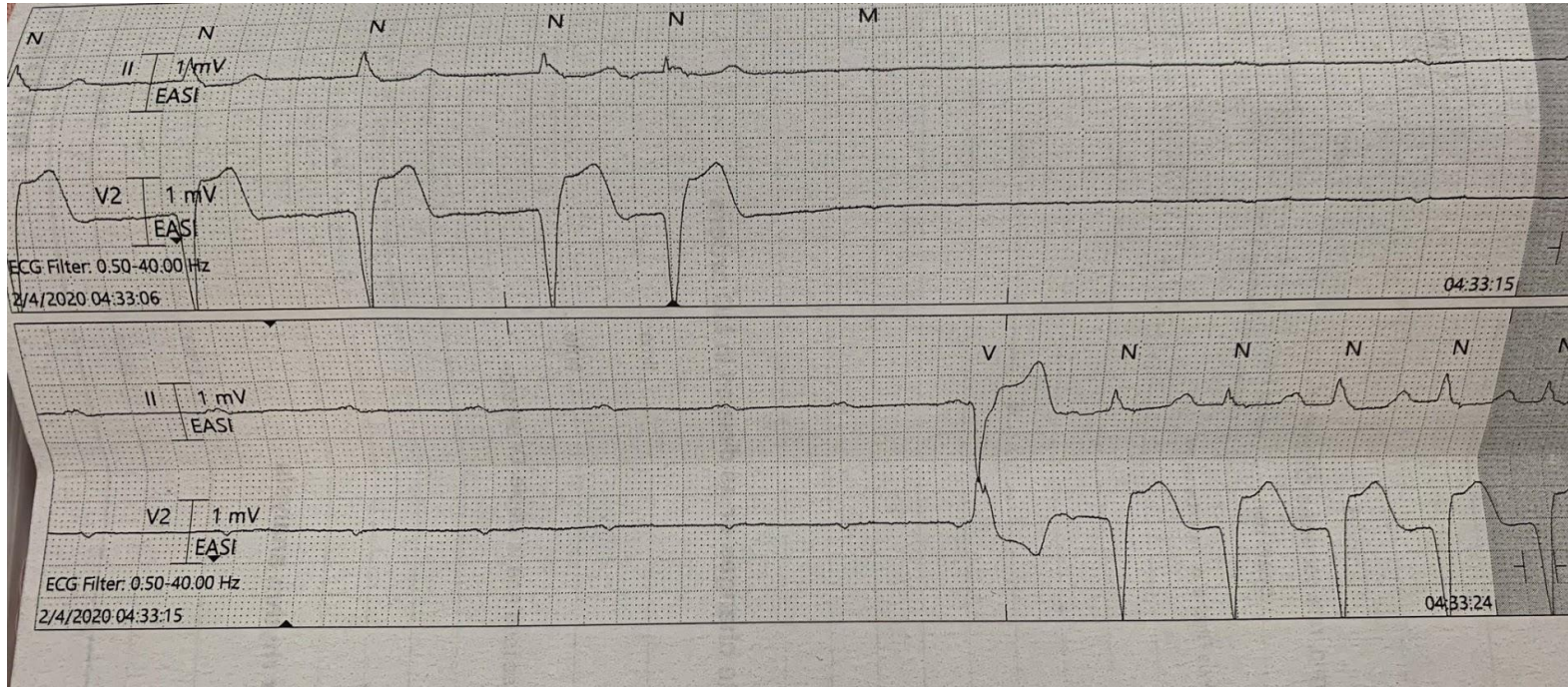


- Nocturnal, sleep apnea
- Neurological/brain stem injuries, suctioning, uncontrolled epilepsy, pain, abdominal processes
- Rx: Tincture of time, Atropine, glycopyrrolate
- Rarely need pacemaker
- Sometimes impedes progression of care- temporary (permanent) pacing

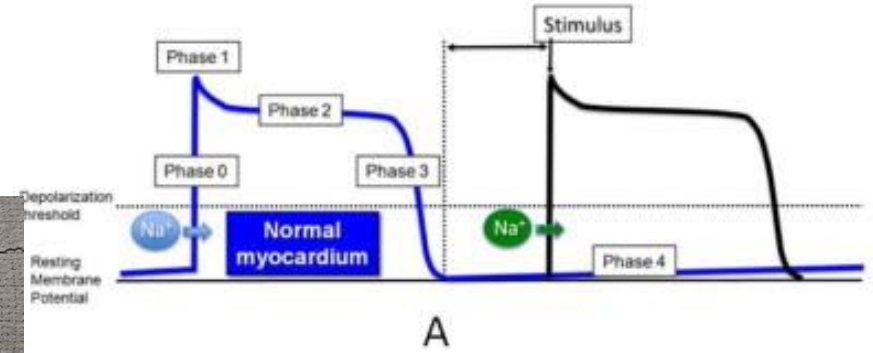
# Complete Heart Block



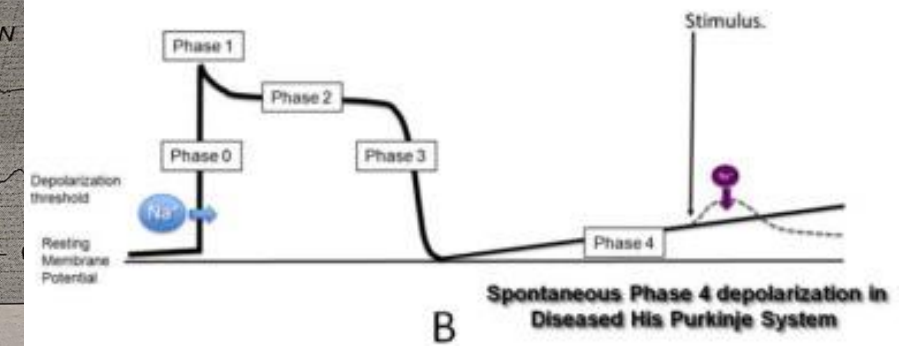
# Phase 4 AV block



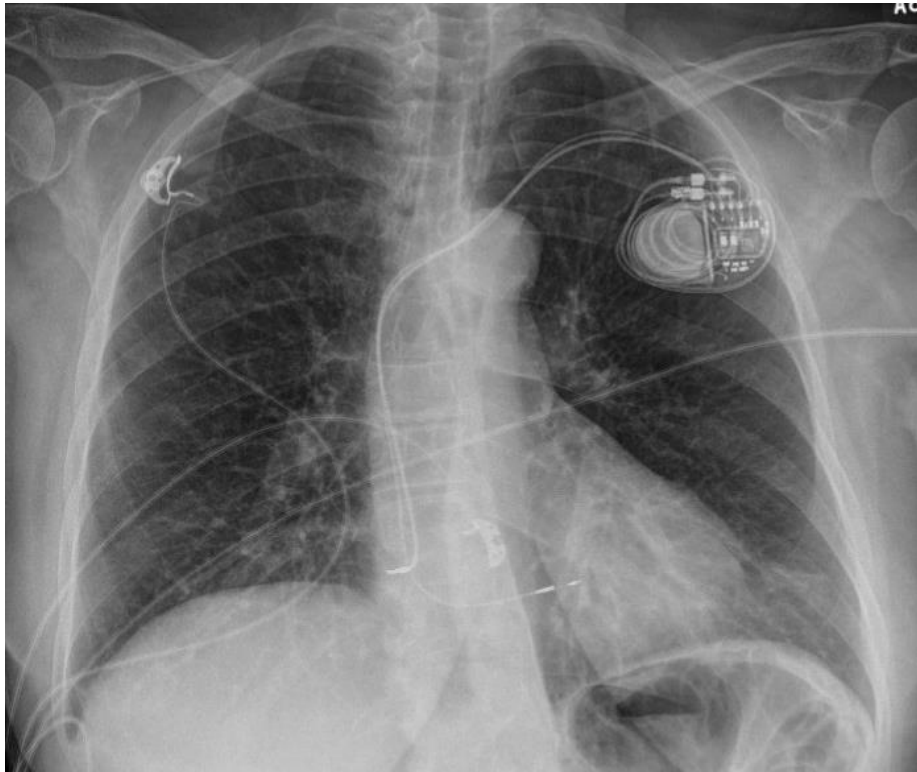
Normal HPS



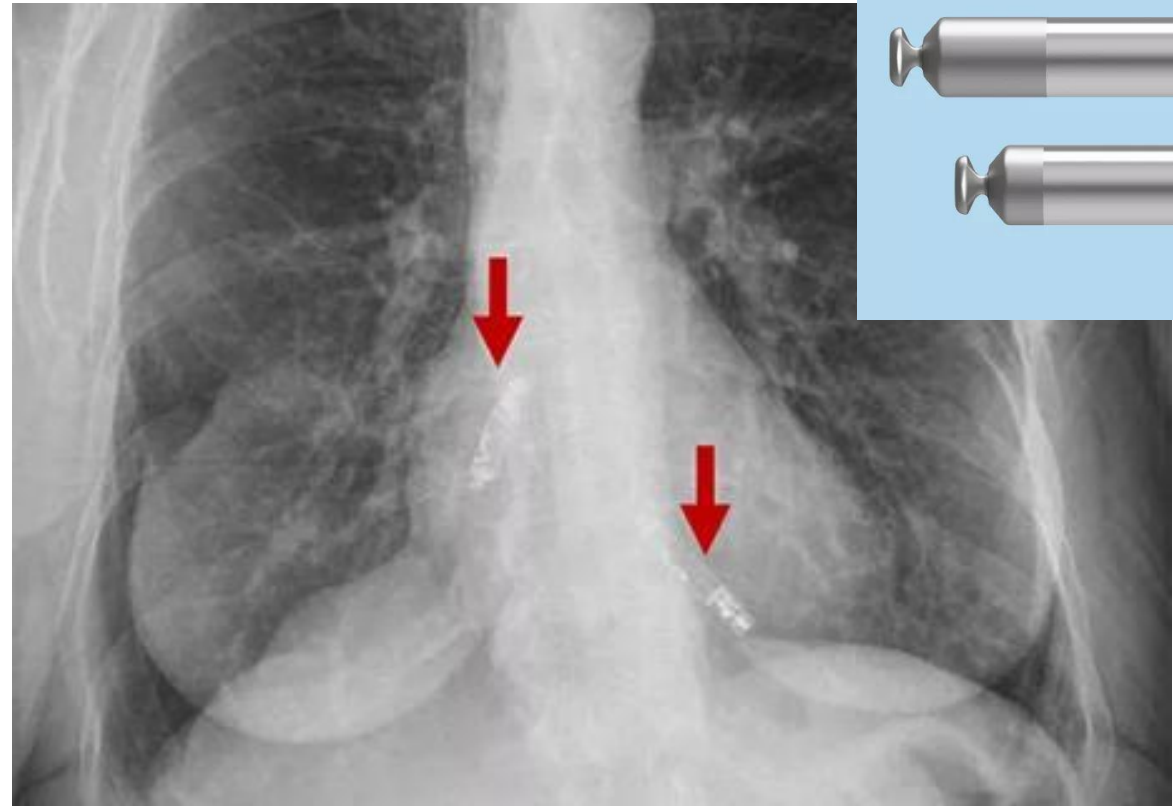
Diseased HPS with Phase 4 block



# How we treat bradycardia is changing



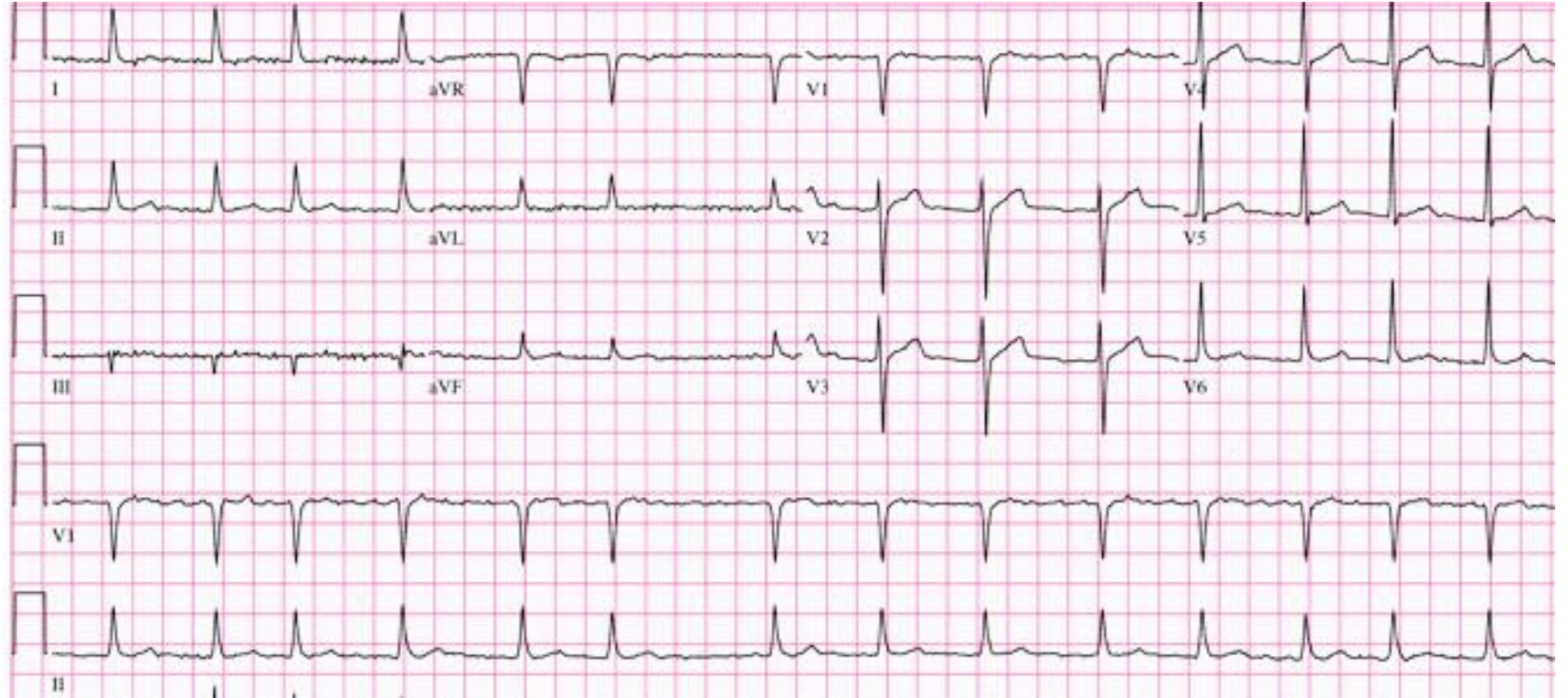
Left Bundle Pacemaker

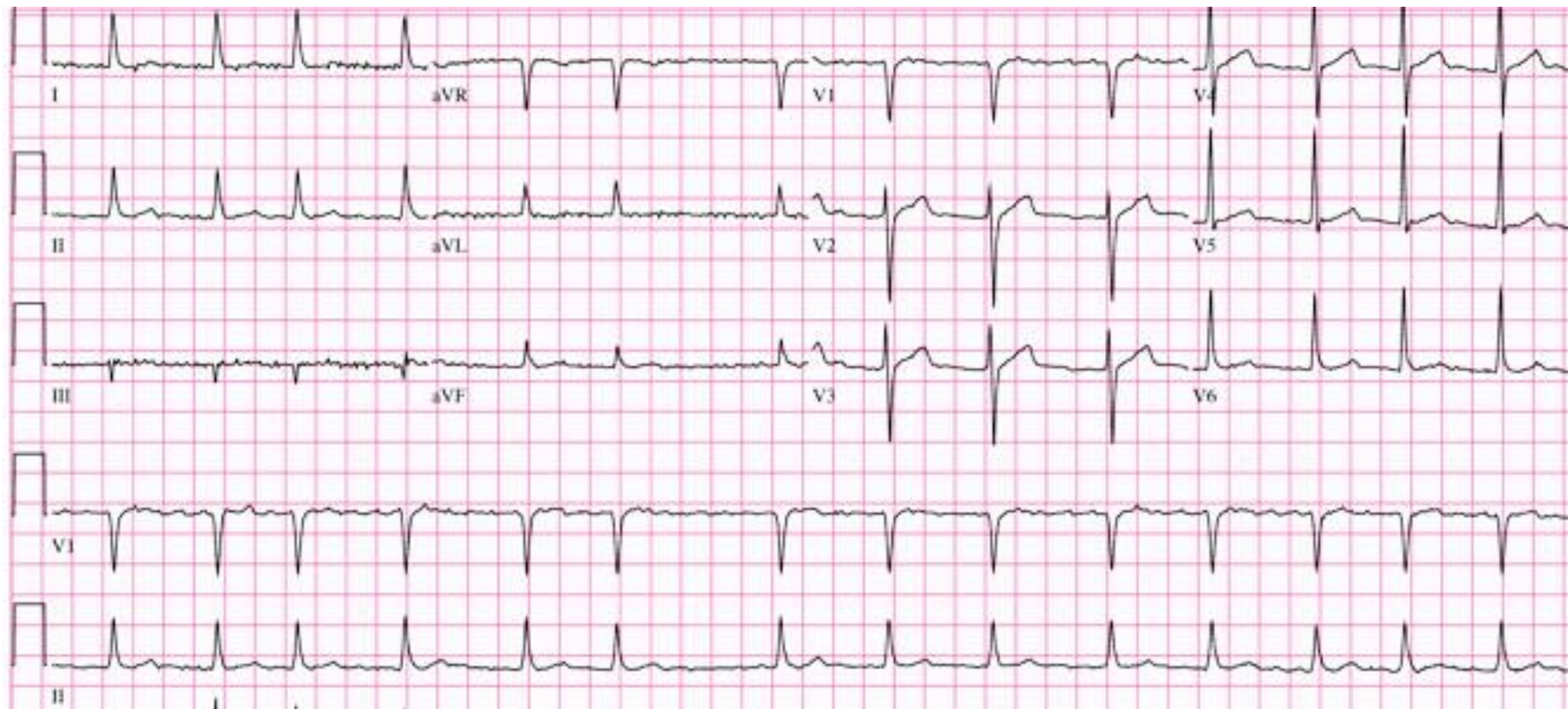


Leadless Pacemaker

Case 3- What is the most widely used score for assessing risk of stroke with the following heart rhythm?

- A. HASBLED
- B. HATCH
- C. MELD
- D. CHA2DS2Vasc







# Anticoagulation

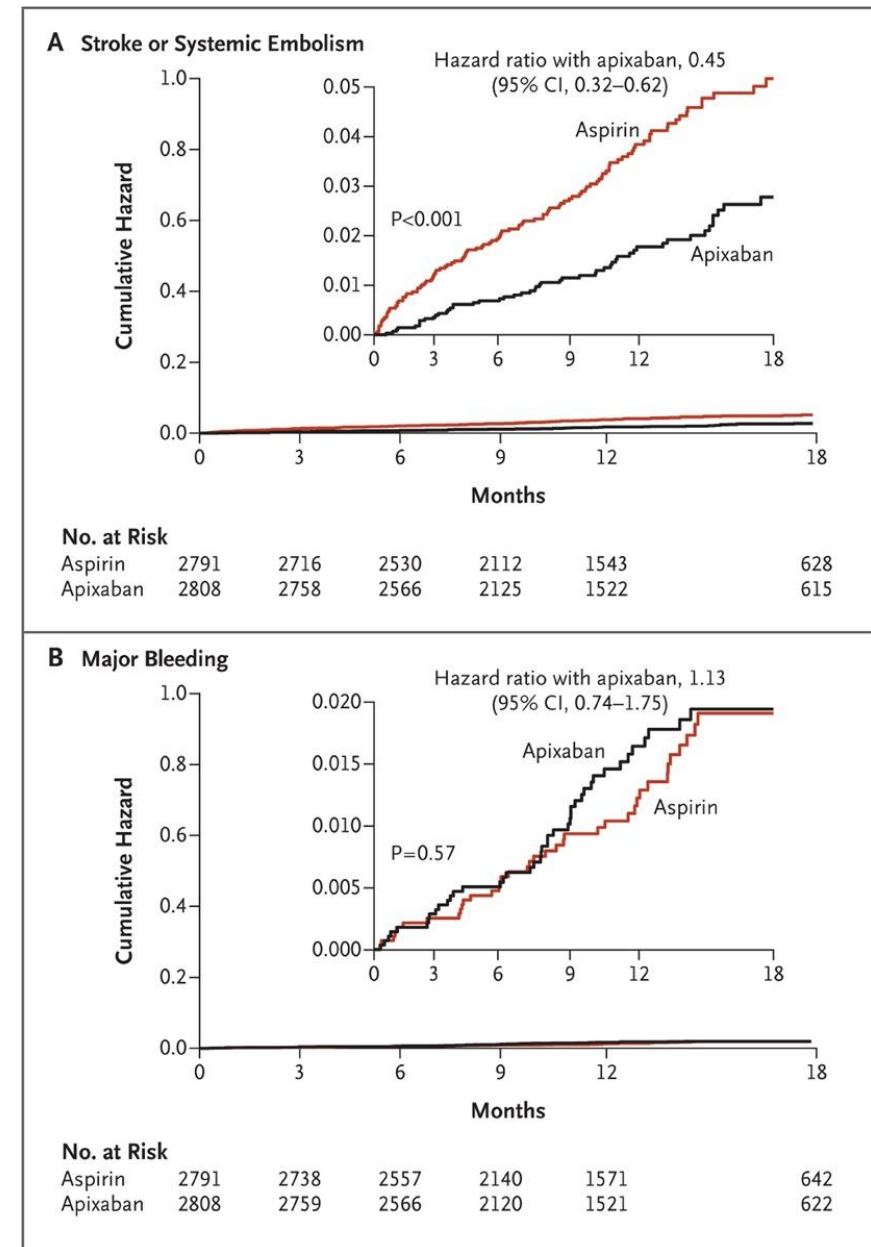
- **5X increased risk of stroke**
- Similar risk profile in paroxysmal vs persistent
- Atrial Flutter- Same tools applied
- Ablation DOES NOT change OAC recommendation

<b>CHF</b>	+1
<b>Hypertension</b>	+1
<b>Age ≥75</b>	+2
<b>Diabetes</b>	+1
<b>Stroke/TIA/VTE</b>	+2
<b>Vascular Disease</b>	+1
<b>Age 65-74</b>	+1
<b>Sex (female)</b>	+1

1. Go AS. et al, Circulation 2013
2. Holmes DR, et al. Seminars in Neurology 2010;30:528-536
3. Hart RG et al. *Ann Intern Med.* 1999.
4. Wolf PA et al, Stroke 1983; 14:664-667

# Anticoagulation- who?

- Valvular AF- moderate-severe mitral stenosis, mechanical valve
- Hypertrophic Cardiomyopathy
- Non valvular atrial fibrillation:
  - CHA2DS2Vasc- 0- **No**
  - CHA2DS2Vasc- 1 (not gender) – **Maybe, Class IIa**
  - CHA2DS2Vasc  $\geq 2$  – **Yes, Class I**
- Aspirin- reduced efficacy with similar bleeding



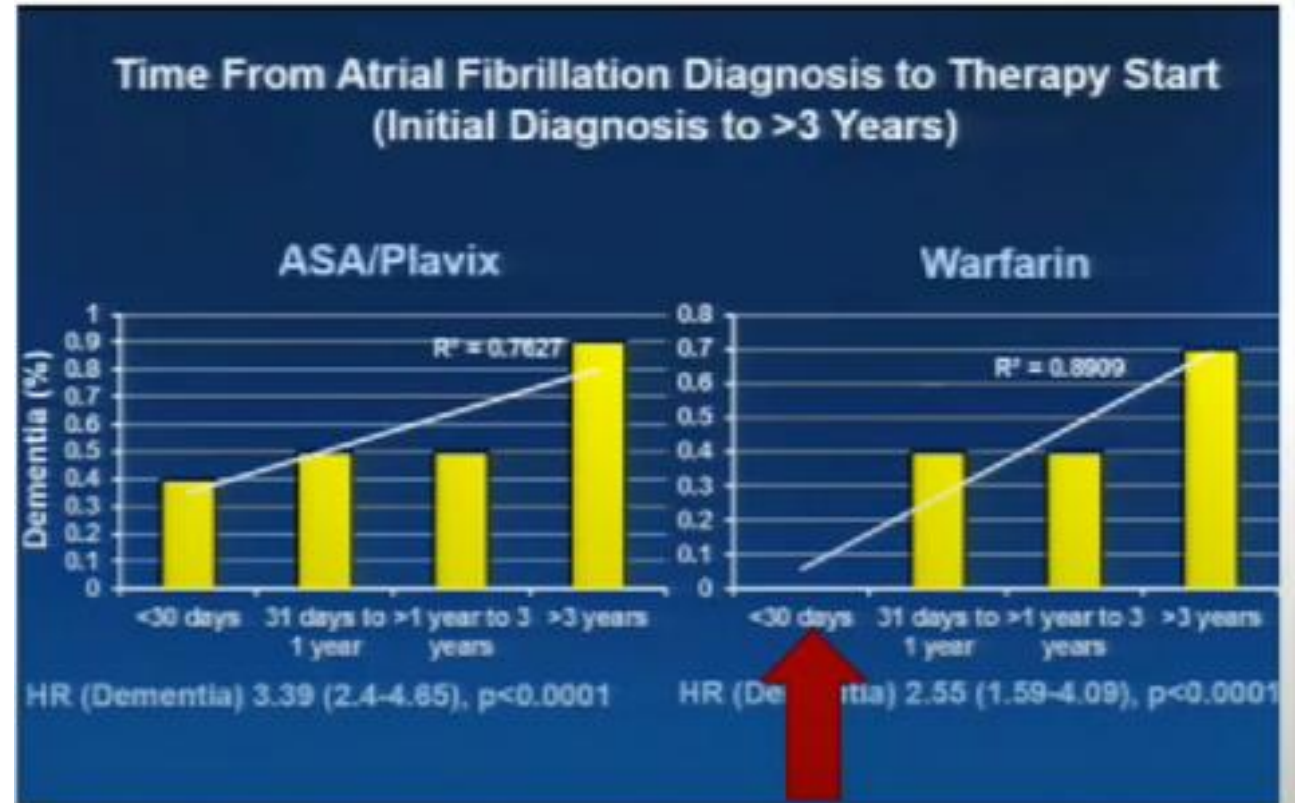
January et al JACC 2014  
Connolly et al NEJM 2011

# Anticoagulation- when to start?

Table 1:

Delays in Initiation of Antithrombotic Therapies in Patients with Newly Diagnosed AF

Time to Initiation	Acetylsalicylic acid/clopidogrel (n=21,781)	Warfarin (n=4,408)
<b>General population</b>		
≤30 days	48.0%	5.2%
31 days to 1 year	10.5%	12.4%
>1 year to 3 years	13.1%	17.1%
>3 years	28.4%	65.3%
<b>CHA<sub>2</sub>DS<sub>2</sub>-VASc 2-4</b>		
≤30 days	50.7%	4.8%
31 days to 1 year	10.2%	12.5%
1 year to 3 years	13.6%	17.9%
>3 years	25.5%	64.8%
<b>CHA<sub>2</sub>DS<sub>2</sub>-VASc &gt;5</b>		
≤30 days	67.1%	7.9%
31 days to 1 year	8.8%	18.4%
1 year to 3 years	10.9%	25.4%
>3 years	13.2%	48.3%

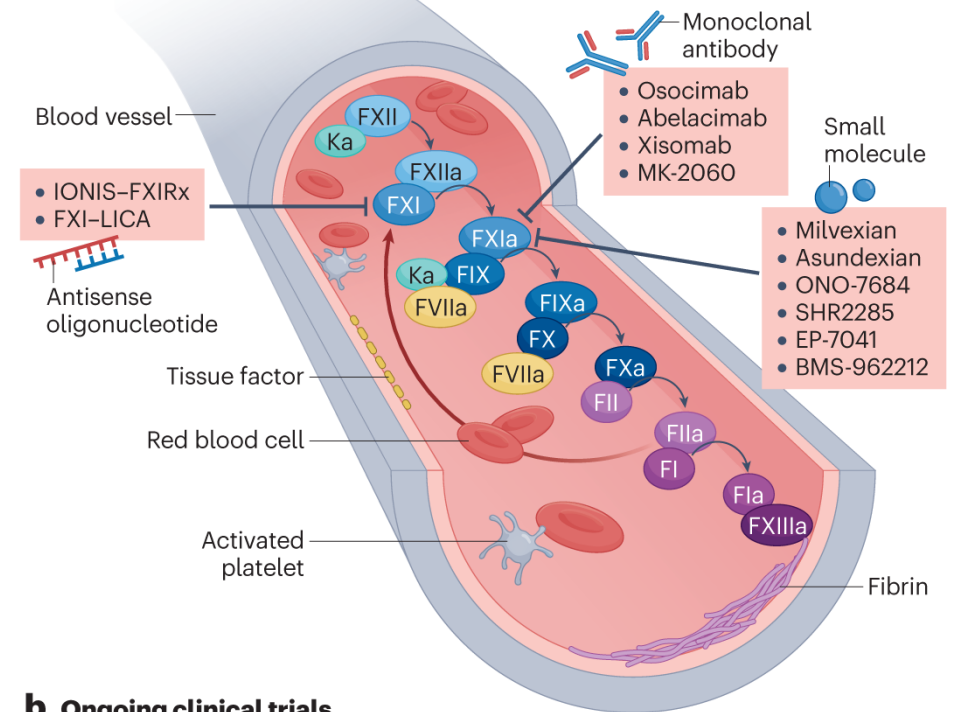


# Anticoagulation- What?

- NOACs > Warfarin- 1A recommendation
- Factor Xa inhibitors
  - Apixaban
    - ARISTOTLE- Slightly lower CVA and major bleeding
  - Rivaroxaban
    - ROCKET AF- Similar CVA and bleeding
  - Edoxaban
    - ENGAGE AF TIMI 48- Similar CVA but lower bleeding
- Direct thrombin inh
  - Dabigatran
    - RELY- Similar CVA and bleeding

## FUTURE- TARGET FACTOR XI

### a FXI inhibition and the coagulation cascade



### b Ongoing clinical trials

- Prevention of cardioembolic stroke in patients with AF
- Prevention of recurrent non-cardioembolic stroke
- Prevention of major adverse cardiovascular events in patients with ACS
- Safety in patients with ESRD

### c Future therapeutic indications

- Valvular AF; mechanical valve
- APS
- Impaired liver function
- Obesity
- Sarcopenia
- Heart failure

# Intravenous Magnesium in the Management of Rapid Atrial Fibrillation: A Systematic Review and Meta-Analysis

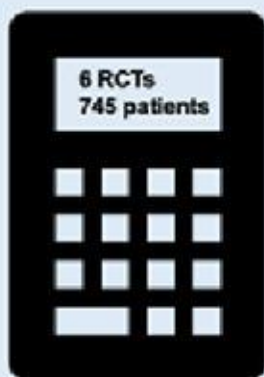
## Methodology

## Results

Literature search to identify relevant randomized controlled trials involving IV Mg<sup>2+</sup> in the management of rapid atrial fibrillation



Pool and analysis of the data, looking at the effectiveness of IV Mg<sup>2+</sup> in rate and rhythm control of atrial fibrillation compared to placebo

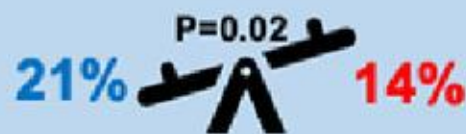


Mg<sup>2+</sup> in addition to standard-of-care is superior in achieving rate control and rhythm conversion to sinus compared to standard-of-care alone

% of pts achieving rate control



% of pts achieving sinus rhythm

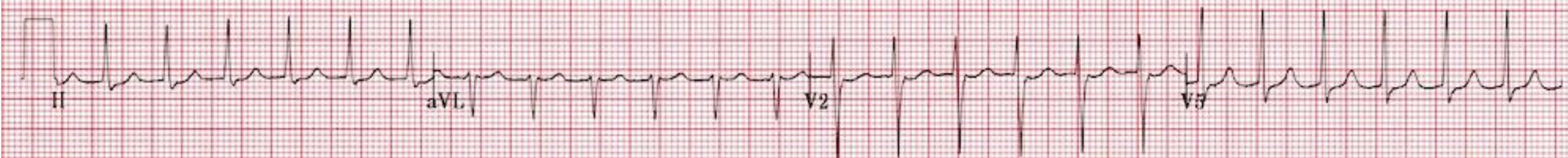


# When to cardiovert?

- Hemodynamic instability
  - Sepsis, trauma, surgery
  - Spontaneous restoration of sinus rhythm in up to 83% within 48 h after treatment of the underlying cause
- Symptomatic, initial diagnosis
- Failed rate control
- Post CV- 1 month of oral AC for all
- Imaging for everyone unless duration <48 hours confirmed
- **Rate control with BB/CCB\*\***

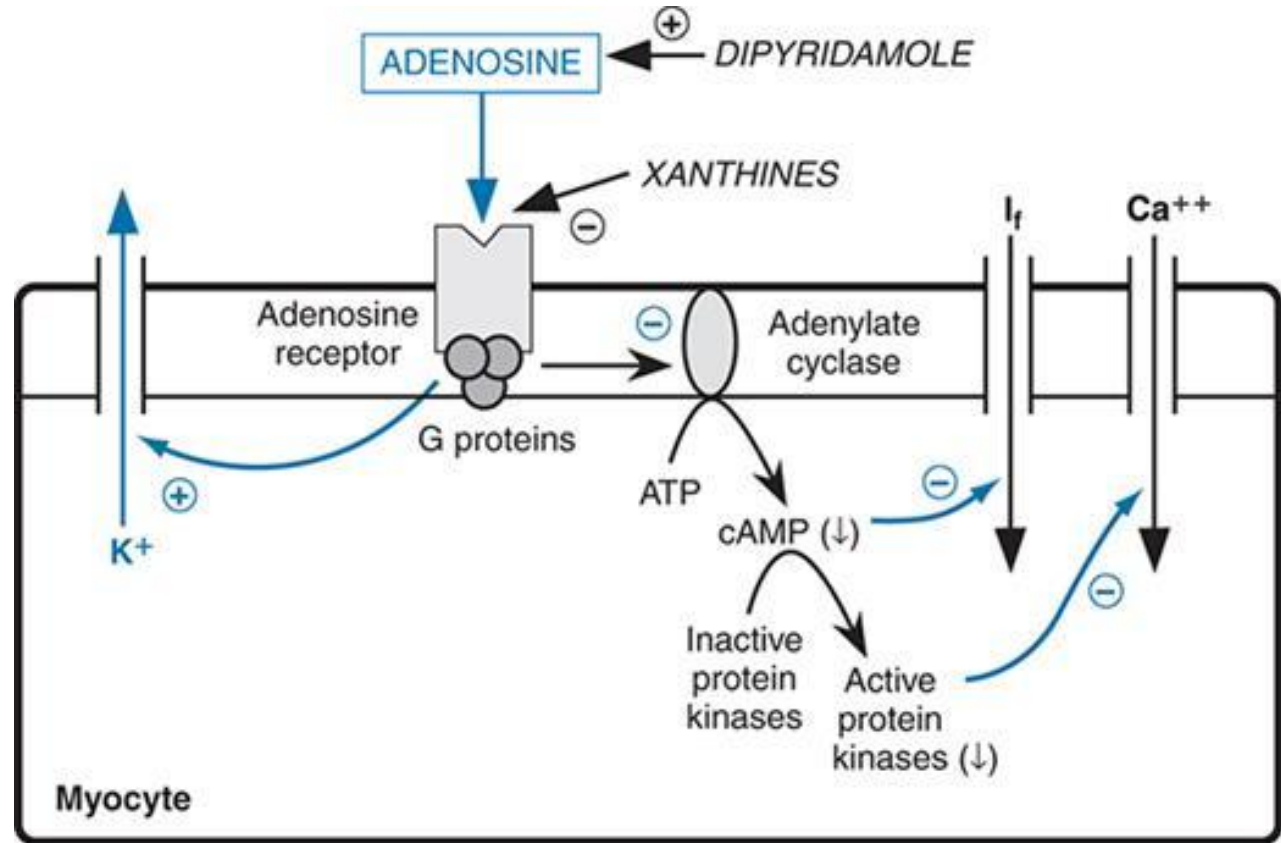
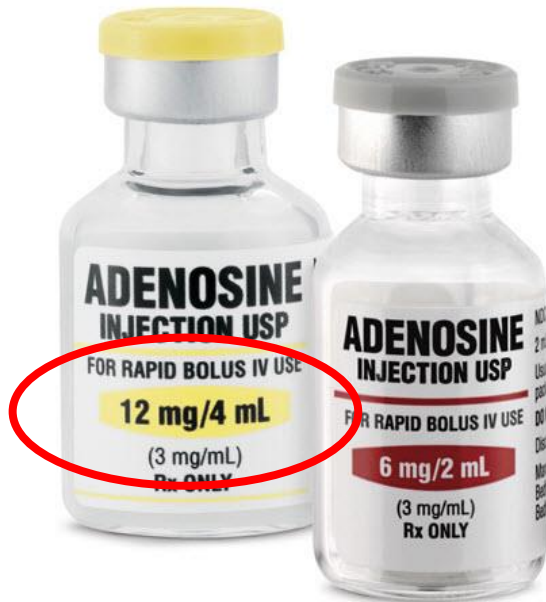
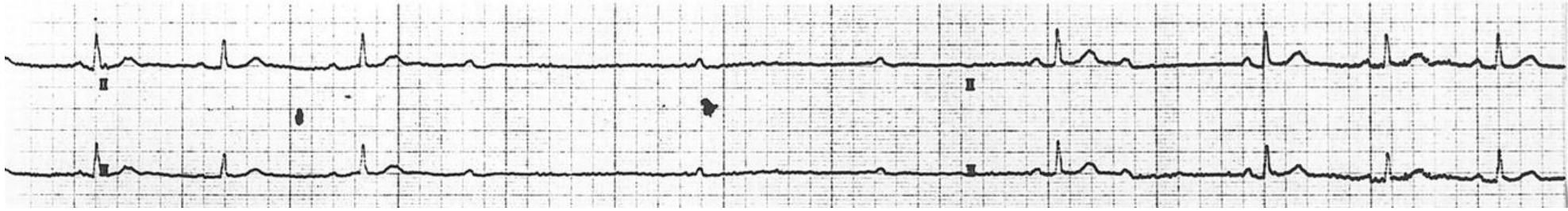
# Case 4

- 52 year old woman with no major medical problems has palpitations that last up to an hour
  - Bonus- this intravenous medication is 1<sup>st</sup> line to aid in acute termination of this rhythm
- A. Supraventricular Tachycardia
  - B. Sinus Tachycardia
  - C. Atrial Fibrillation
  - D. Ventricular Tachycardia





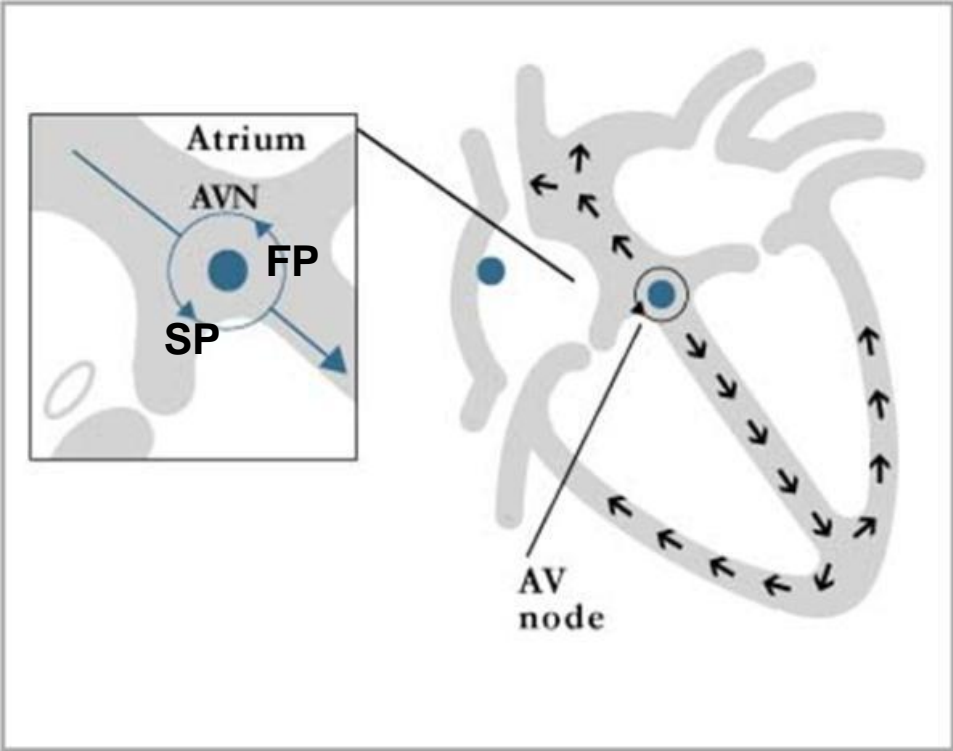
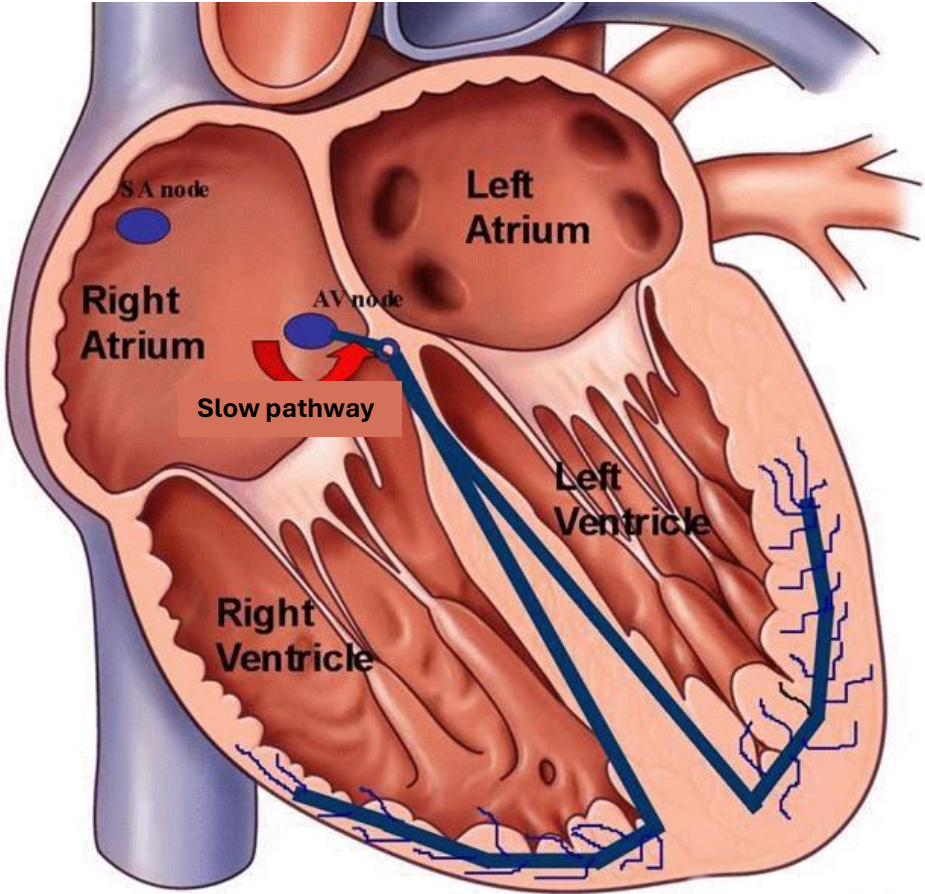
# Adenosine



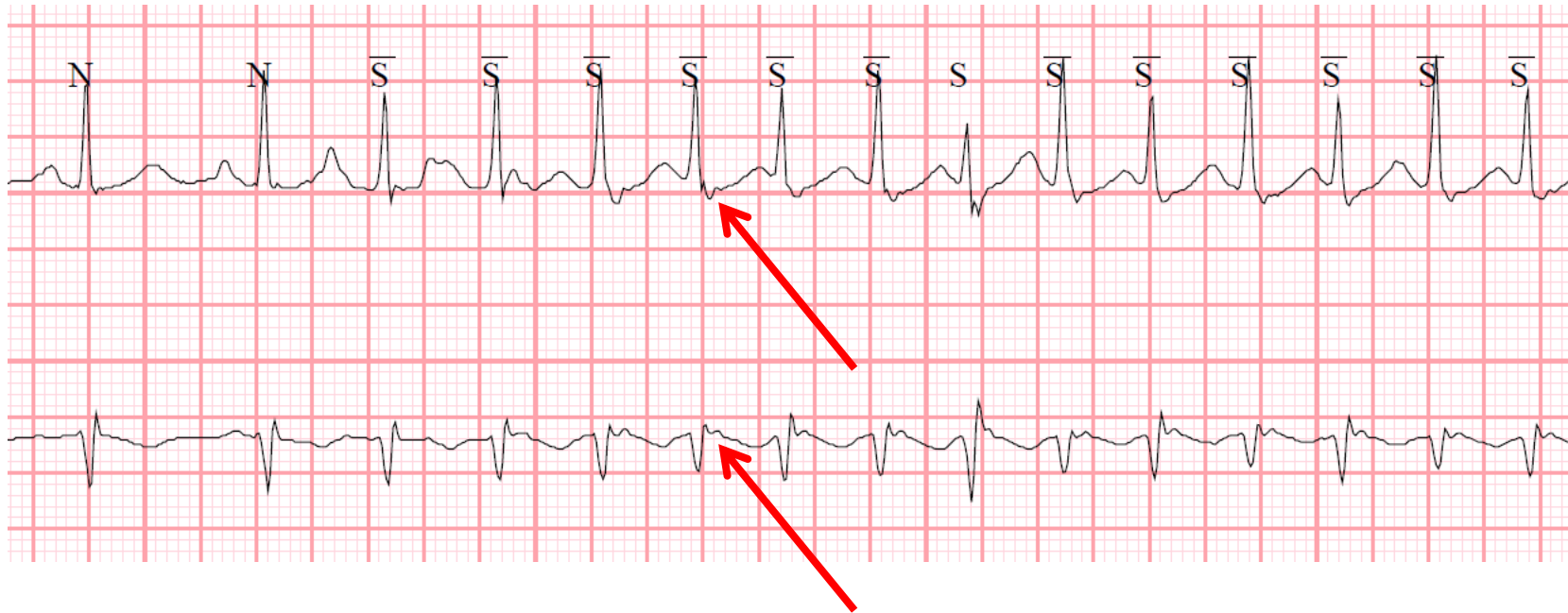
# SVT: (Regular) Narrow-Complex Tachycardias

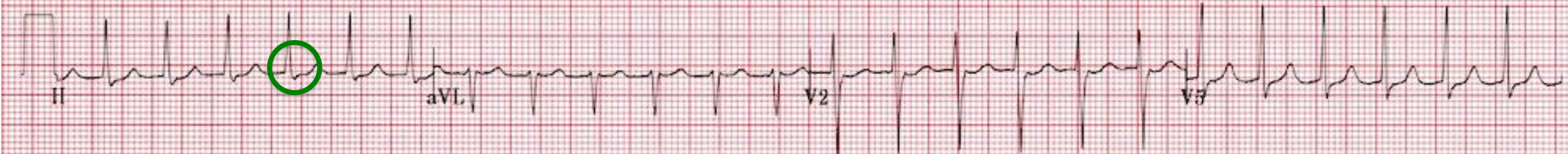
- Sinus Tachycardia
- SVT
  - AVNRT – atrioventricular nodal re-entrant tachycardia
    - Slow and fast pathways
  - AVRT – AV re-entrant tachycardia
    - Accessory pathways; WPW; sometimes delta wave
  - AT – atrial tachycardia
    - Single atrial focus
- Do not miss 2:1 atrial flutter\*\*

# AVNRT Mechanism

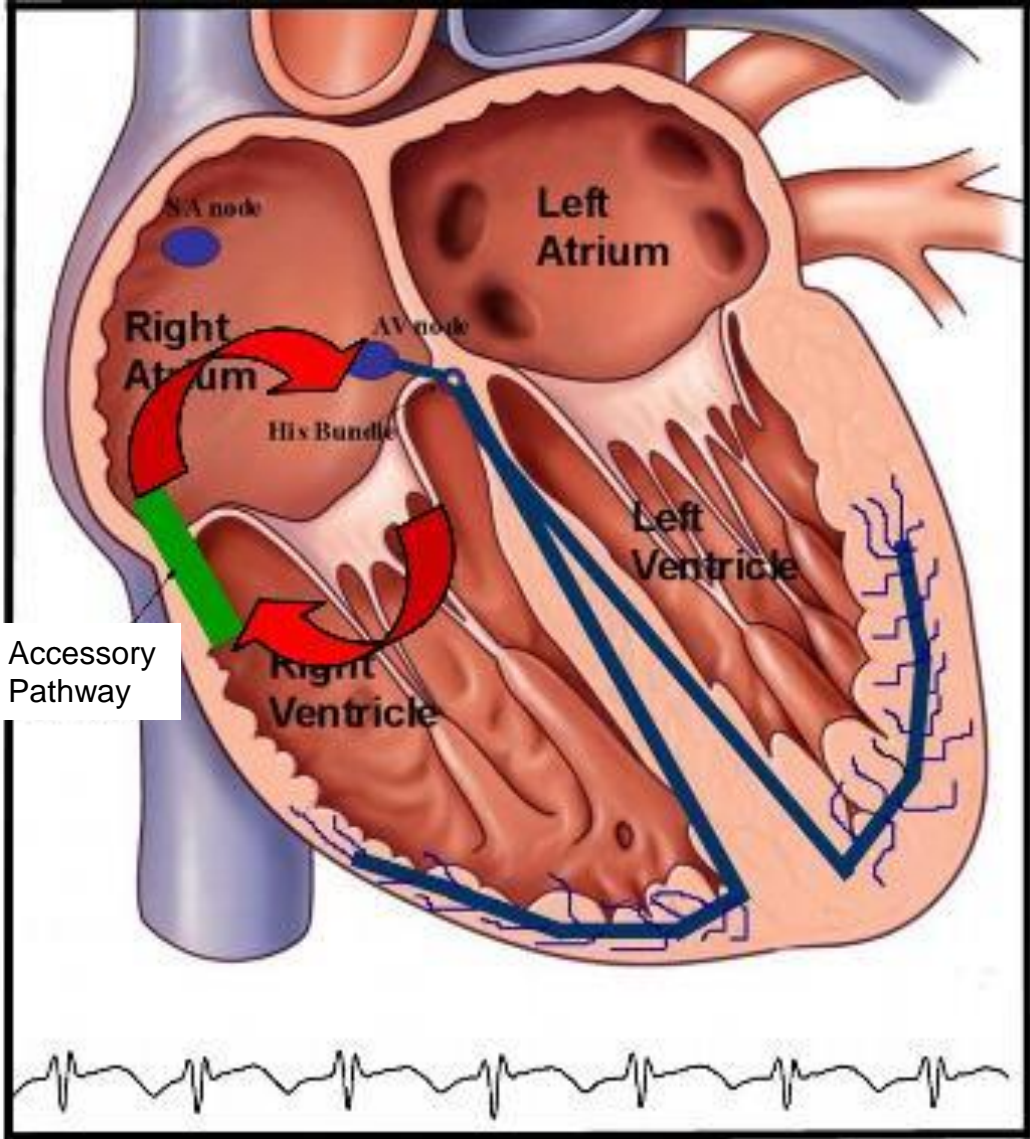


# Holter Monitor - During Symptoms

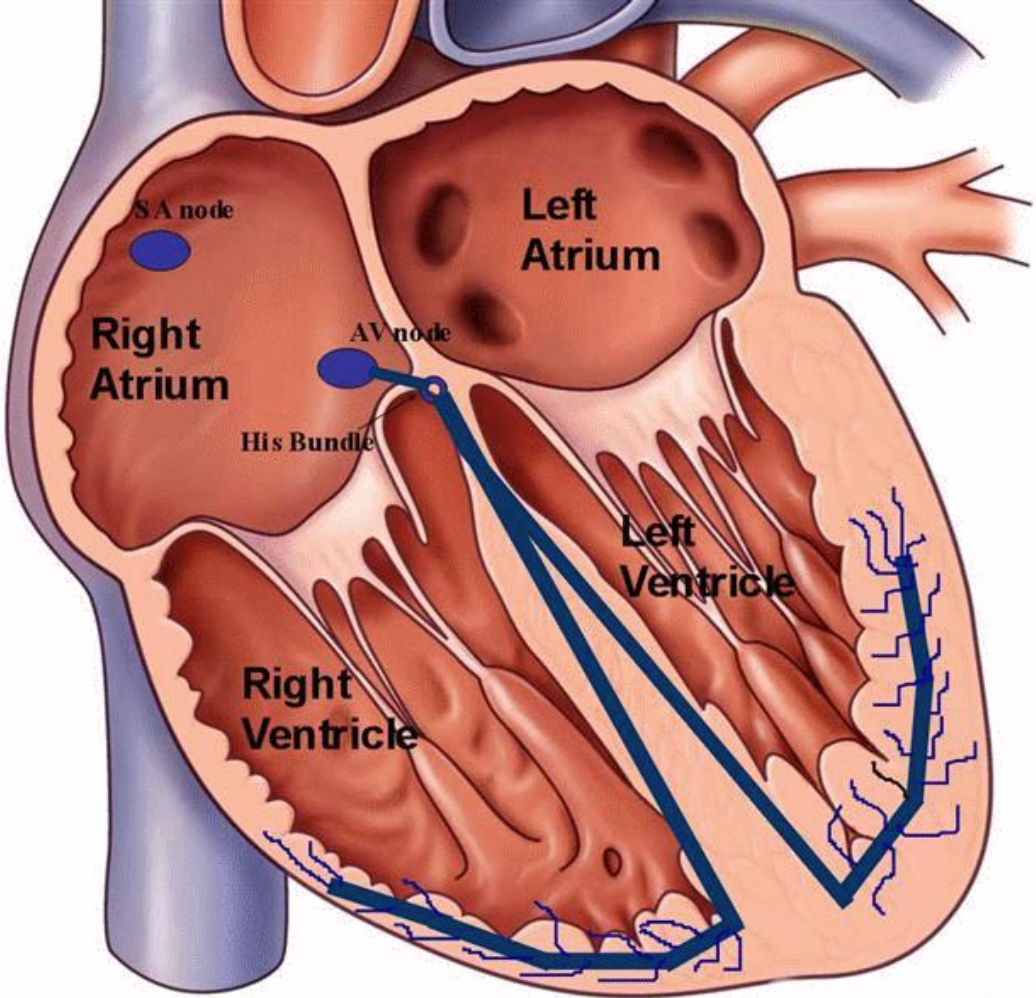




# AVRT Mechanism



# AT Mechanism



\*\*\* \*\*

--Axis--

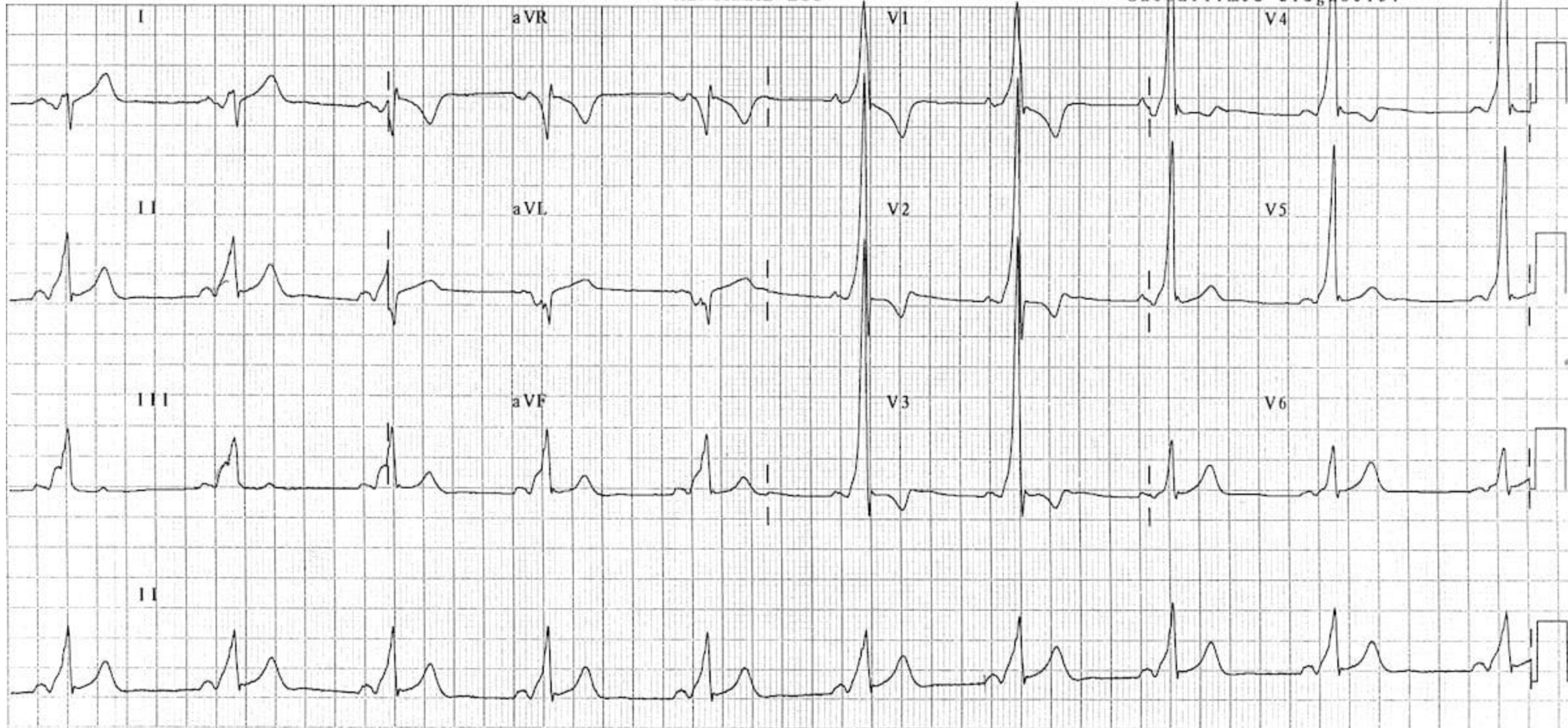
P -40

QRS 77

T 15

- ABNORMAL ECG -

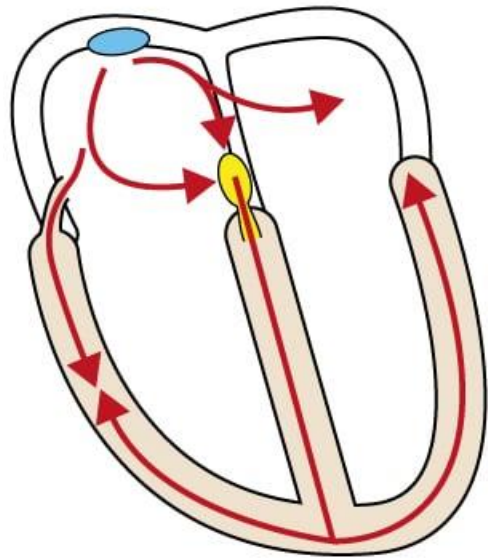
Unconfirmed diagnosis.





# Wolff-Parkinson White / Pre-Excitation

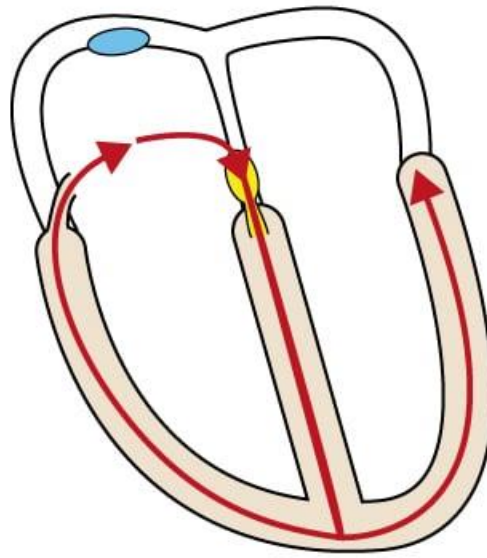
## Pre-excitation



- Short PR interval
- In this case the PR segment cannot be seen.

## Orthodromic AVRT

Antegrade conduction through atrioventricular node



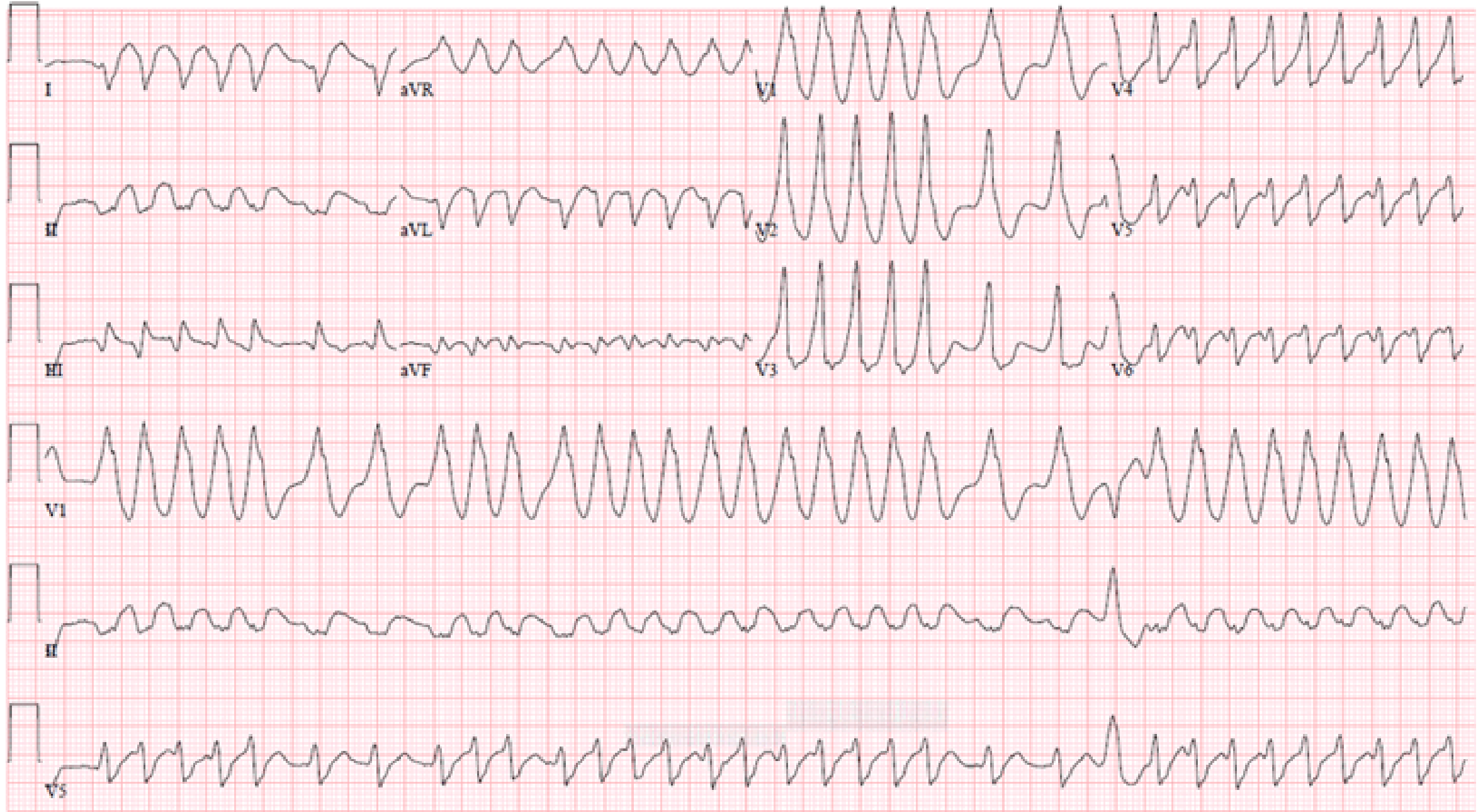
- Normal QRS duration
- No delta wave
- Retrograde P-wave after QRS



## MANIFESTATIONS

- SVT/palpitations
- Sudden death- pre-excited AF
- Asymptomatic/benign

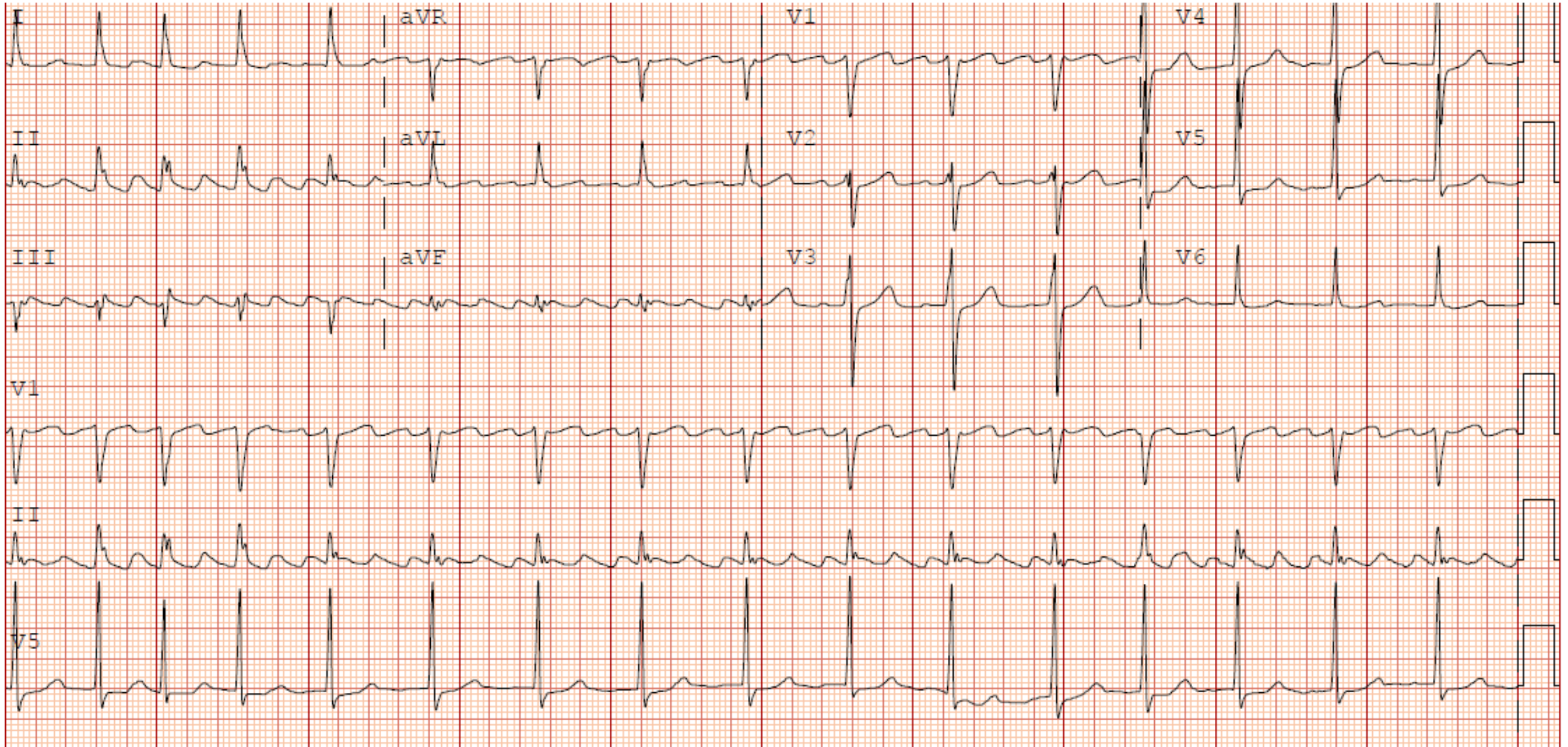
ASLMC:



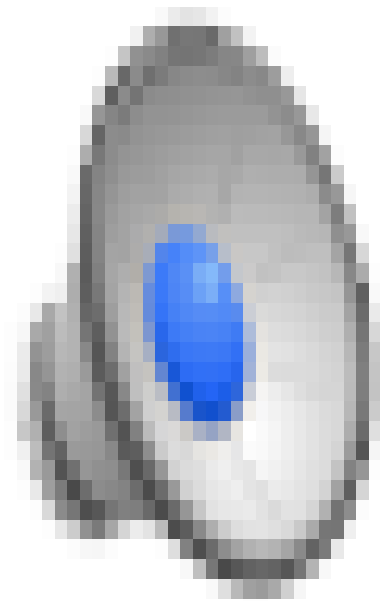
# Pre-excited AF Rx

- Avoid agents that slow AV nodal conduction- can precipitate VF
- Ibutilide- prolongs refractoriness in both AV node & pathway
- Procainamide- alternate, specific for myocardium
- Cardioversion
- Ultimately refer to EP for ablation (95% successful with 1% complications)

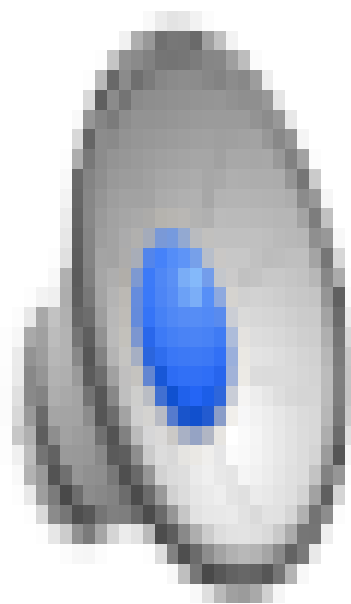
# Carrying this theme forward



# Atrial Flutter Activation Mapping



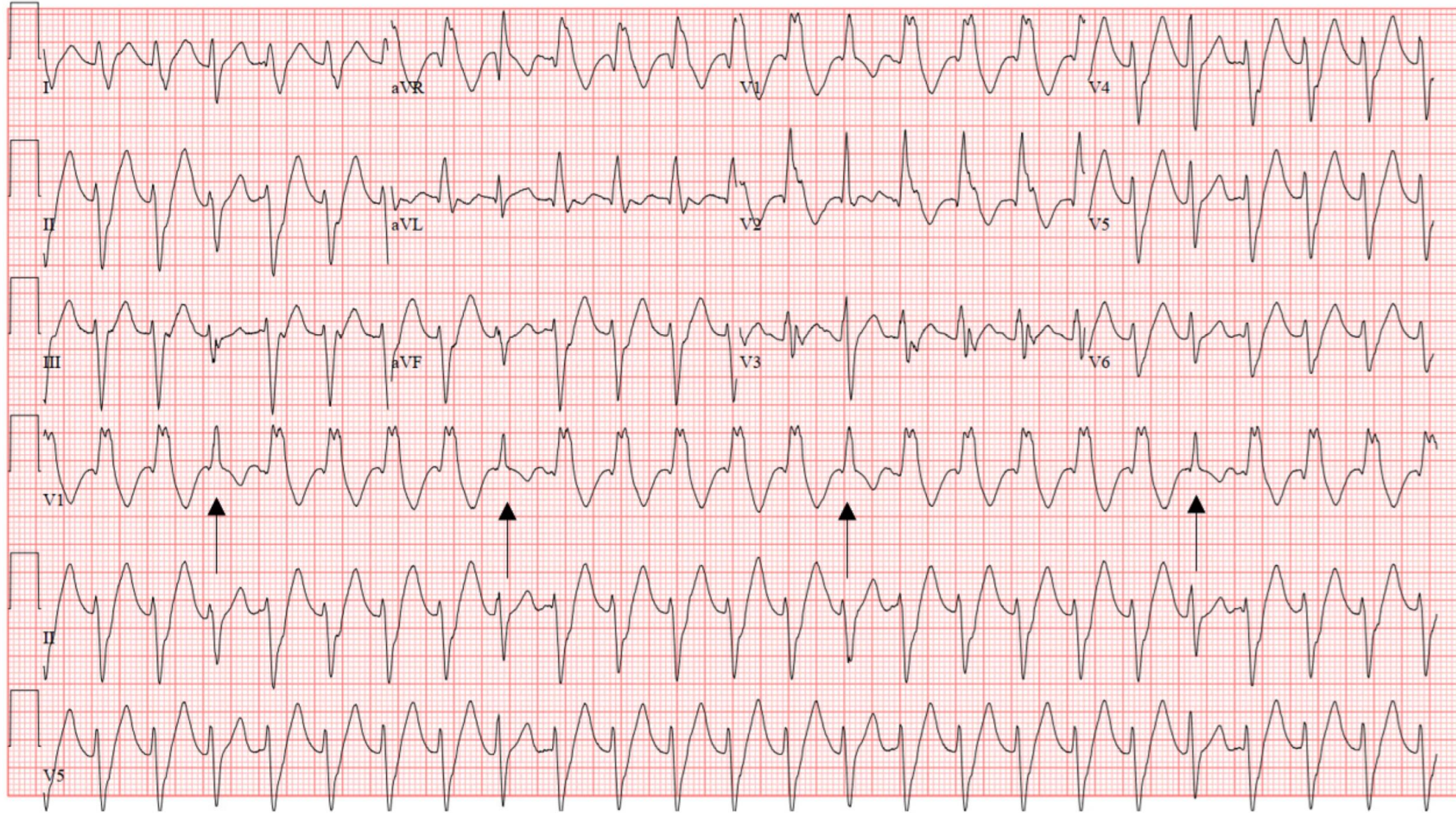
# Atrial Flutter Activation Mapping



# Atrial Flutter

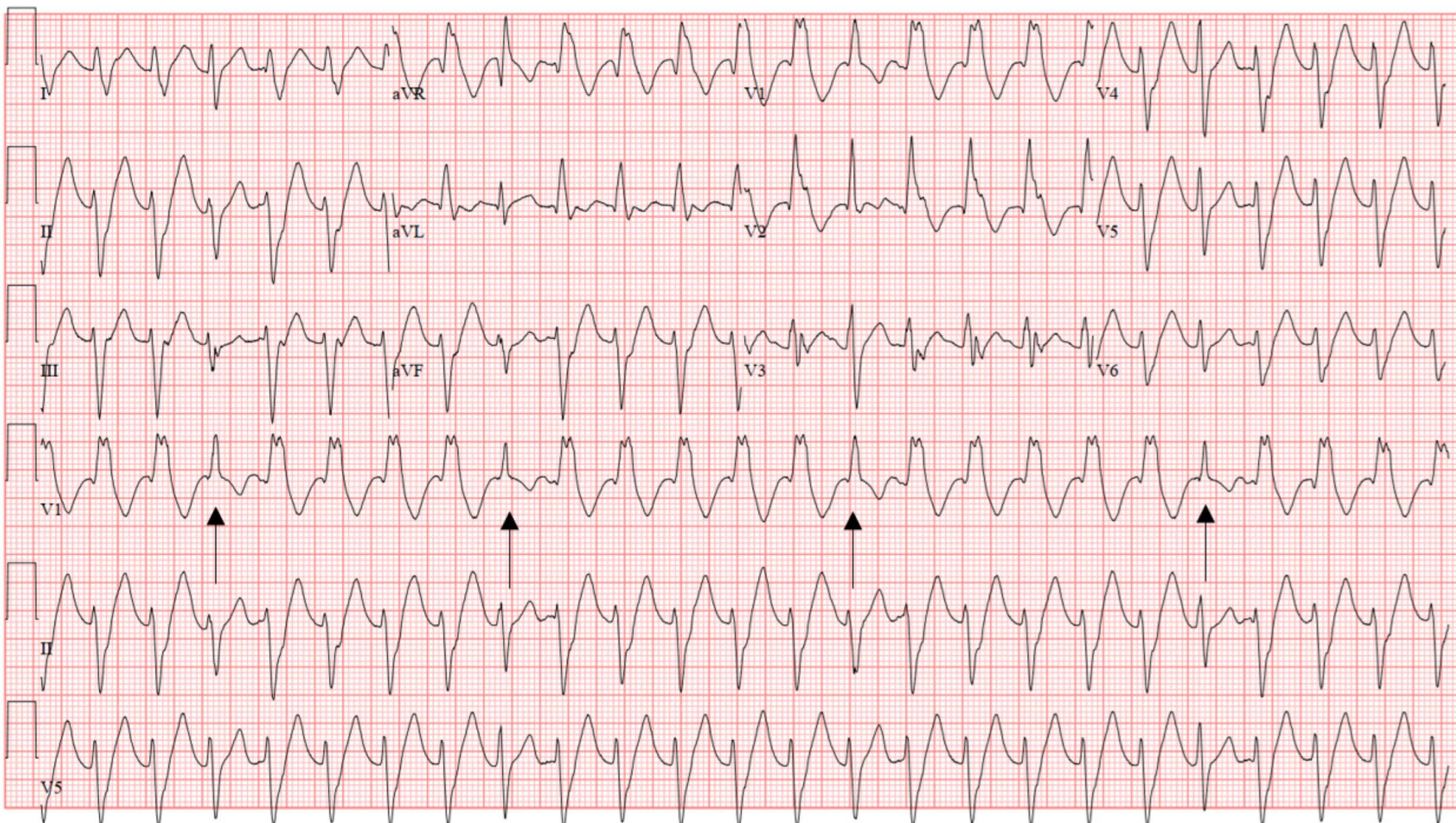
- **Ablation is effective (95%) and safe (1%)**
- Atrial rate is between 280-350 bpm (often ~ 300 bpm for typical flutter)
- Ventricular rate is usually slower, 2:1 conduction is common
- Chronic AFL imparts same stroke risk as AF

# Case 5- 62 year old man with Hypertrophic Cardiomyopathy- SVT with aberrancy or VT?





# Ventricular Tachycardia

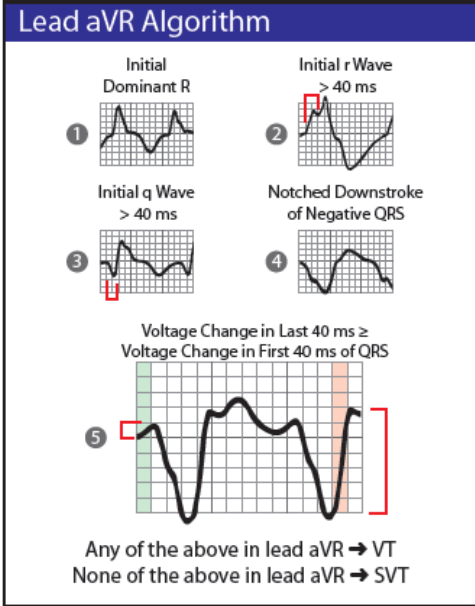
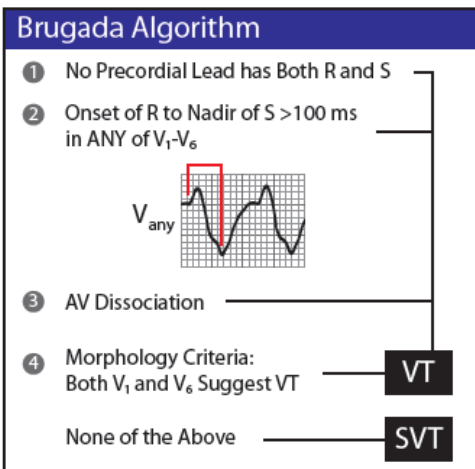
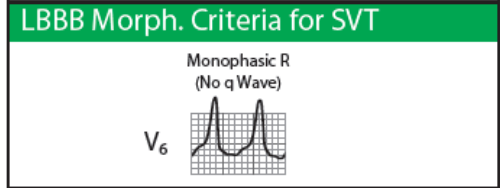
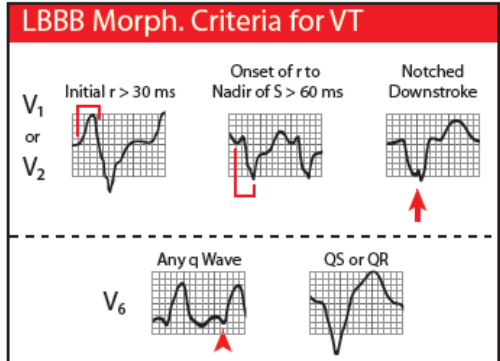
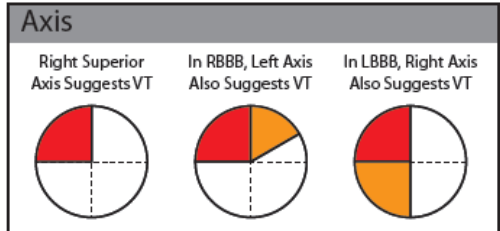
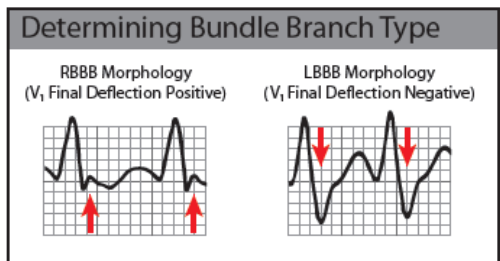
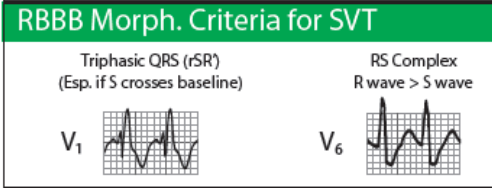
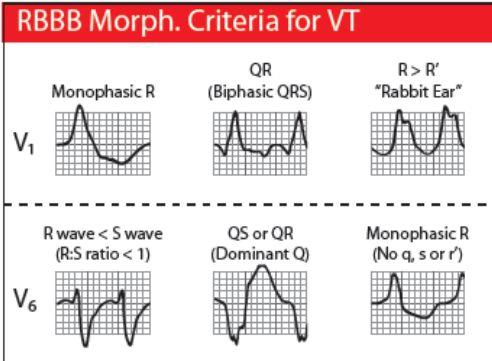
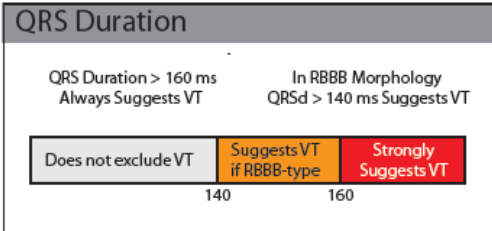
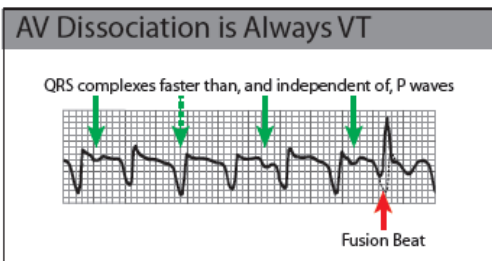


# VT vs SVT

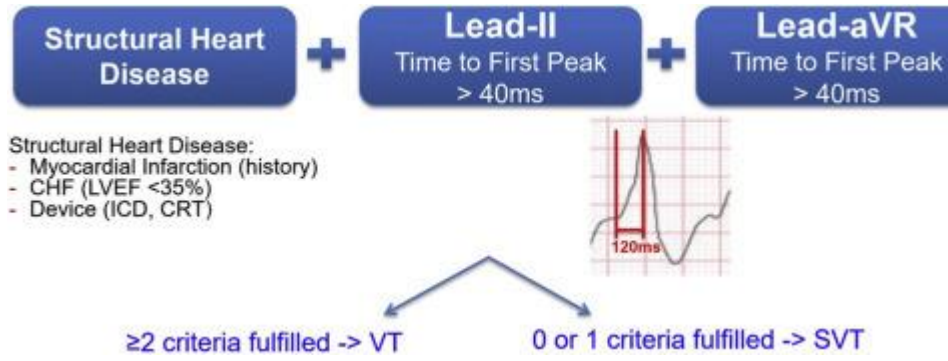
- 3 hallmarks for VT:
  - AV dissociation
  - Fusion complexes
  - Capture beats
- Several VT algorithms
  - Brugada
  - Basel
  - Varecki

**Structural Heart Disease**

Figure 1: Morphological Criteria for Discriminating Ventricular Tachycardia from Supraventricular Tachycardia with Aberration



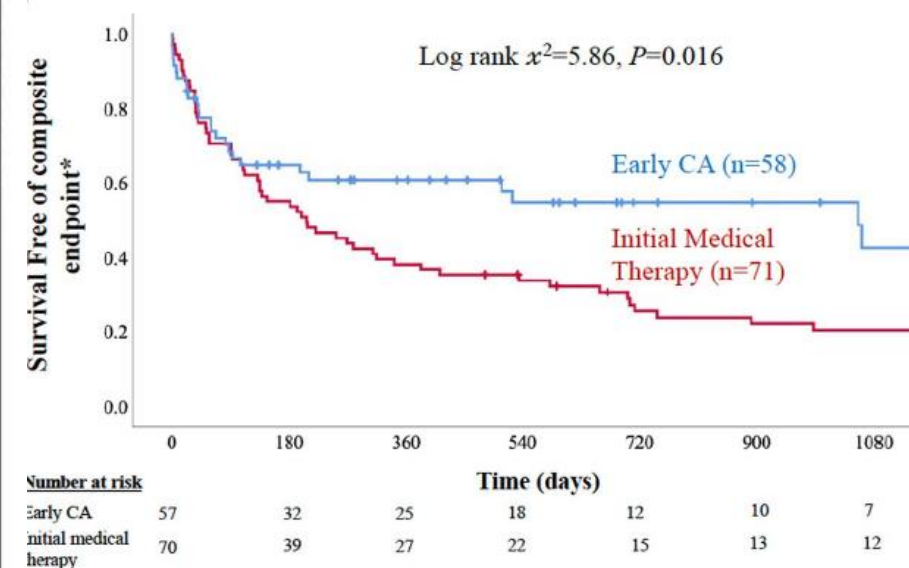
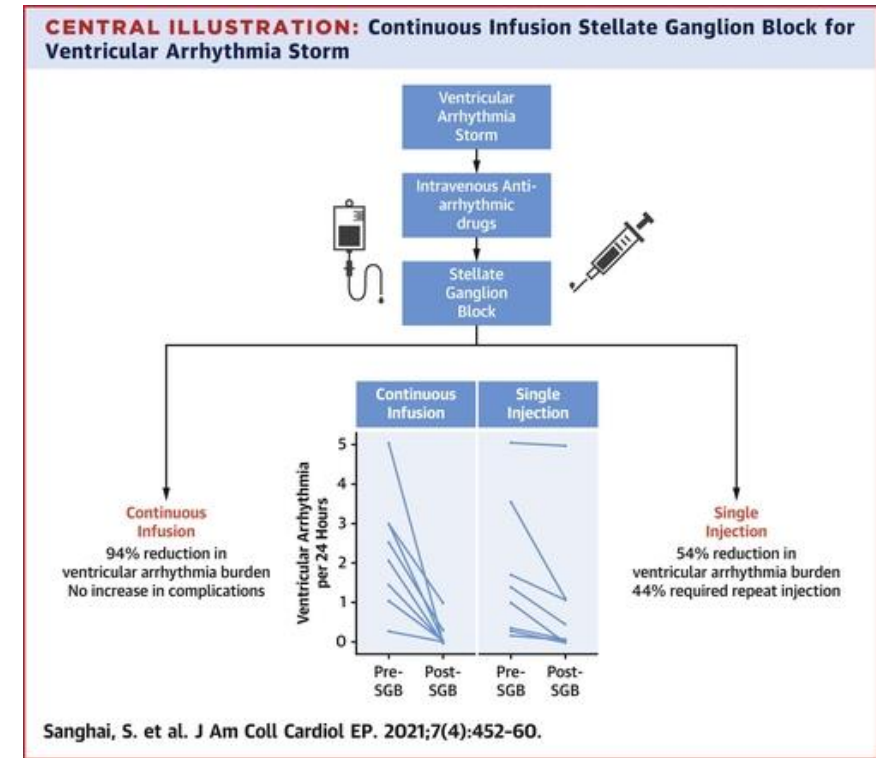
# Basel criteria



AV = atrioventricular; aVR = augmented vector right; LBBB = left bundle branch block; RBBB = right bundle branch block; SVT = supraventricular tachycardia; VT = ventricular tachycardia.

# Management of VT/electrical storm in 2024

- Shock
- Treat ischemia/underlying cause
- Amiodarone\*/Procainamide/Lidocaine
- Beta blockers- propranolol
- Stellate Ganglion Block
- General anesthesia
- Mechanical support
- ABLATION!



Is it  
real?

Slow

Fast

Atropine  
Isoproterenol  
Pacemaker  
Do Nothing

SVT

VT

Cardiovert  
Adenosine  
AV node blocker  
Anti arrhythmic Drugs  
Ablation  
Do Nothing

# THANK YOU

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