

# Cardiac Electrophysiology Review

A review of basic rhythms, treatment options, and cardiac rhythm devices

Kelly Garaffa, NP

1

## Objective

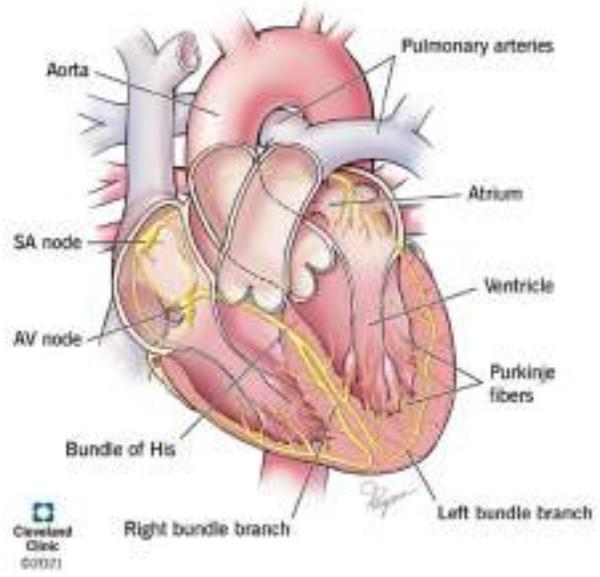
- Review of basic rhythms
- Discussion of treatment and interventions for rhythms
- Brief synopsis of cardiac devices and indications

3

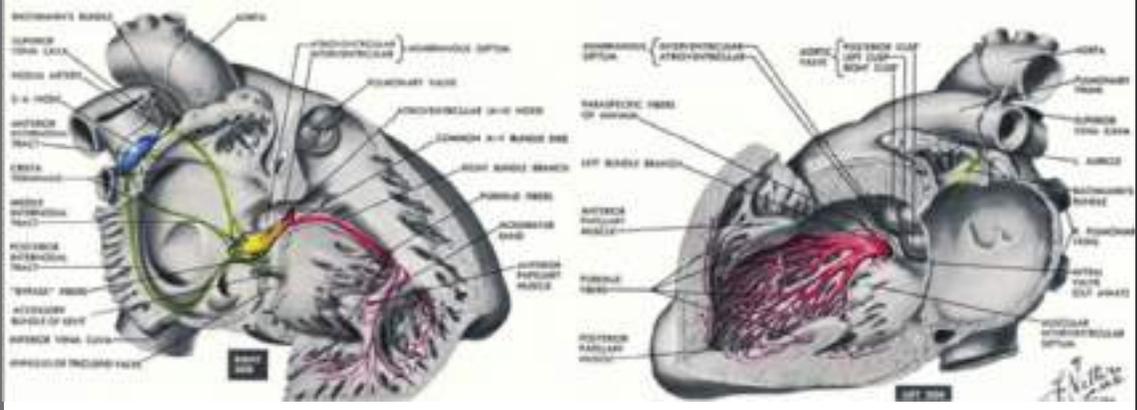
# Review of Conduction

- PR Interval: 120-200ms
- QRS: 80-120ms
- QT: less than 500 ms pending heart rate

• <https://my.clevelandclinic.org/health/body/21648-heart-conduction-system>



4



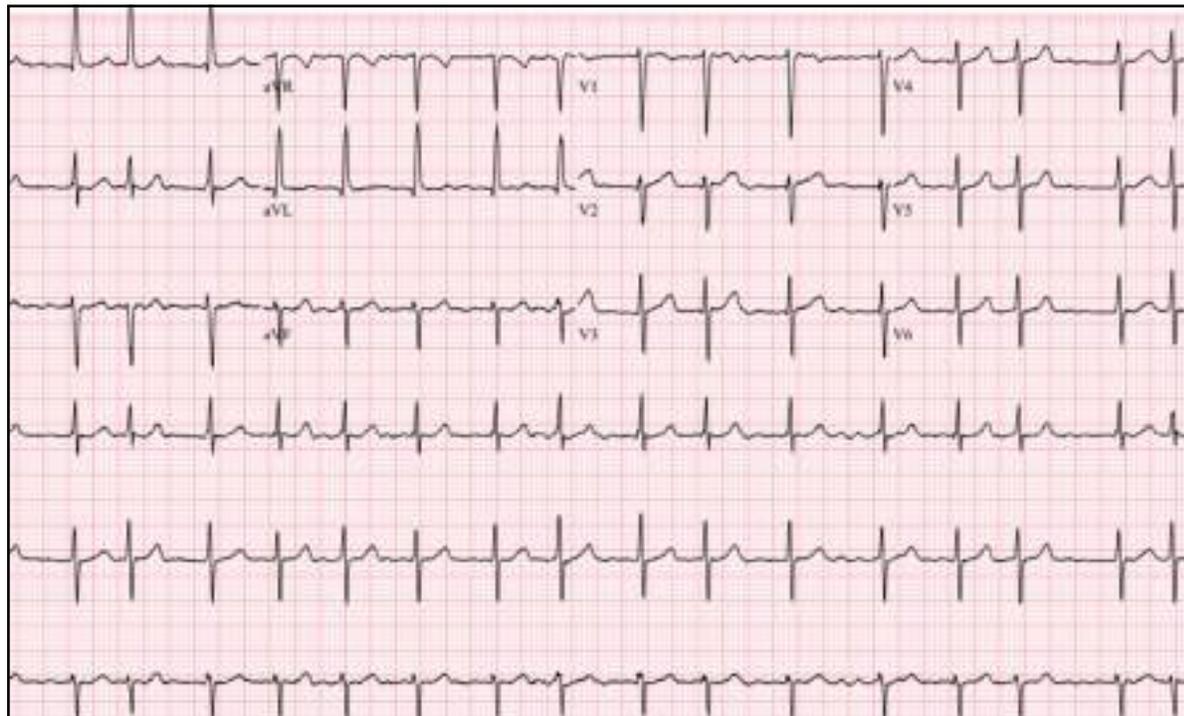
# Left and Right Bundle Anatomy

5

## Identifying Rhythms

1. What is the Rate? Are my measurements normal
2. What do the P waves look like?
3. Is there a P wave for every QRS?
4. Is the QRS in normal range?
5. What does my ST segment look like?

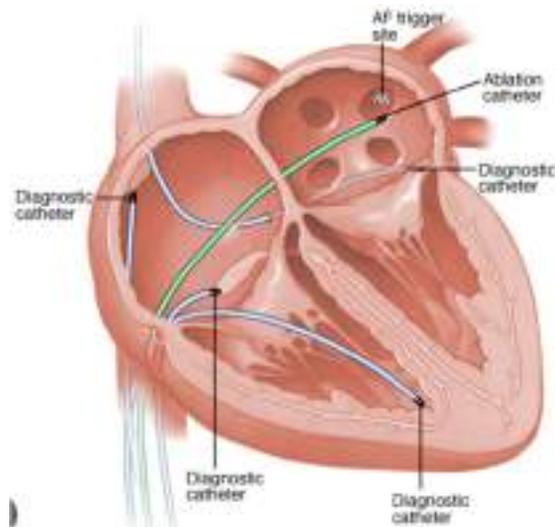
6



7

## Atrial Fibrillation

- Comes from left atrium
- Treatments include medication, cardioversion, ablation
  - Medications:
    - Sotalol
    - Flecainide
    - Dronedaron
    - Tikosyn
    - Propafenone
    - amiodarone
- When does EP come into play
  - Second occurrence of afib
  - Recurrence of afib on antiarrhythmic medication
  - Drop in EF associated with rapid heart rates
- No cure for afib

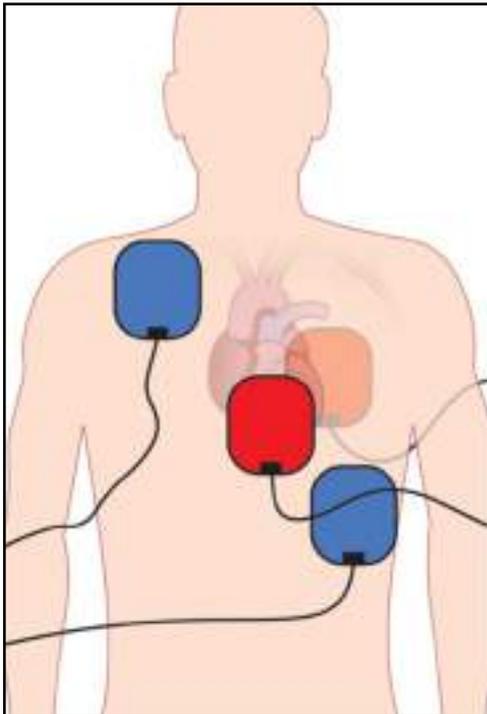


<https://www.mayoclinic.org/img-20096441>

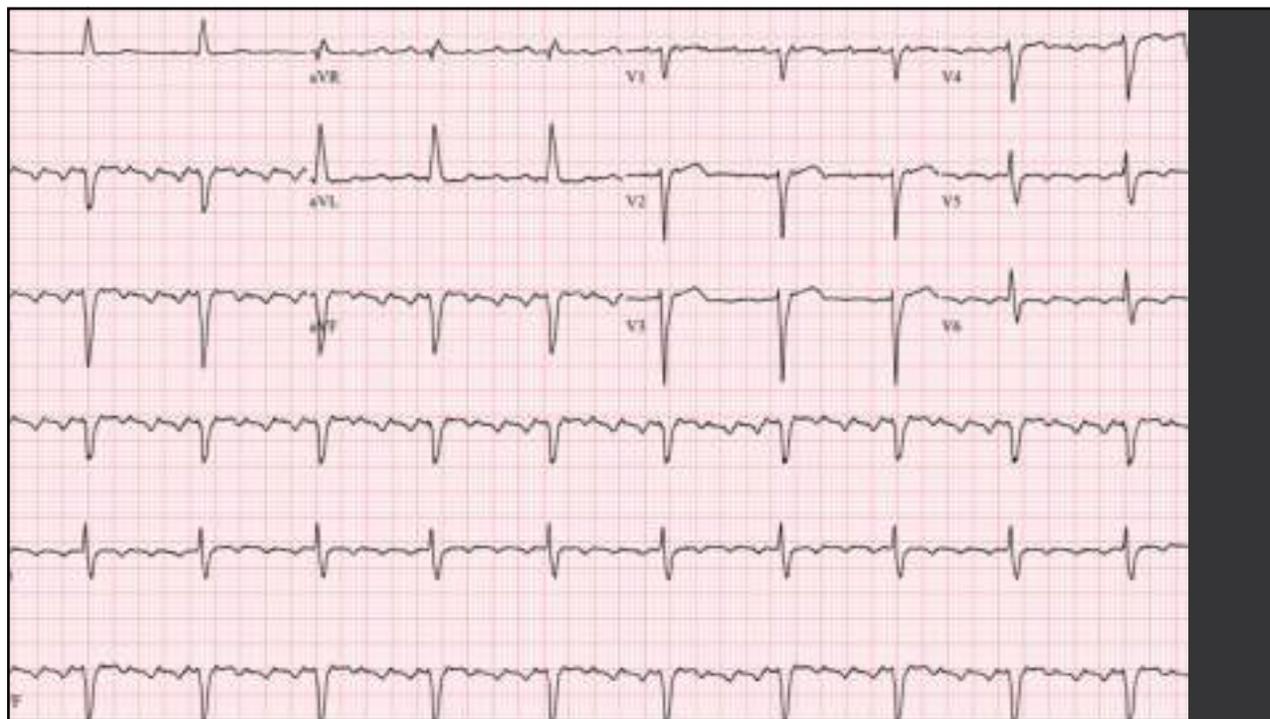
8

## Cardioversion PSA

- Patch placement in IMPORTANT
- Anterior-posterior placement preferred



9



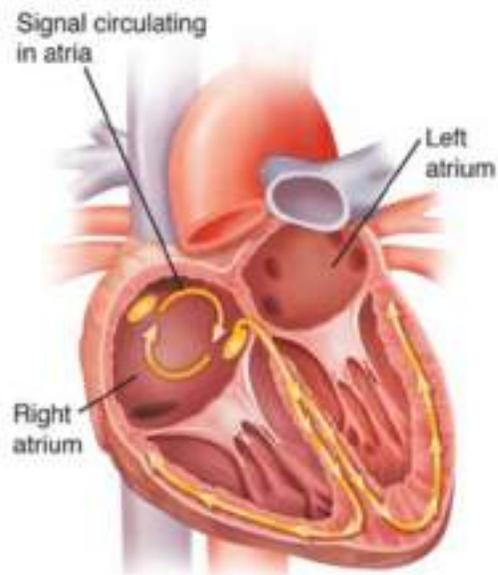
10



11

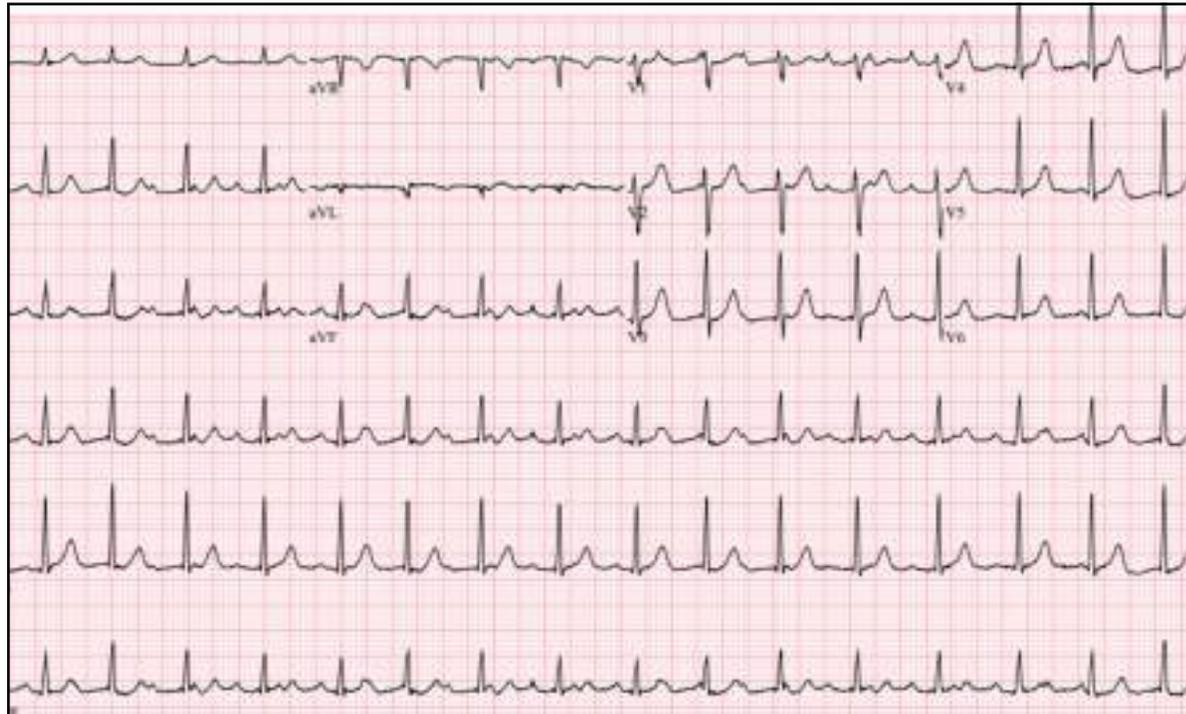
## Typical Atrial Flutter

- Comes from right atrium
- Preferred treatment is ablation
- Ablation considered curative
- Increased risk for developing atrial fibrillation later in life
- Prefer to keep patient in atrial flutter for ablation if tolerated



<https://hopeforhearts.com.au/arrhythmias/atrial-flutter/>

12



13

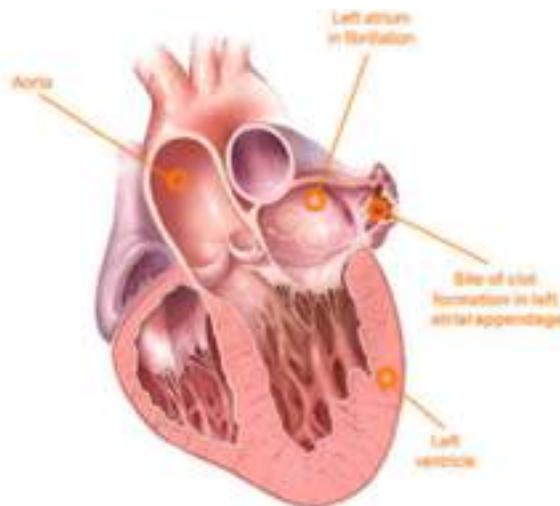
## Atypical Atrial Flutter

- Most commonly from left atrium, but can come from right
- Occurs in patient with scarring in atria
  - Cardiac surgery
  - Previous ablations
- Difficult to identify, always question mysterious rise in resting heart rate

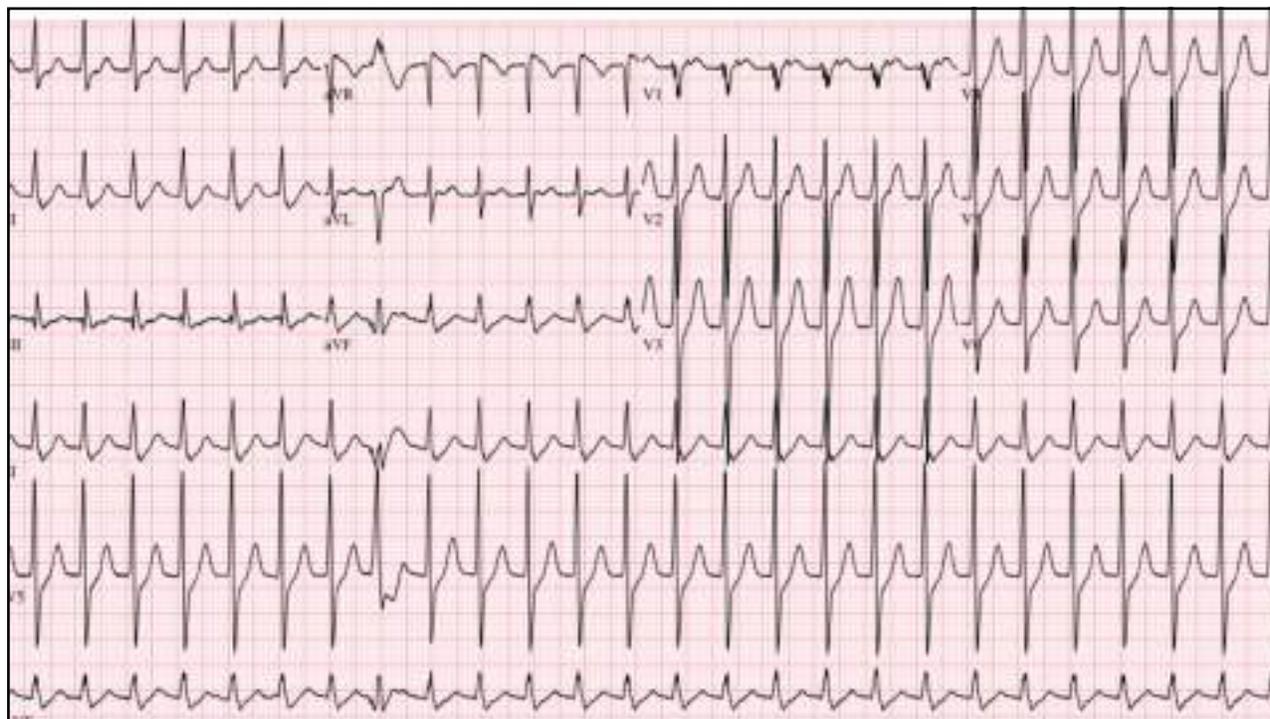
14

## Cardioversion PSA

- Patients need to be therapeutic in anticoagulation prior to cardioversion
- aPTT > 55 seconds or on oral anticoagulation
- When do we need TEE or cardiac CT?
  - If in atrial fib/flutter > 48h without anticoagulation
  - If more than 1 missed dose of oral anticoagulation over last 3 weeks
  - If one missed dose over last 7 days



15



16

## Supraventricular Tachycardia

- Electricity reentering atria through the ventricles

Regular qrs

Avnrt

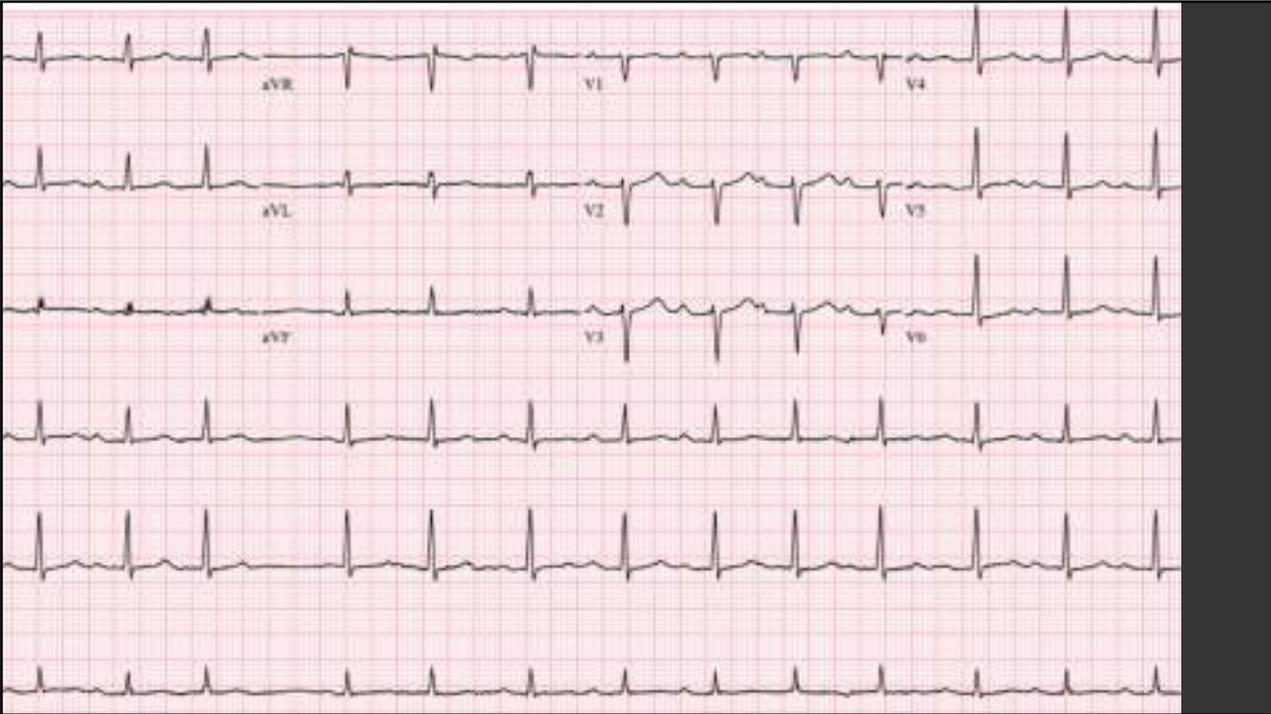
Avrt most common accessory pathway wpw

At

Vasovagal, adenosine, CCB verapamil, DCCV

Adenosine eliminates AVN

17



18

**1st Degree AV Block**

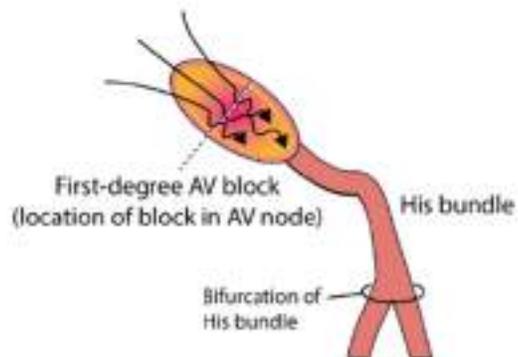
- Prolonged PR
- If chronic, can be a sign of risk for high grade AVB
- Can occur transiently after cardiac procedures

<https://ecgwaves.com/topic/atrioventricular-av-block-ecg-blocks/>

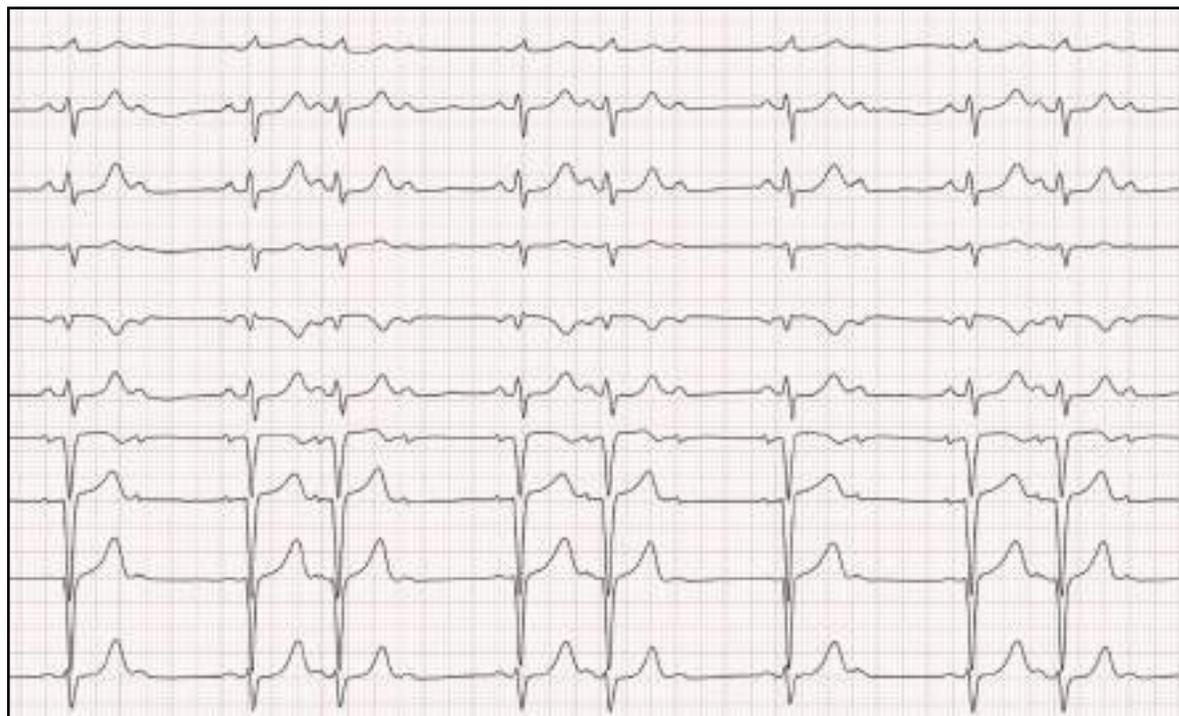
19

## 2nd Degree AV Block, Mobitz I

- Signal getting through AV node, with intermittent loss of signal
- Intermittent Mobitz I, pacemaker not indicated
- Continuous or high burden Mobitz I, or symptomatic with episode, patient needs pacemaker



20

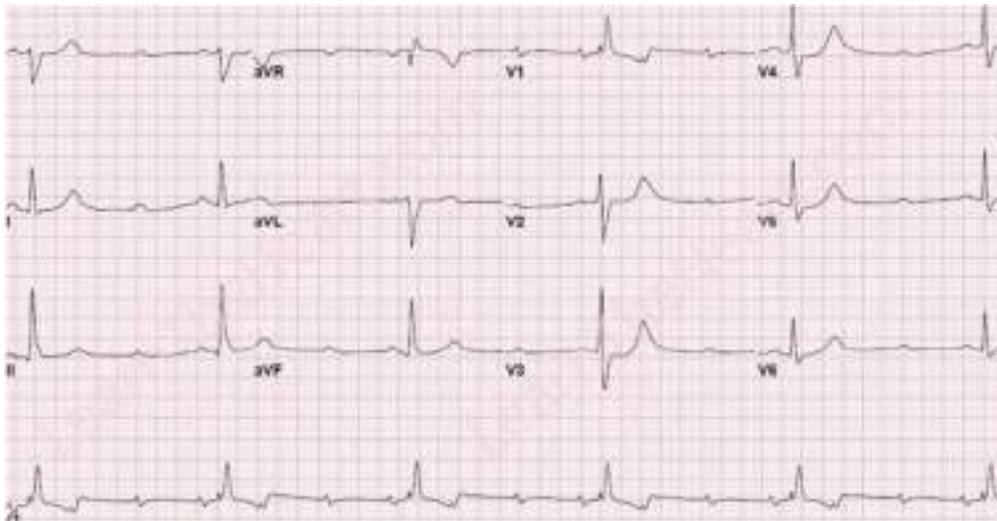


21

## 2nd Degree AV Block, Mobitz II

- No delay occurring, but intermittently blocking signal = much higher risk for complete heart block
- Pacemaker indicated if:
  - Occurring during waking hours
  - Occurring at night with no evidence of OSA

22

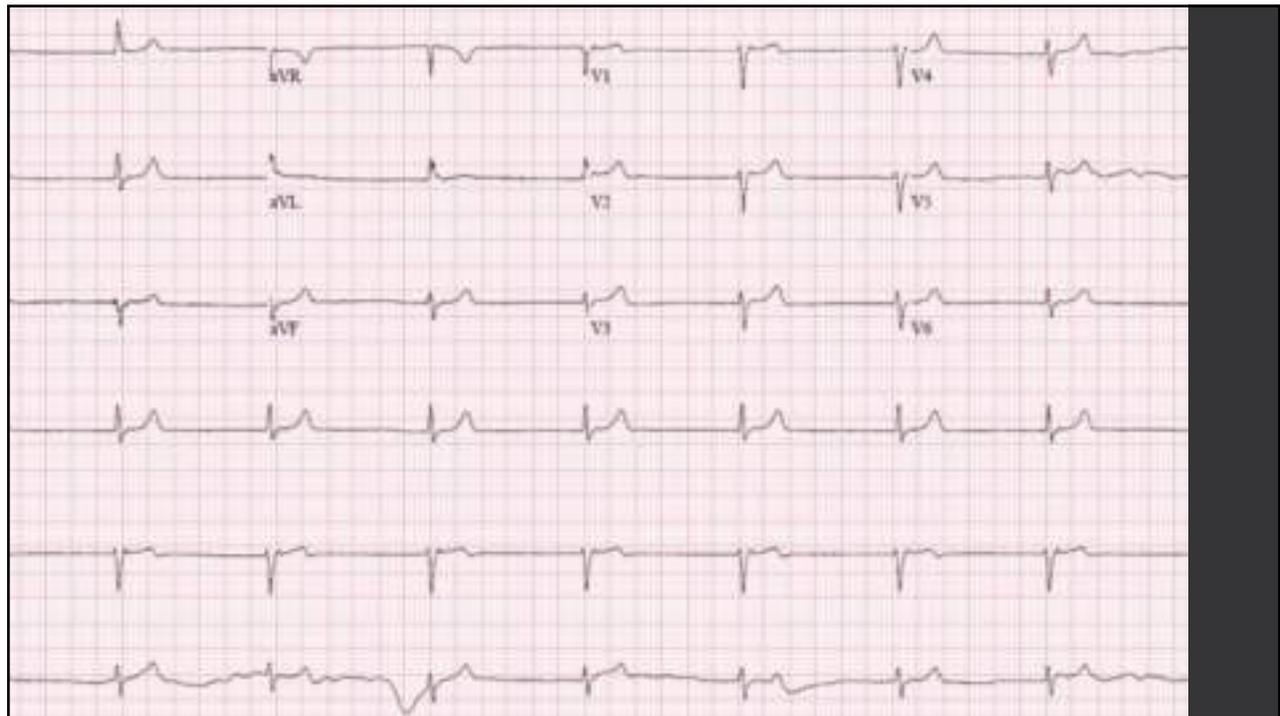


23

## 3rd Degree AV Block

- No communication between atria and ventricles
- Emergent pacing needed if:
  - Hypotensive
  - Any history of syncope
- Permanent pacemaker required
- Caveat: Lymes disease

24



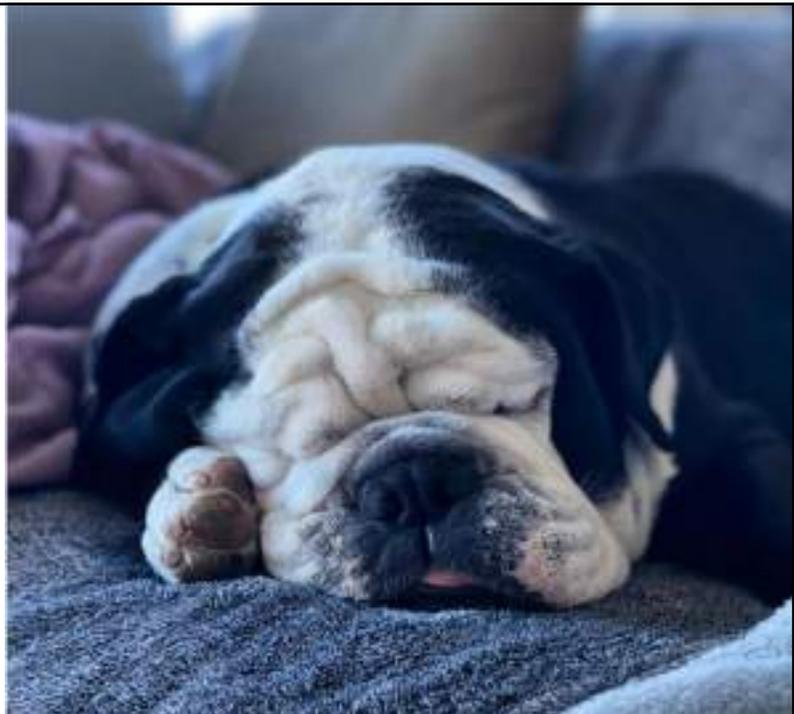
25

## Junctional Bradycardia

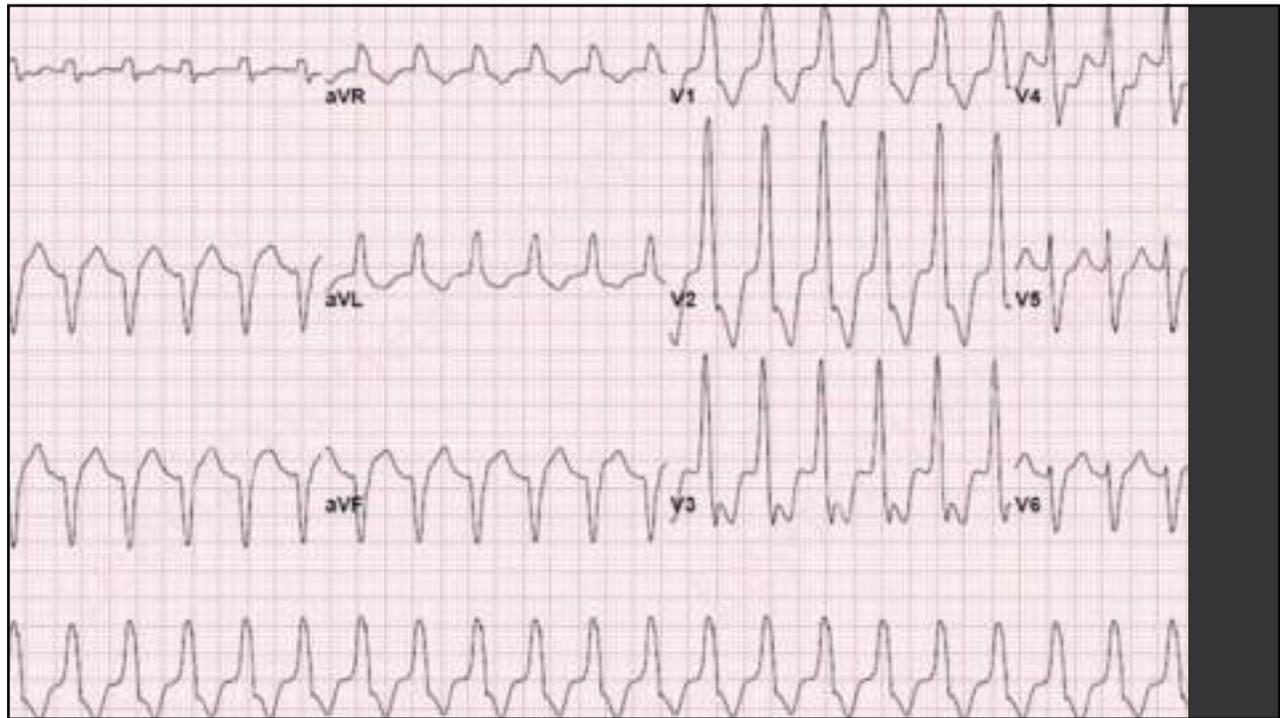
- Signal from sinus node to AV node is interrupted
- Post surgical, watchful waiting

26

Hang in there...  
we're almost  
done



27



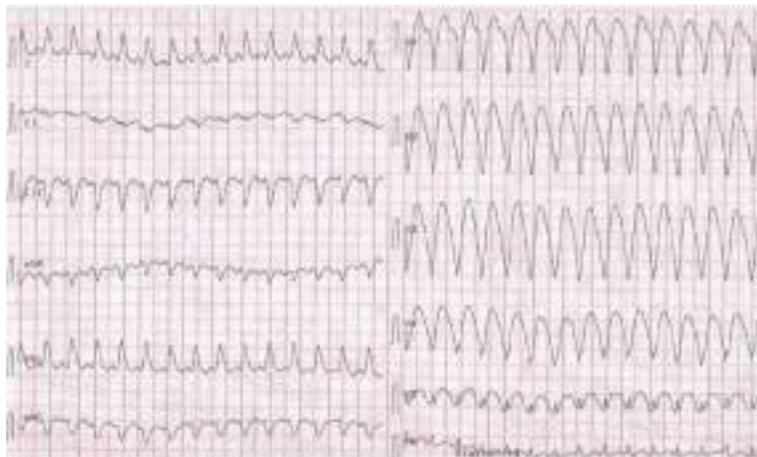
28

## Ventricular Tachycardia

- Comes from multitude of issues.
- Need to differentiate if source is acute versus chronic
- When to ablate?
  - Monomorphic versus multiple foci
  - Ischemic versus non-ischemic
- Medication suppression
  - Metoprolol
  - Amiodarone
  - Mexilitine

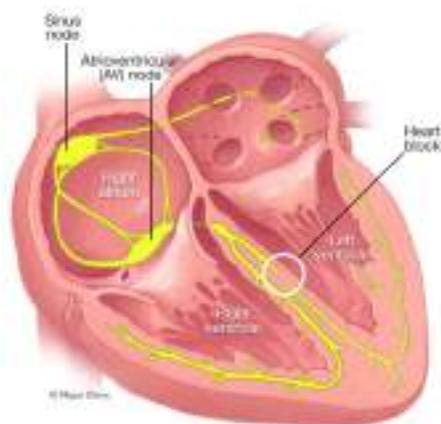
29

## SVT with Aberrancy versus VT



30

## Bundle Branch Block

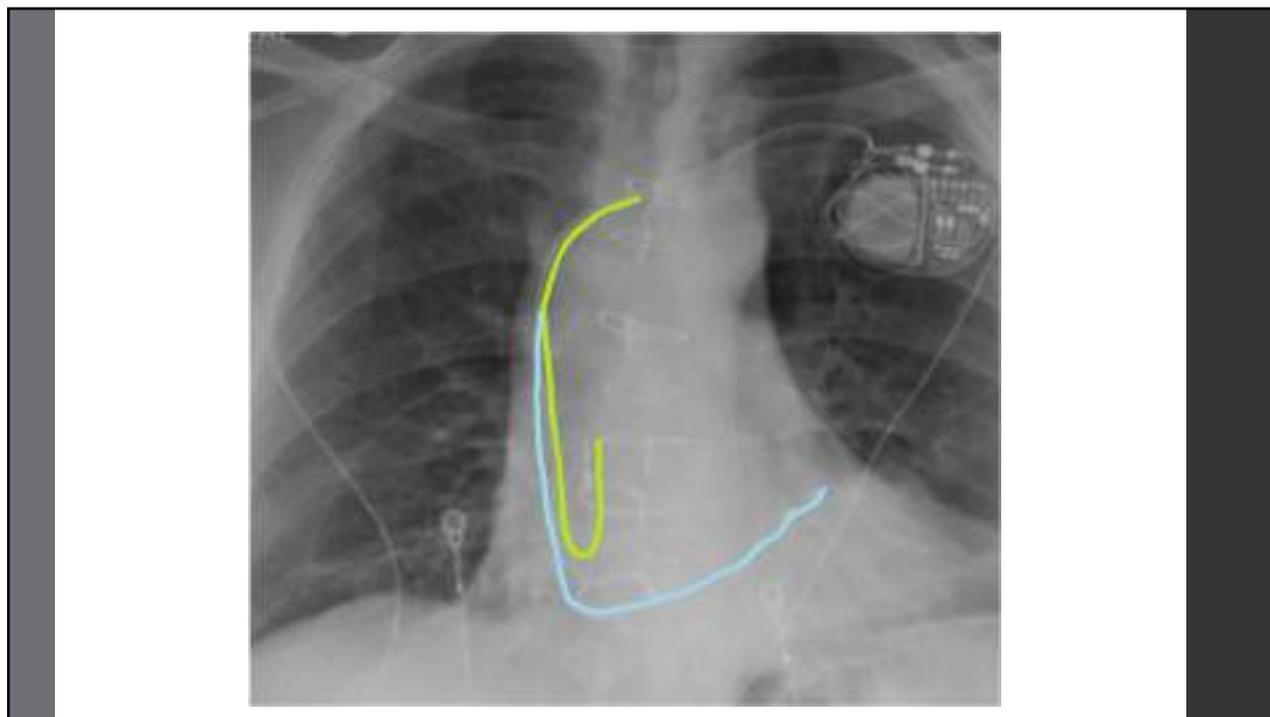


- Any QRS greater than 120 ms
- New bundle branch block warrants investigation
- To identify, look at V1
- Right bundle = thumbs up
- Left bundle = thumbs down



31



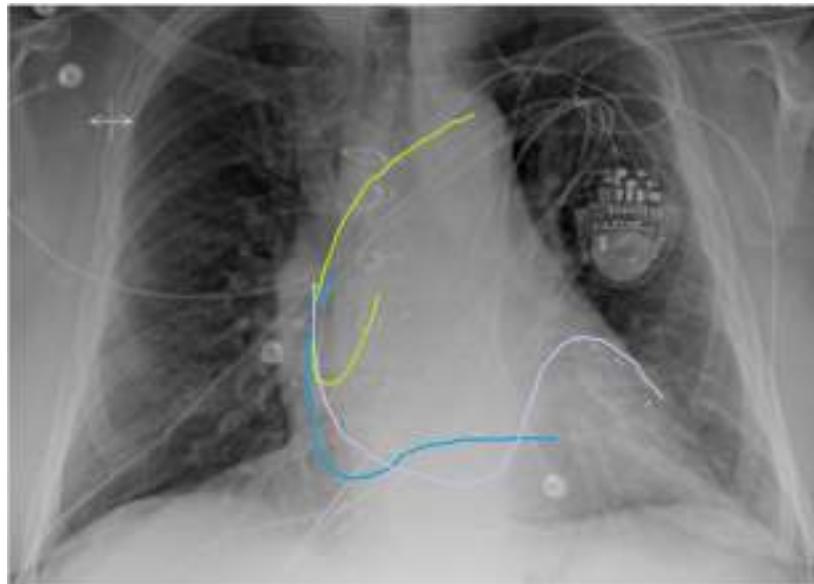


34

## Biventricular pacemaker

- Right atrial lead, right ventricular lead, left ventricular lead
- For patient with bundle branch block and an EF < 35% on appropriate medical therapy > 3 month
- Can be used in patient with high RV pacing burden and decrease in EF
- LV lead placement challenging and higher risk

35



36

## Micra

- Leadless pacemaker
- Ideal for:
  - Patients who need rare pacing
  - Challenging vascular access
  - Patients with history of systemic infections

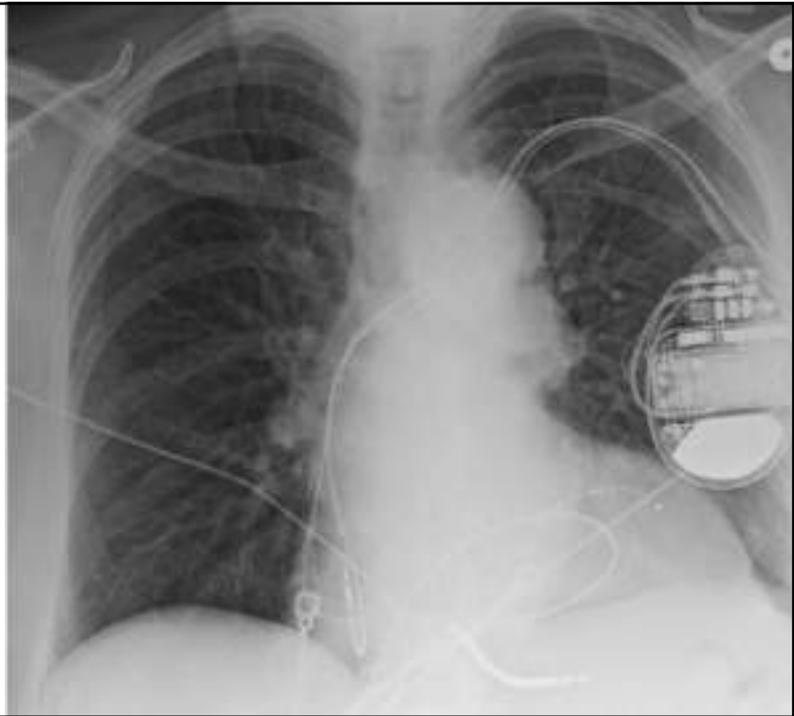


<https://www.acc.org/Latest-in-Cardiology/Articles/2021/04/01/01/42/Focus-on-EP-Leadless-Technology-A-Paradigm-Shift-in-Cardiac-Implantable-Electronic-Devices>

37

## When to place ICD?

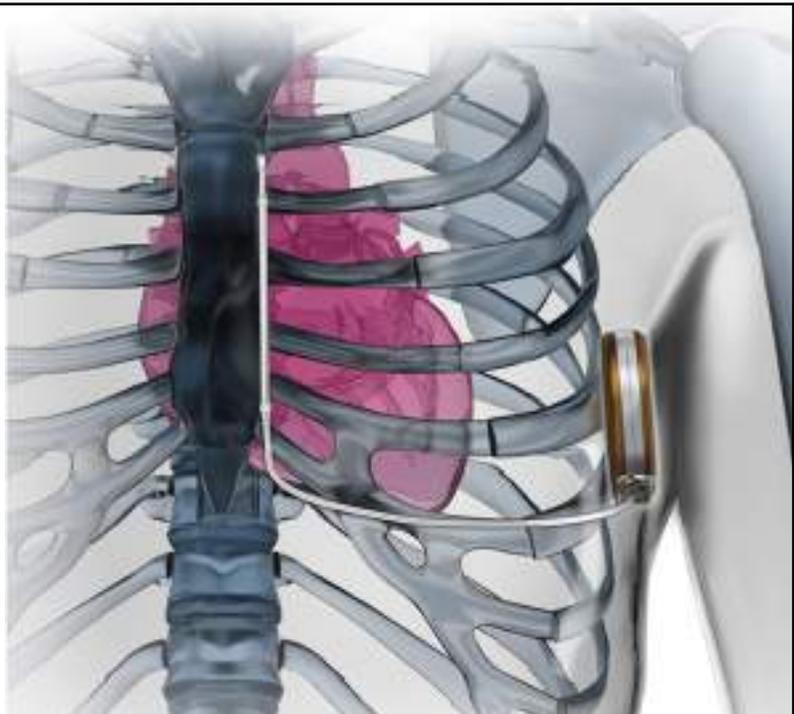
- Indications
  - EF < 35% and on heart failure medications for > 3 months
  - More than 1 year life expectancy
  - History of high-risk cardiac disease
  - History of cardiac arrest or sustained VT/VF
- Can be single, dual, or biventricular system
- ICD lead is larger than typical pacing leads



38

## Subcutaneous ICD

- Option for younger patient requiring an ICD
- Benefit: avoid vascular access as long as possible
- Disadvantage: cannot pace, more post procedural pain



<https://www.bostonscientific.com/en-IN/products/defibrillators/s-icd.html>

39



## LifeVest

- Option for bridging patients awaiting ICD placement
- Very similar criteria to ICD placement

<https://www.usatoday.com/story/money/business/2014/11/22/defibrillator-vest-proves-a-lifesaver-for-ailing-man/19420695/>

40



## Wrap up

- Any rhythm you're unsure of, save a cardiac strip
- Please reach out with any questions or if you want copies of slides
  - [kelly.garaffa@allina.com](mailto:kelly.garaffa@allina.com)
  - I'm terrible with email...please stop me when you see me!

41