Basic ECG interpretation

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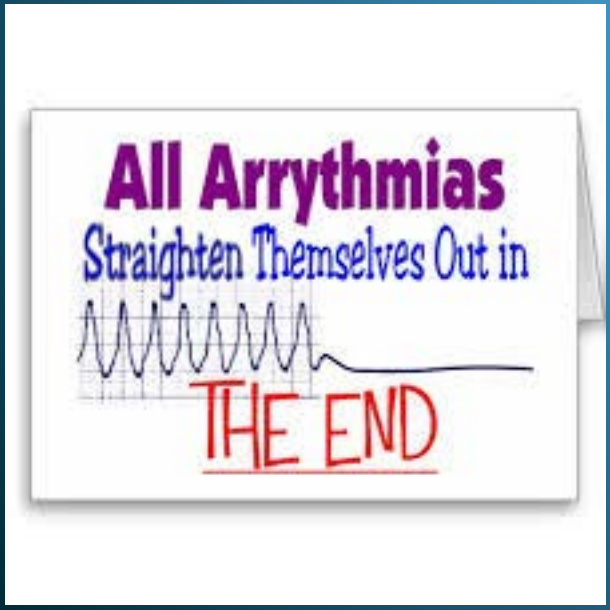


Disclosures

- No Disclosures

Learning Objectives

- Be able to interpret a basic ECG
- Be able to recognize a STEMI
- Be able to recognize T wave changes
- Be able to interpret the PR interval
- Be able to recognize different ECG rhythms

What is an ECG

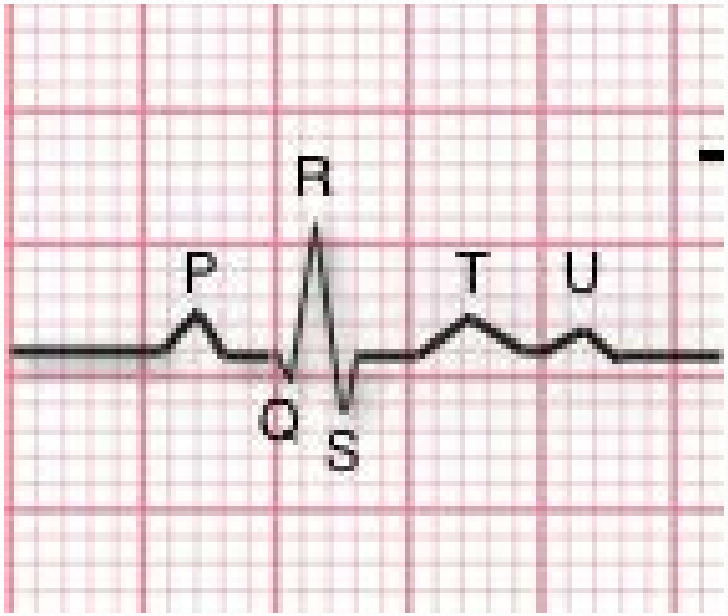
- An electrocardiogram or ECG, records electrical activity in the heart. An ECG machine records these electrical signals across multiple heart beats and produces an ECG strip

What are normal adult heart rates

- **Normal =** 60 – 100 bpm
- **Tachycardia >** 100 bpm
- **Bradycardia <** 60 bpm

What are the components

- It is waveform components that consist of the electrical events during one heartbeat
- The waveforms are labeled as P, Q, R, S, T and U.



P wave

- P wave is the first short upward movement of the ECG tracing. It indicates that the atria are contracting, pumping blood into the ventricles.
- Amplitude: 2-3 mm high
  The P-wave should be 2–3 small squares in duration
  Duration: 0.06 - 0.12 sec

QRS complex

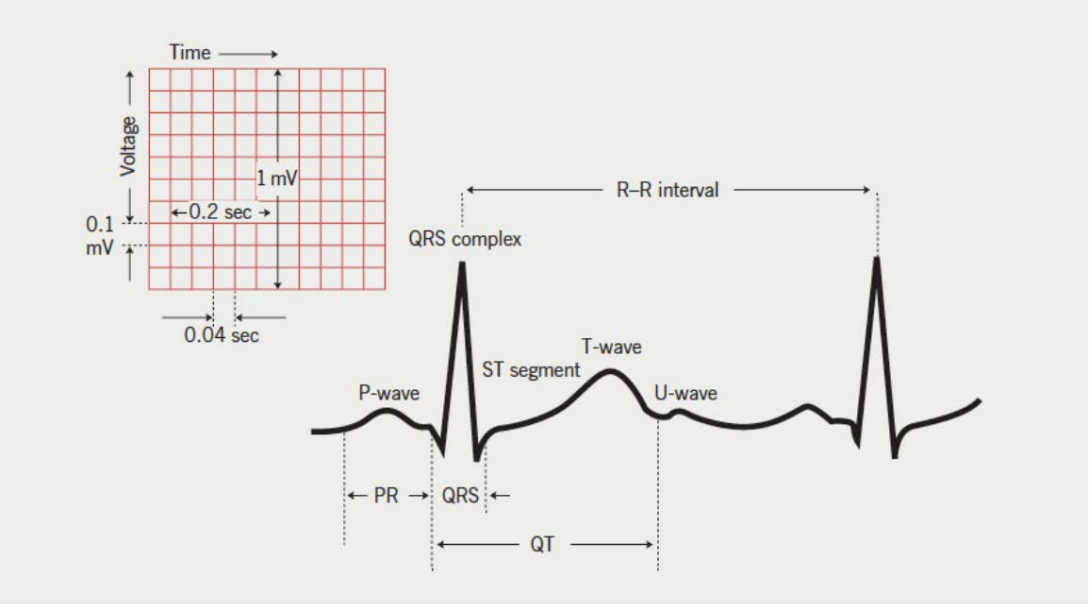
- The QRS complex, normally beginning with a downward deflection, Q; a larger upwards deflection, a peak (R); and then a downwards S wave. The QRS complex represents ventricular depolarization and contraction.
- Amplitude: 5-30 mm high
  The QRS complex should be 1.5–2.5 small squares in duration
  Duration: 0.06 - 0.10 sec

PR interval

- The PR interval indicates the transit time for the electrical signal to travel from the sinus node to the ventricles.
- Duration: 0.012 - 0.20 sec
- The PR interval should be 3–5 squares in duration

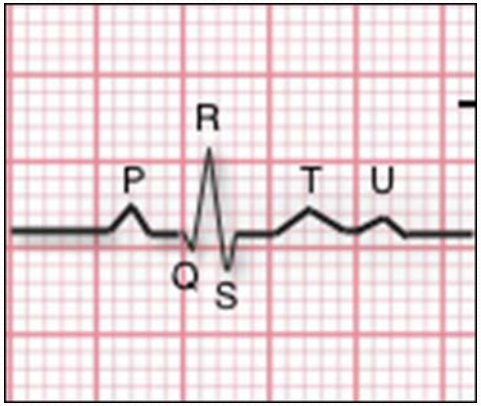
QT interval

- The QT interval should be 9–11 small squares



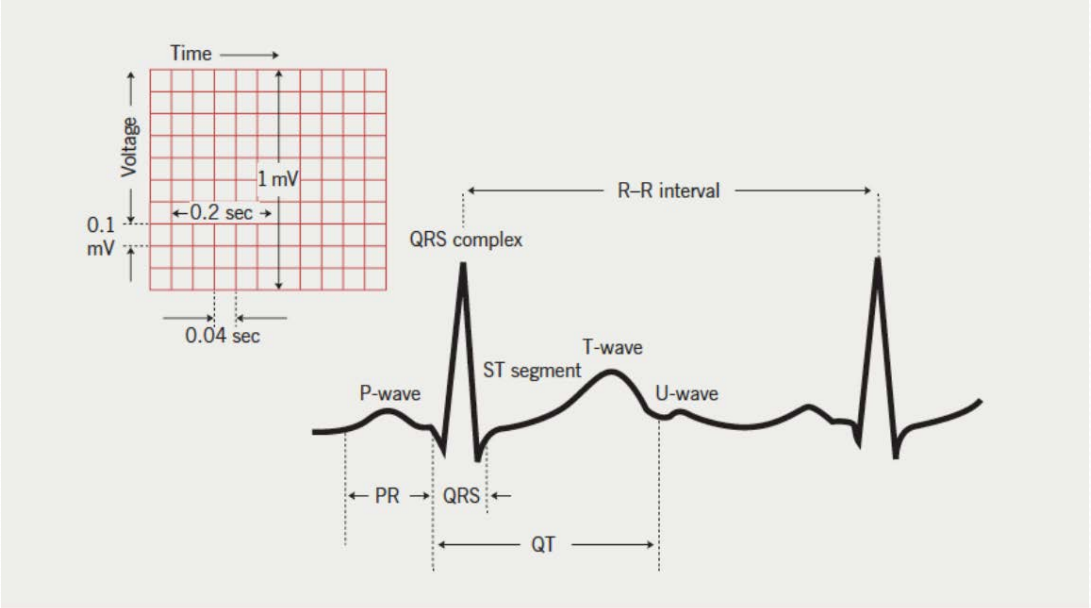
T wave

- T wave is normally a modest upwards waveform representing ventricular repolarization
- Amplitude: 0.5 mm in limb leads
  Duration: 0.1 - 0.25 sec



Know your measurements!

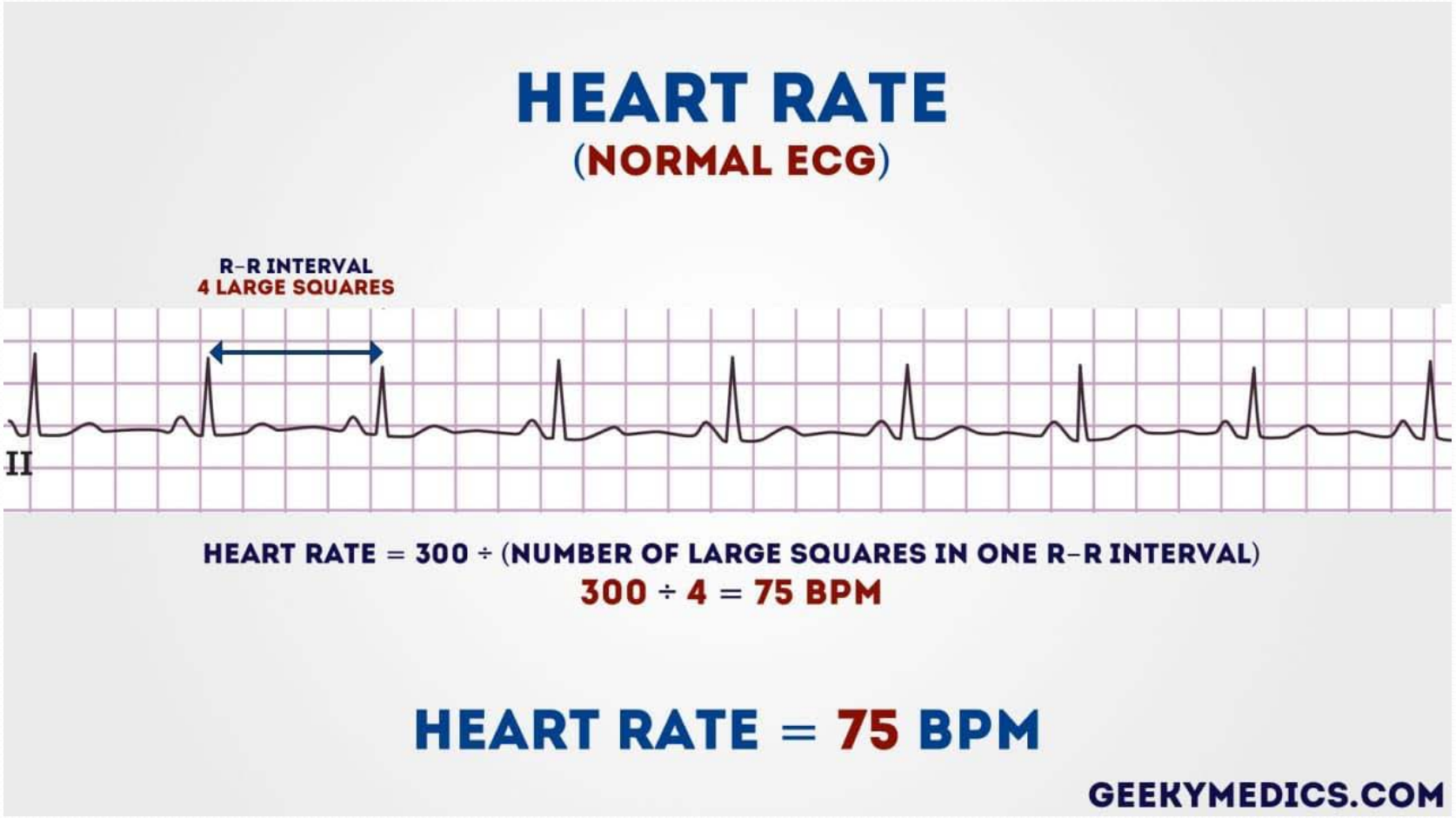
- Assuming standard paper speed of 25 mm/s, then one small square = 0.04 s



Rate Estimation

- To calculate the rate of a regular ECG, simply divide 300 by the number of large squares between two complexes.
- For irregular rhythms, count the number of complexes between 30 large squares and multiply by 10 (30 large squares = 6 seconds, assuming standard paper speed of 25 mm/s).

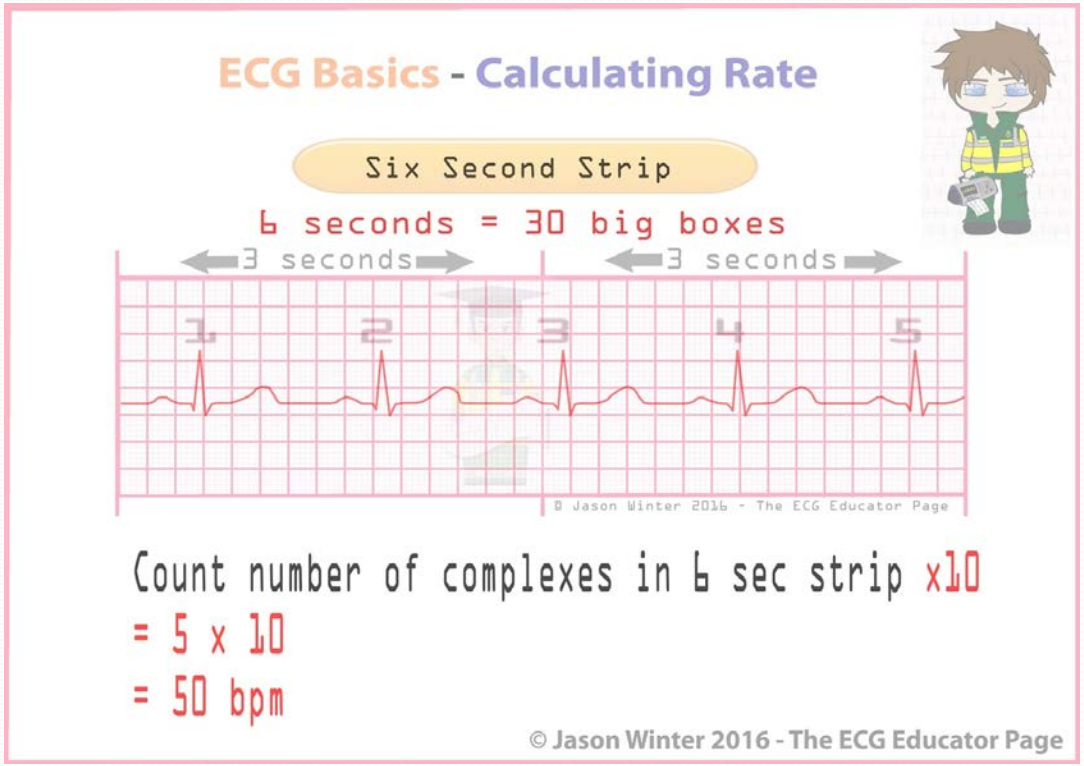
Rate estimation cont. rule of 300



What if the rhythm is irregular?

- The first method of calculating the heart rate doesn't work when the R-R interval differs significantly throughout the ECG and therefore another method is required
  - Count the number of complexes on the rhythm strip *(each rhythm strip is 10 seconds long)*
  - Multiply the number of complexes by 6 *(giving you the average number of complexes in 1 minute)*

e.g. 10 complexes on a rhythm strip X 6 = 60 beats per minute

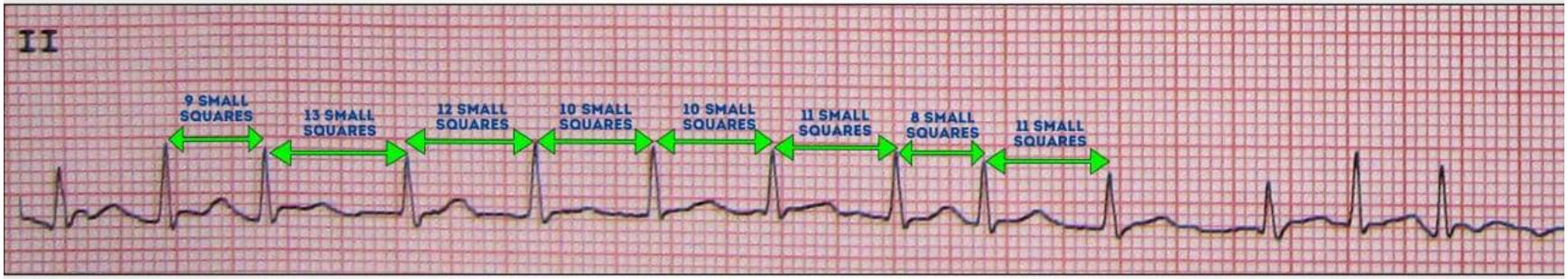


Irregular rhythms

- Mark out the RR patterns on a piece of paper to see if intervals are the same
- Regularly irregular
  - In a reoccurring irregular pattern
- Irregularly irregular
  - completely disorganized

A-Fib

HEART RHYTHM

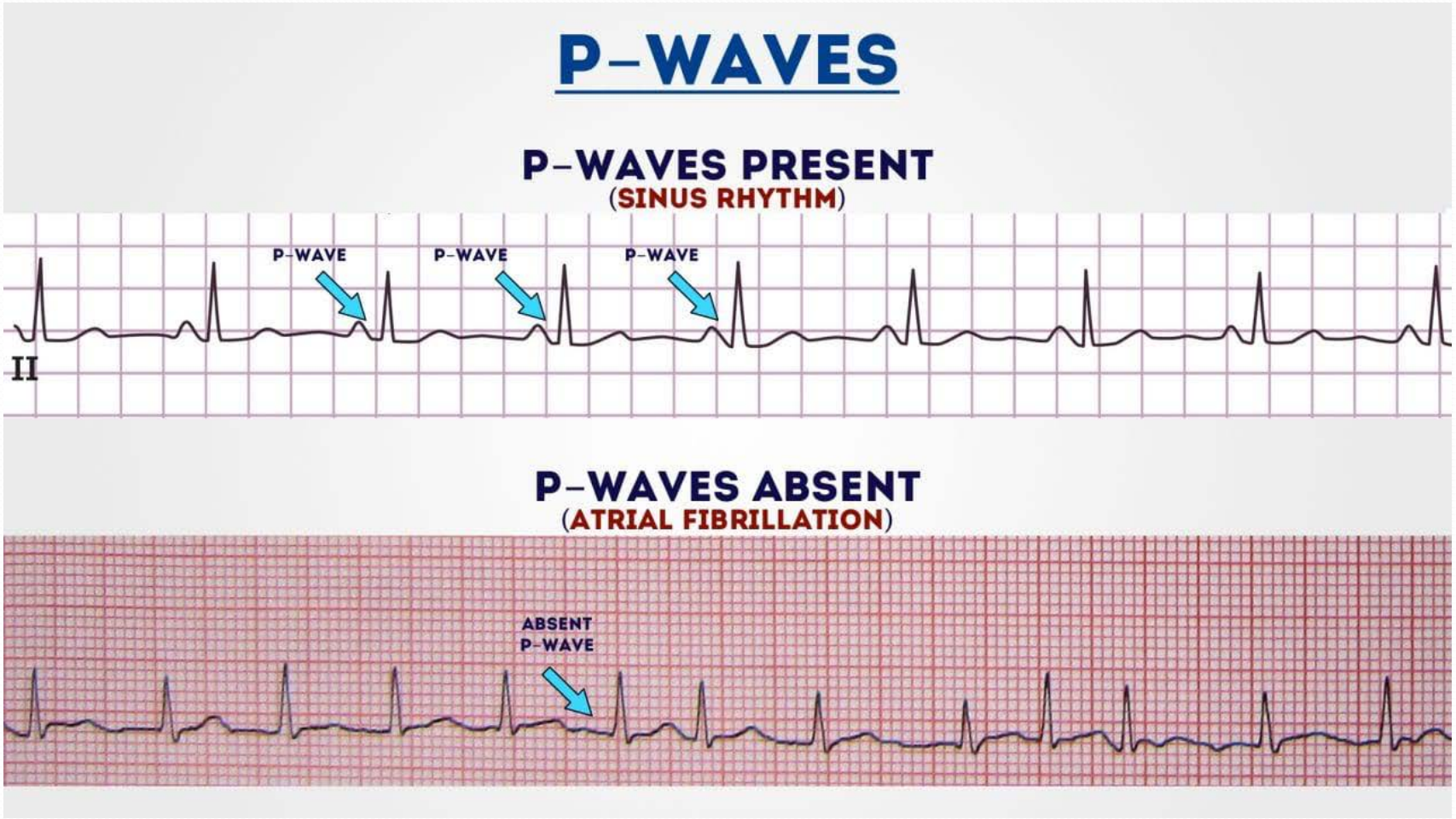


IRREGULARLY IRREGULAR (ATRIAL FIBRILLATION)

P waves where did they go?

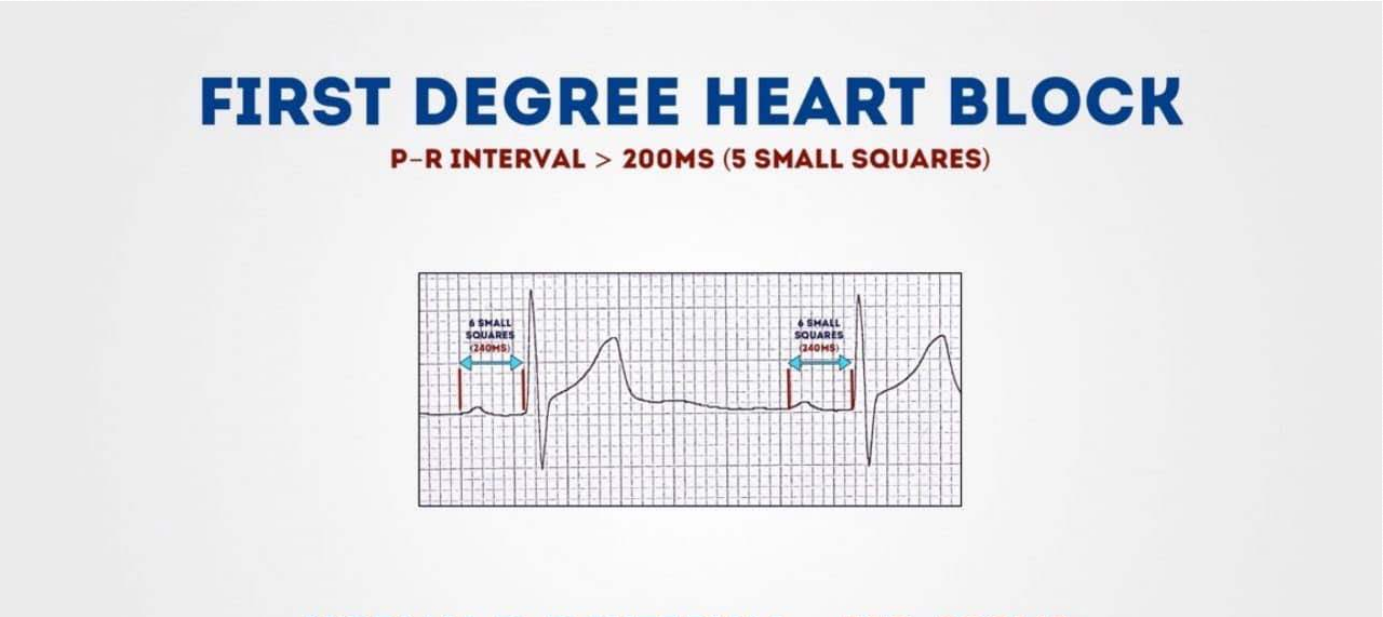
- P waves are absent in atrial fibrillation compared to a sinus rhythm
- If P waves are absent and it is an irregular rhythm it may suggest A-Fib
- Is there a QRS after the P wave

P waves cont.


P-WAVES
P-WAVES PRESENT
(SINUS RHYTHM)
P-WAVE
P-WAVE
P-WAVE
II
P-WAVES ABSENT
(ATRIAL FIBRILLATION)
ABSENT
P-WAVE

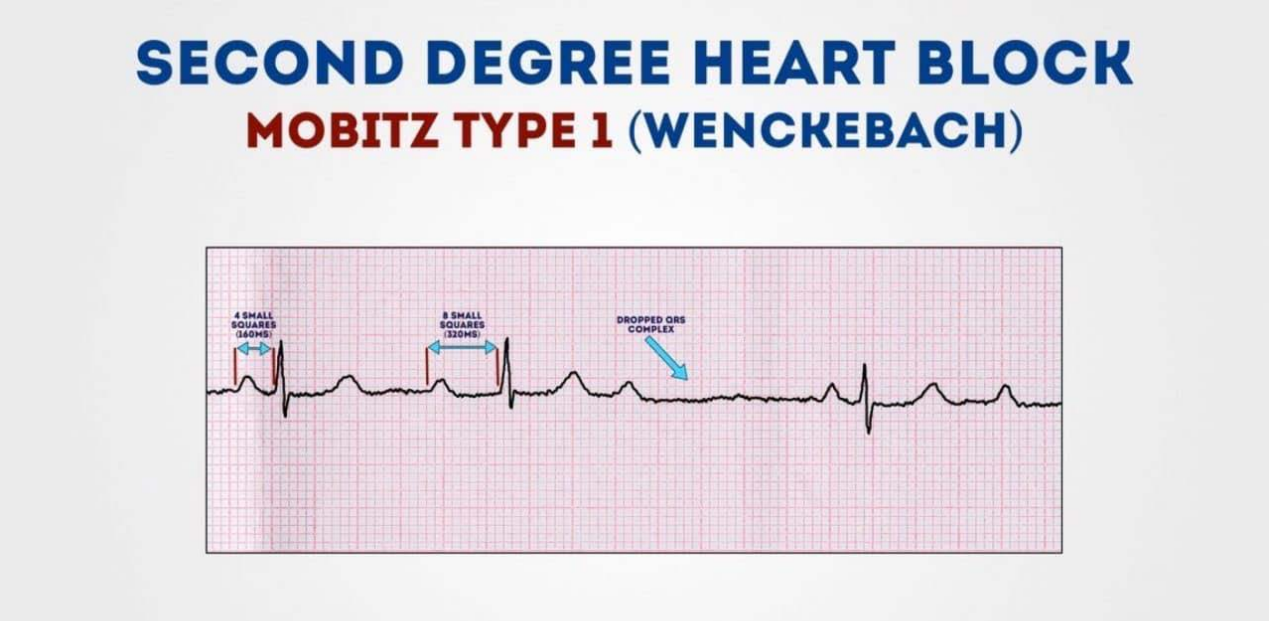
Prolonged PR interval

- A prolonged PR interval suggests there is an atrioventricular delay (AV block)
- First Degree Heart Block
  - Involves a fixed prolonged interval >200ms



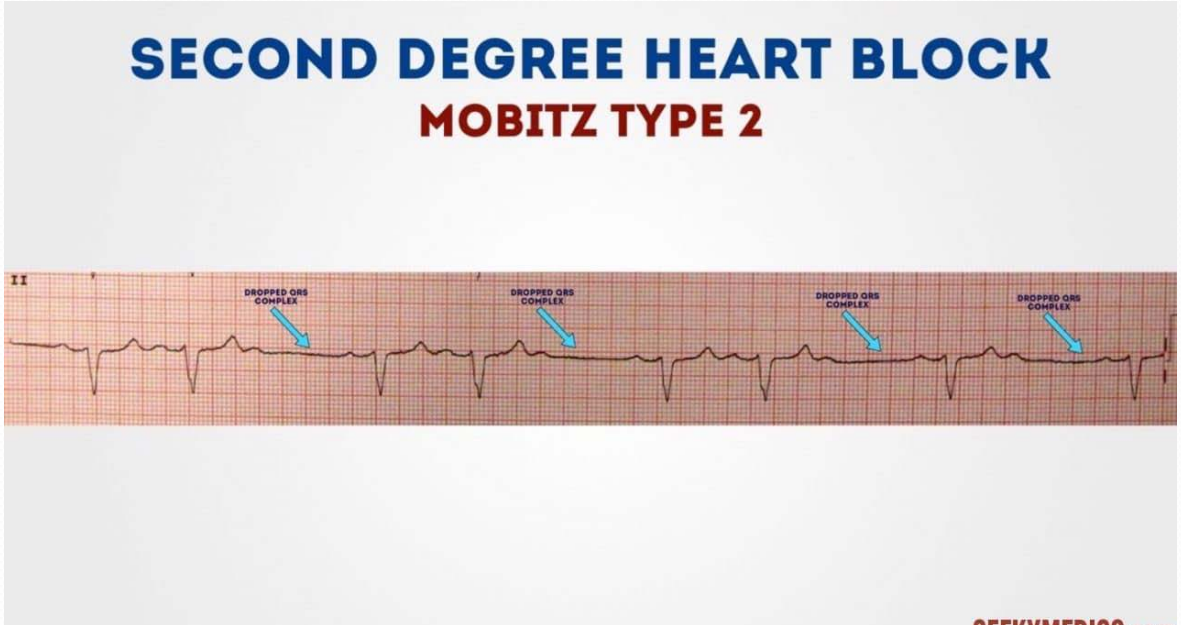
Second Degree Heart block

- Mobitz type 1
  - Wenkebach
- If the PR interval slowly increases then there is a dropped QRS complex



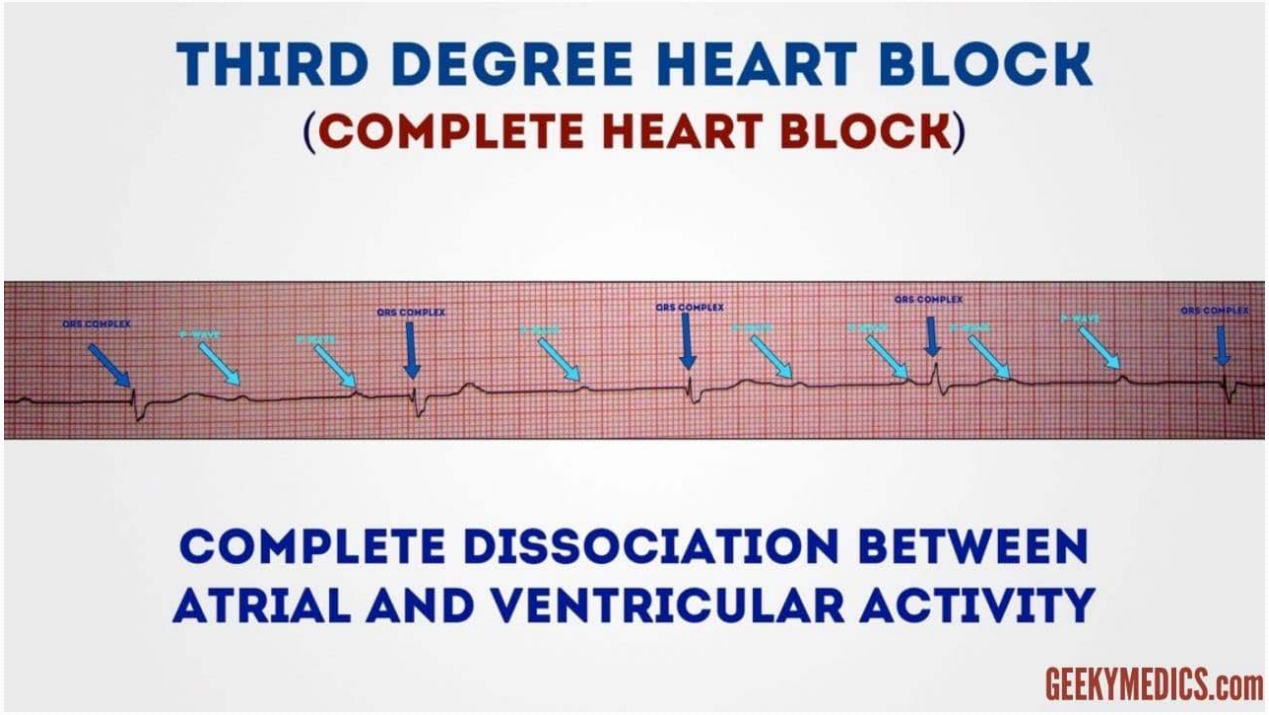
Second Degree Heart block cont.

- Mobitz type 2
  - If the PR interval is fixed but there are dropped beats
- Clarify by the number of dropped beats (2:1, 3:1, 4:1)



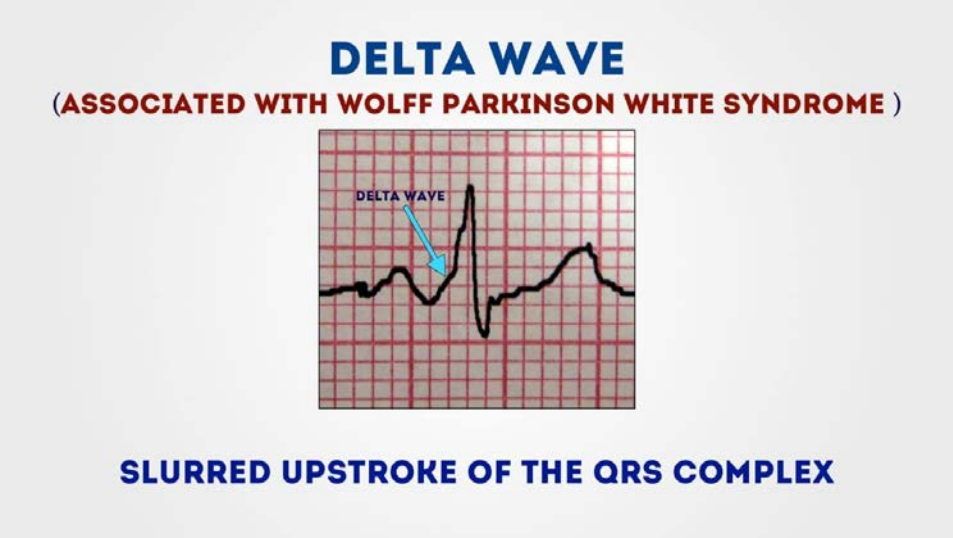
Third degree Heart Block

- Complete Heart Block
- Think baby shark from the fin like look
- The P waves and the QRS complex are completely unrelated



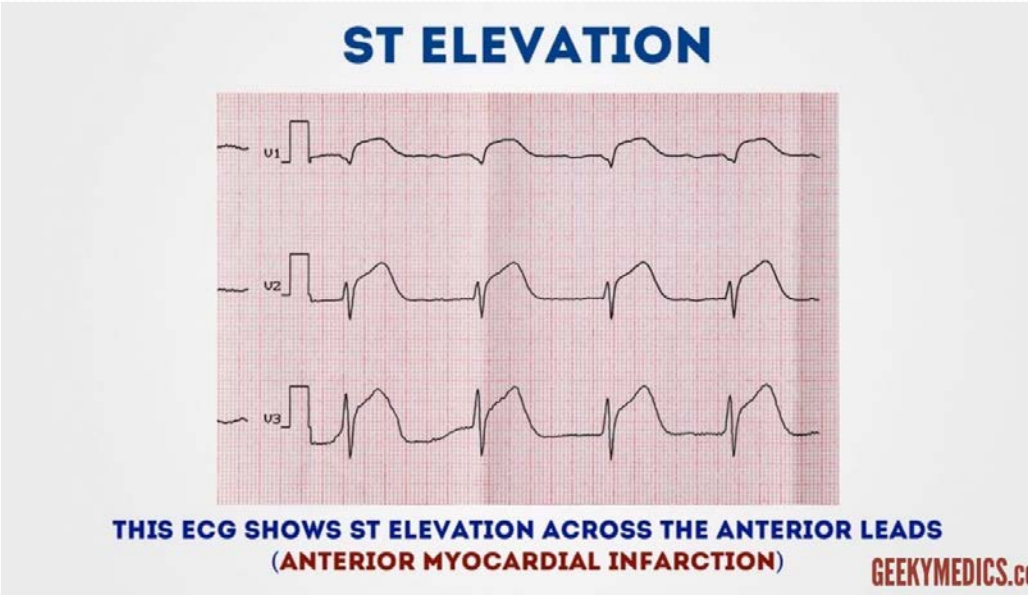
The shortened PR interval

- Wolf Parkinson White Syndrome (WPW)
- The atrial impulse is getting to the ventricle by a faster shortcut instead of conducting slowly across the atrial wall. This is an accessory pathway which can be associated with a delta wave.



ST elevation

- Is significant when it is greater than 1 mm (1 small square) in 2 or more contiguous limb leads or greater than 2 mm in 2 or more leads
- It is usually caused by complete full thickness myocardial infarction

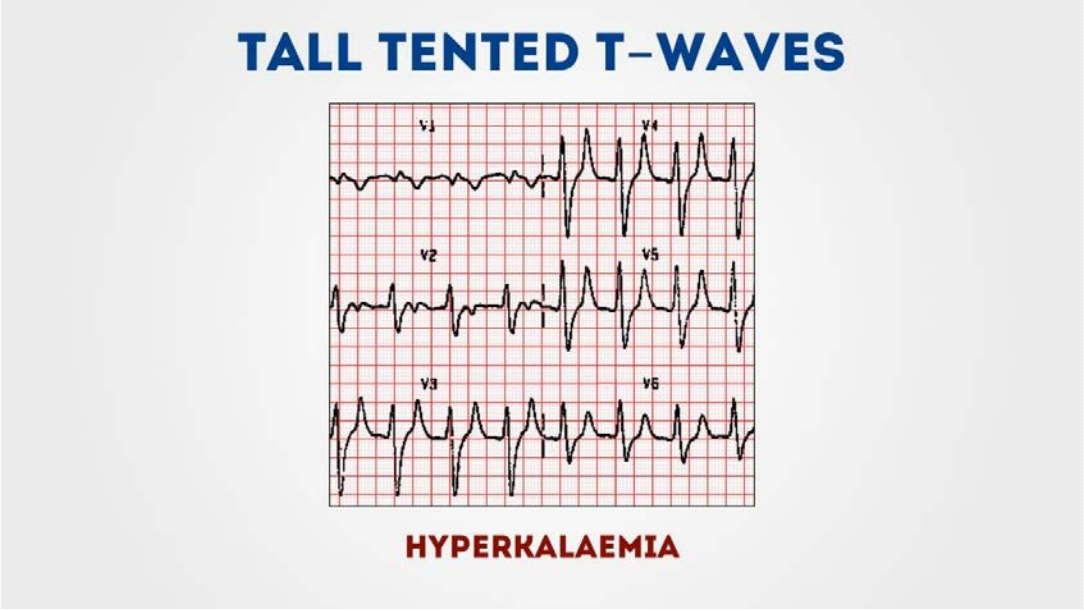


ST depression

- ST depression > or equal to 0.5 mm in greater than or equal to 2 contiguous leads, it indicates myocardial ischemia

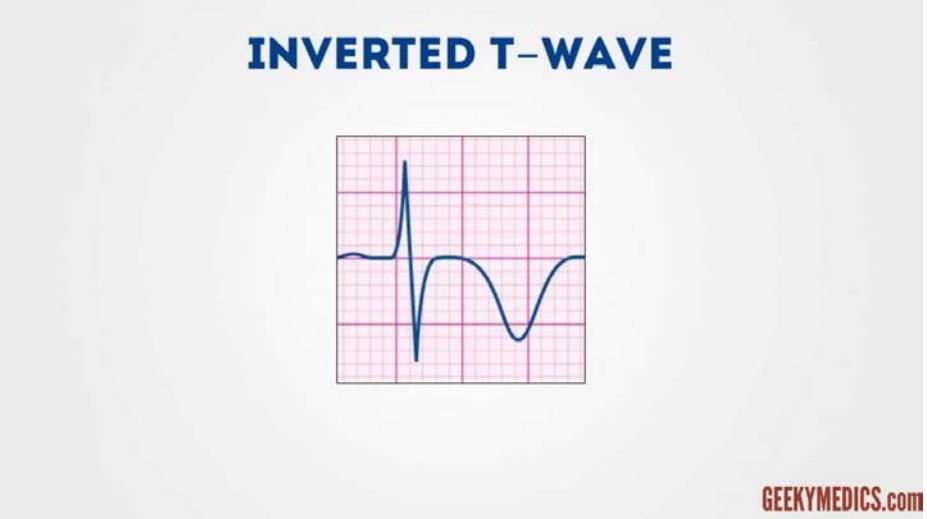
BEWARE: T waves are too tall

- >5 mm in the limb leads
- >10 mm in the chest leads, its the same criteria as small QRS complexes
- You should be thinking of Hyperkalemia or a hyper acute STEMI



Inverted T waves

- Normally inverted in V1 and inversion in lead III is a normal variant
- In other leads can be a non specific sign of a variety of conditions
- Use this finding in the context of your patient

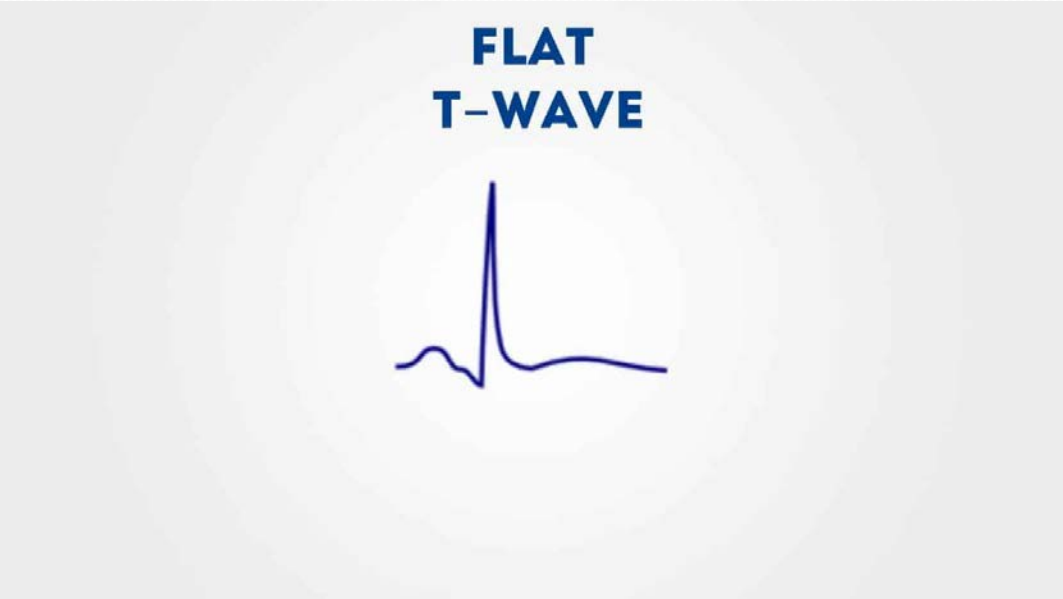


Bi phasic T waves

- They have 2 peaks
- Can be indicative of ischemia and hypokalemia

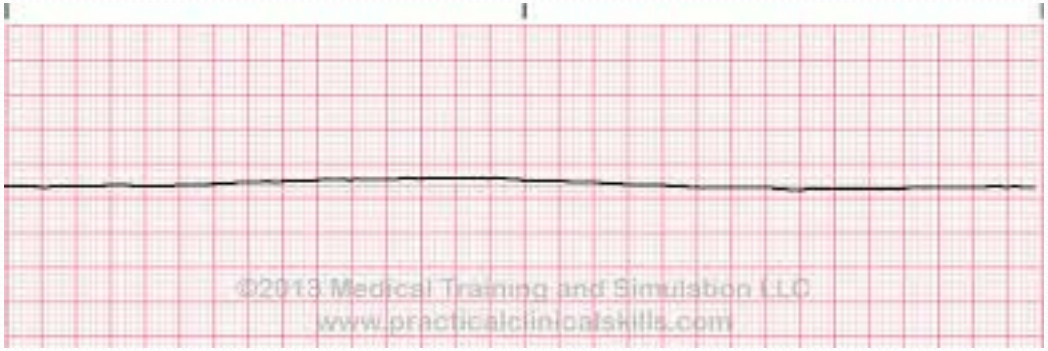
Flat T waves

- non specific
- May represent ischemia or electrolyte imbalances



The only stable rhythm… Asystole

- A cardiac arrest rhythm with no electrical activity. There are no P waves or QRS complexes, The heart is not functioning.



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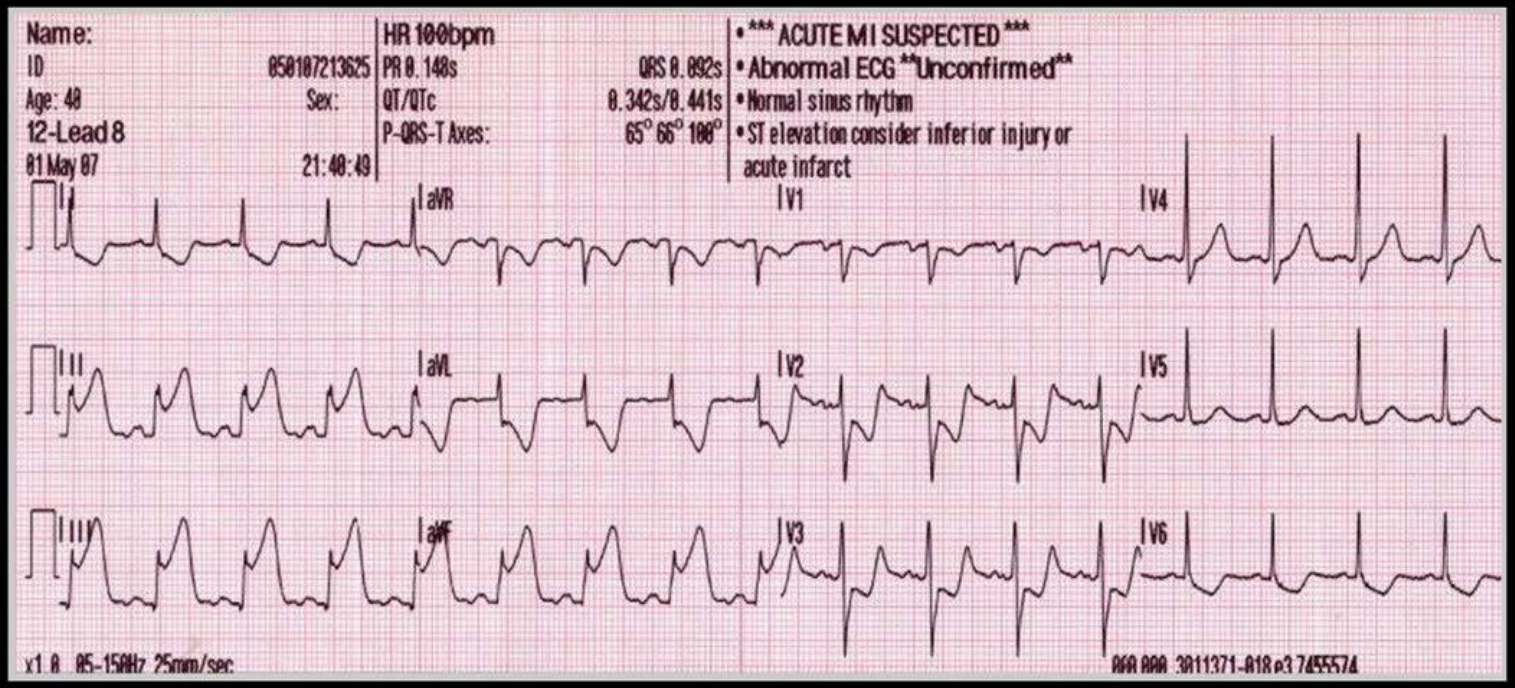

ECTOPOOPY:

WHEN YOU LOOK AT YOUR PATIENTS' ECG AND SAY 'OH S**T!'

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