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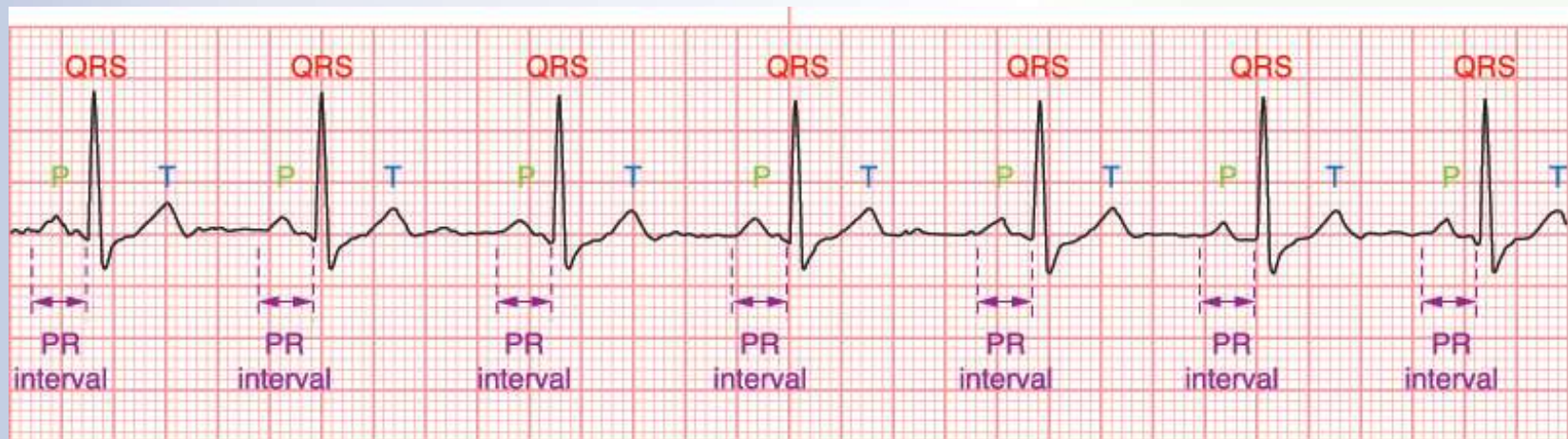
# P Waves

Fast & Easy ECGs – A Self-Paced  
Learning Program



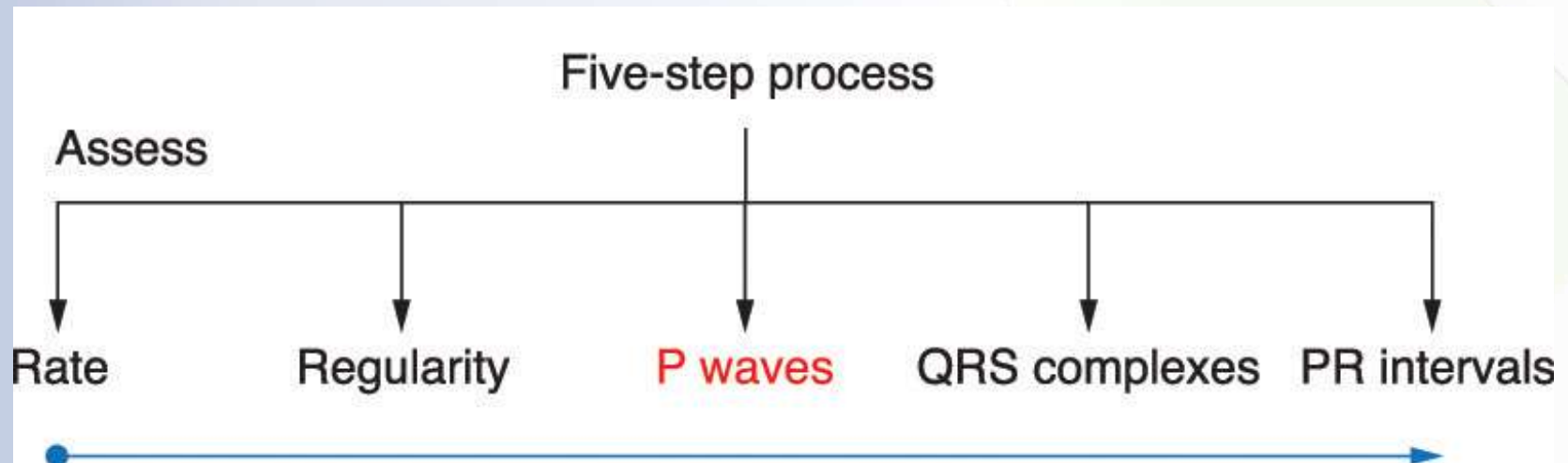
# ECG Waveforms

- Normally the heart beats in a regular, rhythmic fashion producing a P wave, QRS complex and T wave



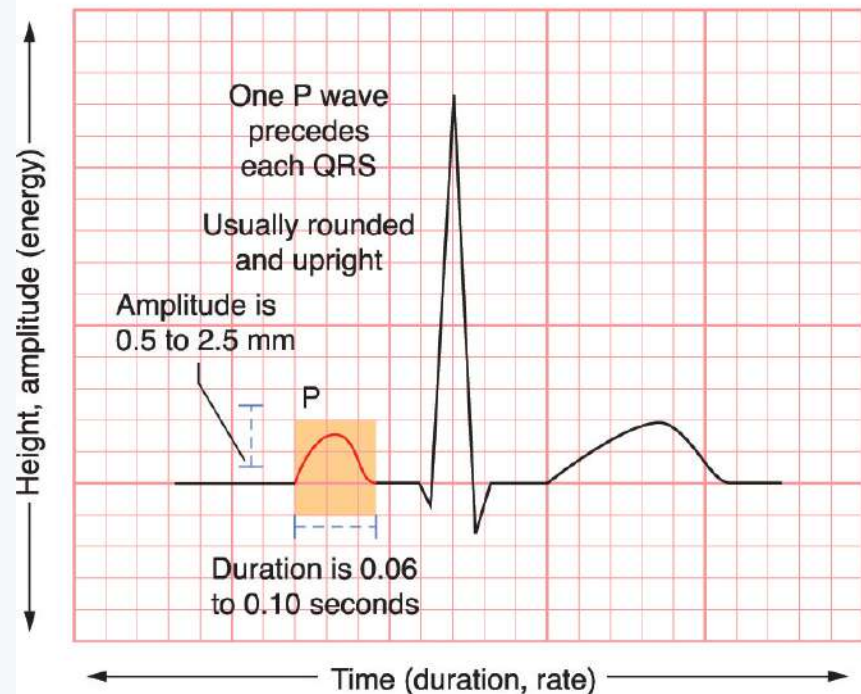
# Step 3 of ECG Analysis

- Examining the P waves



# P Wave

- First deflection from baseline at beginning of cardiac cycle
- Upright, round (in lead II) and precedes each QRS complex

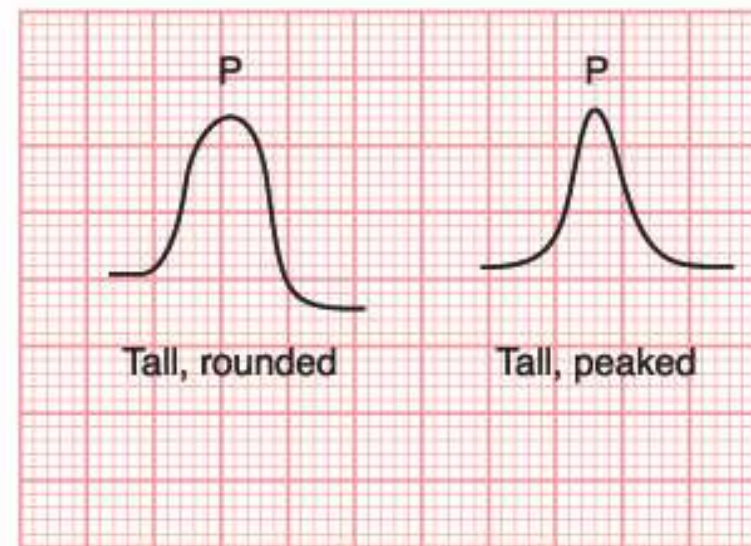


# Different Looking P Waves

- May originate in SA node but conducts abnormally through altered, damaged atria
- Can result from a pacemaker site that occurs outside SA node

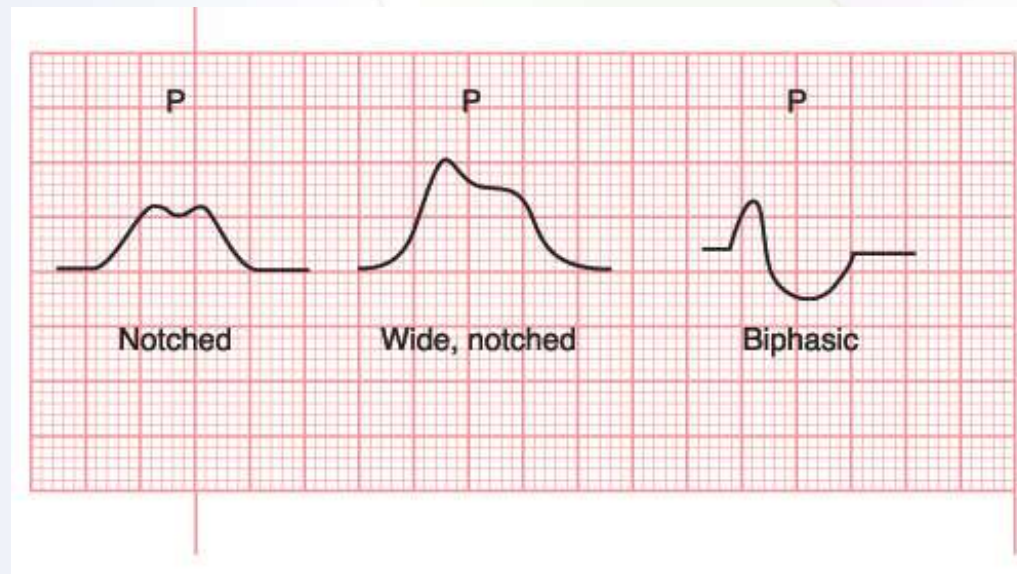
# Different Looking Sinus P Waves

- Tall, rounded or peaked P waves may be seen with increased right atrial pressure and right atrial dilation



# Different Looking Sinus P Waves

- Notched, wide (enlarged) or biphasic P waves may be seen in increased left atrial pressure and left atrial dilation

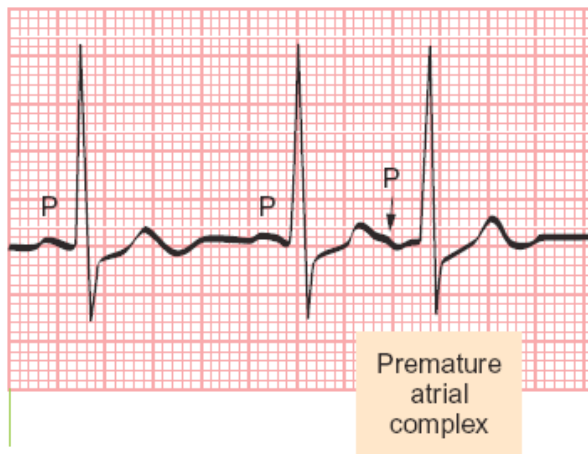


# Different Looking P Waves

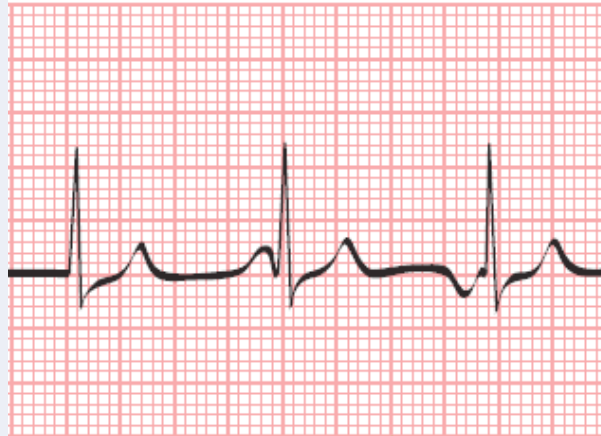
- Impulses arising from the atria produce P waves that look different than sinus P waves
  - Referred to as P Prime or P' waves
  - Seen with:
    - Premature atrial complexes (PACs)
    - Wandering atrial pacemaker
    - Atrial tachycardia



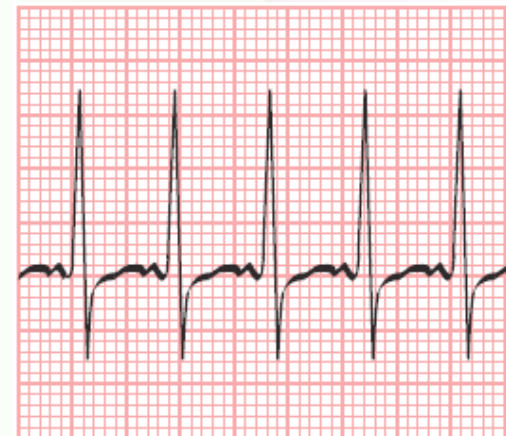
# P' Waves



P' wave of early beat differs in appearance from underlying rhythm



P' waves continuously change in their appearance



Rate is between 150 to 250 beats per minute and may be buried in T wave of preceding beat

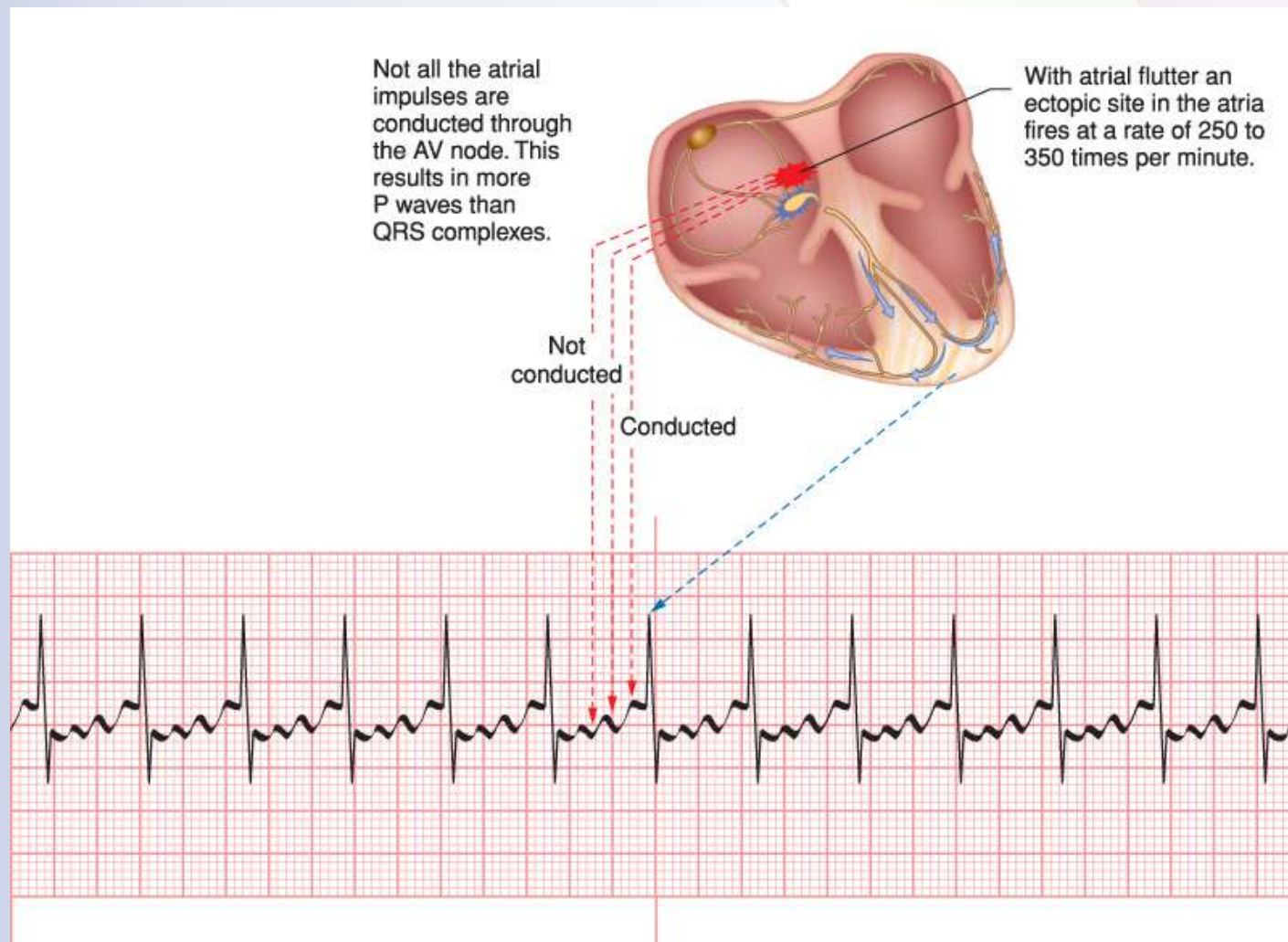
# Different Looking P Waves

- In rapid rates (i.e. atrial tachycardia) the P' wave is likely buried in the T wave of the preceding beat (due to the short P'-P interval)
- When this occurs the T waves are often peaked, notched or larger than normal

# Different Looking Atrial Waveforms

- Flutter waves are seen instead of normal P waves when the atria fire rapidly from one site at a rate of 250 - 350 BPM
- Often described as a saw-toothed pattern
- Called “F” waves

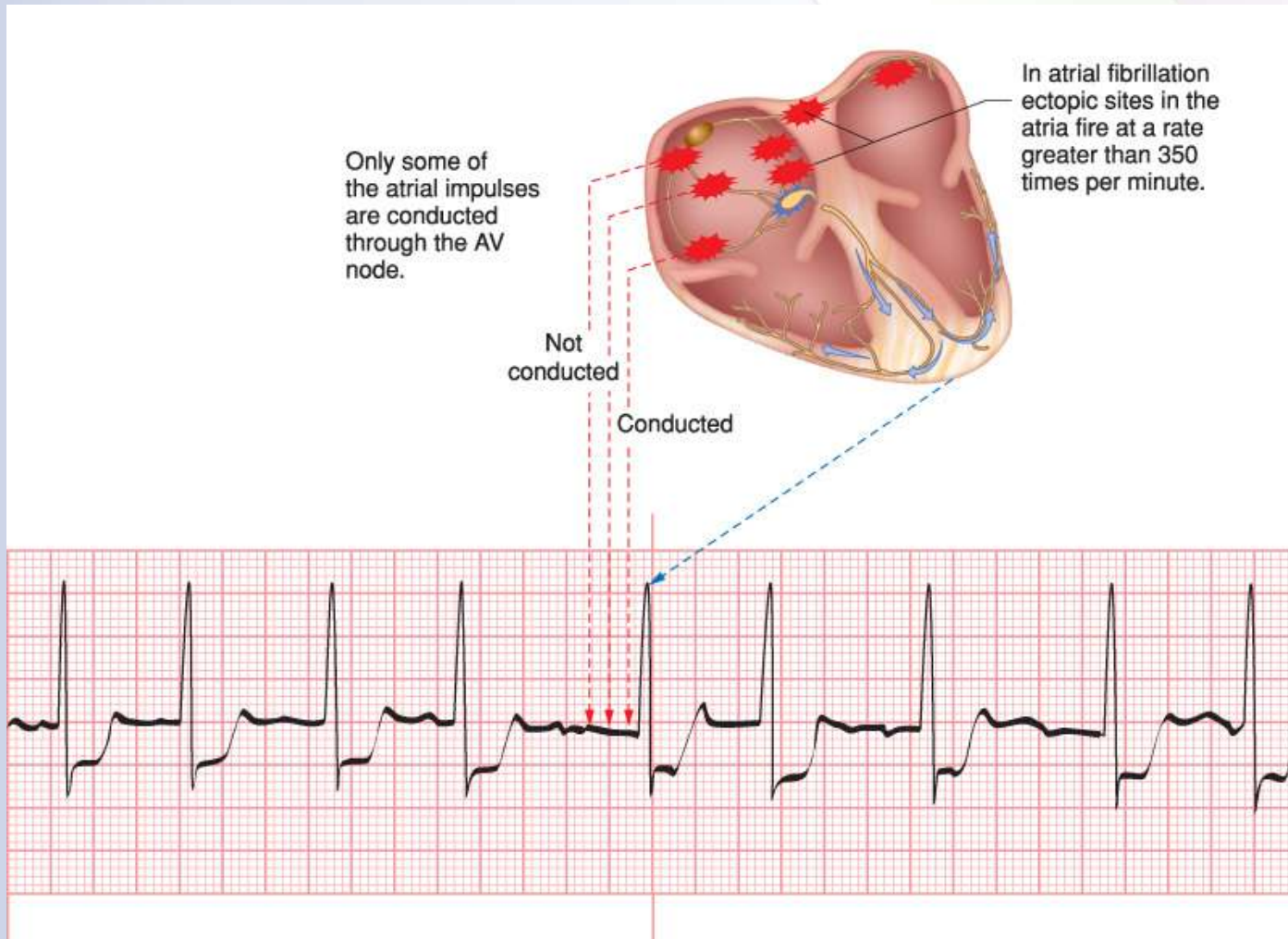
# Flutter Waves



# Different Looking Atrial Waveforms

- An absence of discernable P waves is seen when the atria fire rapidly from many sites at a rate  $>350$  BPM
- Instead there is a chaotic looking baseline of fibrillatory (“f”) waves preceding the QRS complexes

# Fibrillatory Waves



# Inverted P' Waves

- Produced when a P' wave arises from the lower right atrium near the AV node, in the left atria or the AV junction
- Results in retrograde depolarization of the atria

# Inverted P' Waves

- May immediately proceed, occur during or follow the QRS complex
- Associated with dysrhythmias that originate from the AV junction

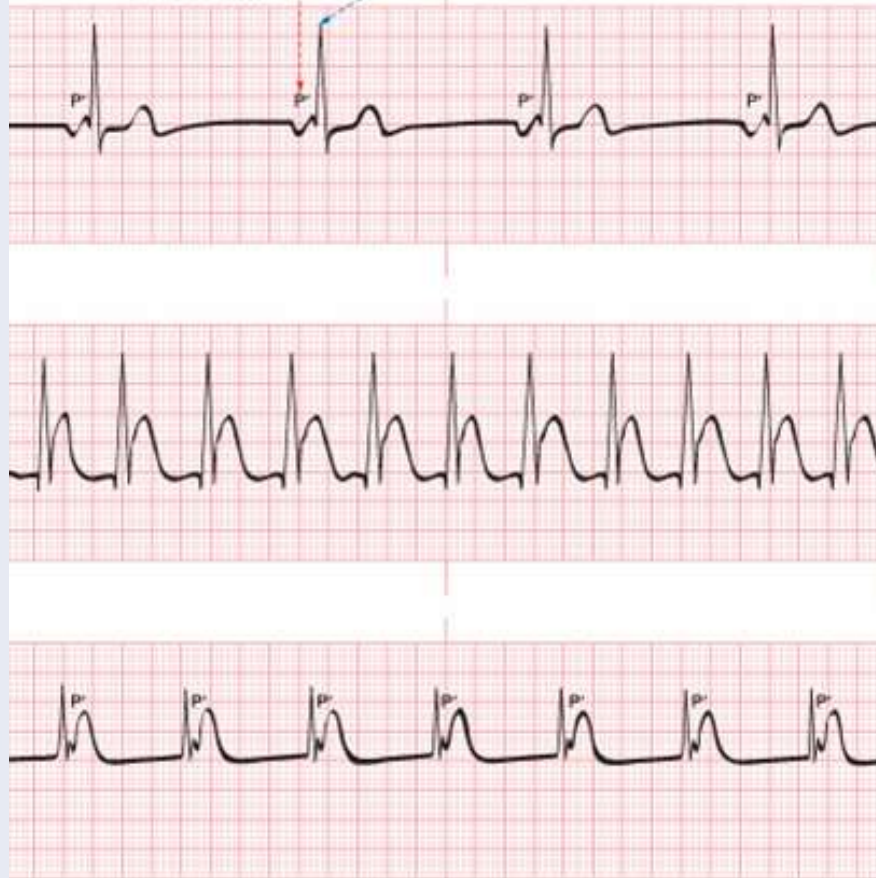


The atria are stimulated via retrograde conduction.

Impulse originates in the AV junction.



Inverted P waves



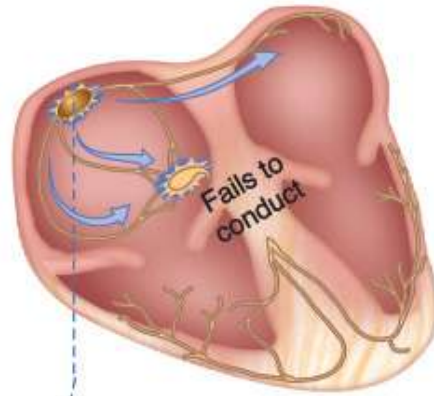
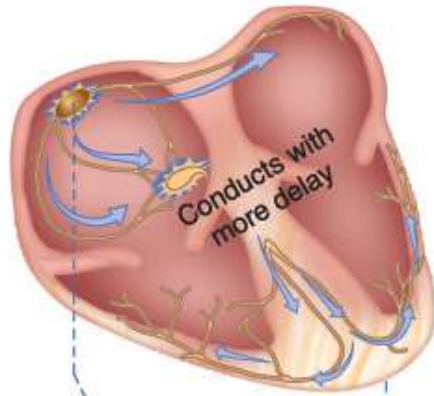
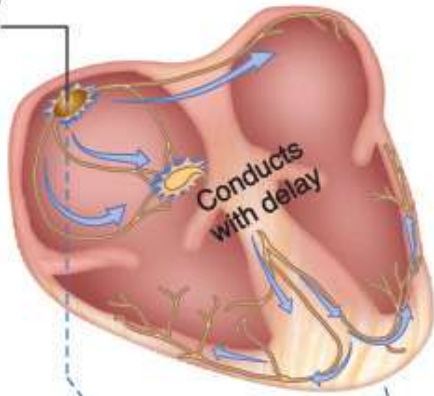
# More P Waves Than QRS Complexes

- Indicates the impulse was initiated in the SA node or atria but was blocked and did not reach the ventricles

# More P Waves Than QRS Complexes

- Most common causes
  - 2<sup>nd</sup>-degree AV heart block (Types I and II)
  - 3<sup>rd</sup>-degree AV heart block
  - Blocked premature atrial complexes (PACs)

Impulse originates in SA node

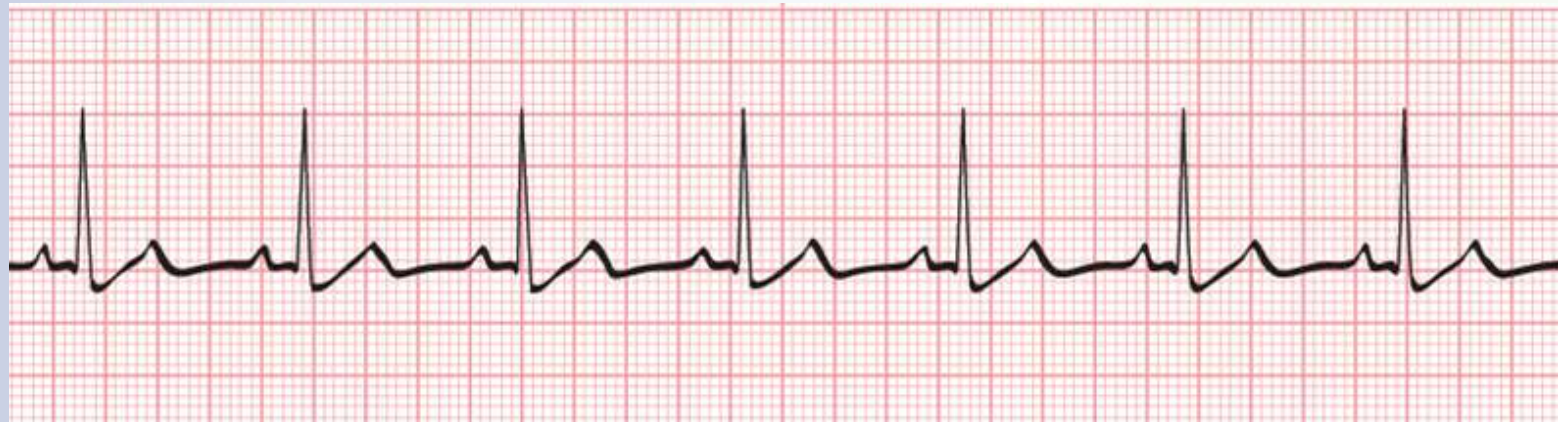


Impulse is not carried through the AV node, resulting in a dropped QRS complex



# Practice Makes Perfect

- Determine the type of atrial waveforms



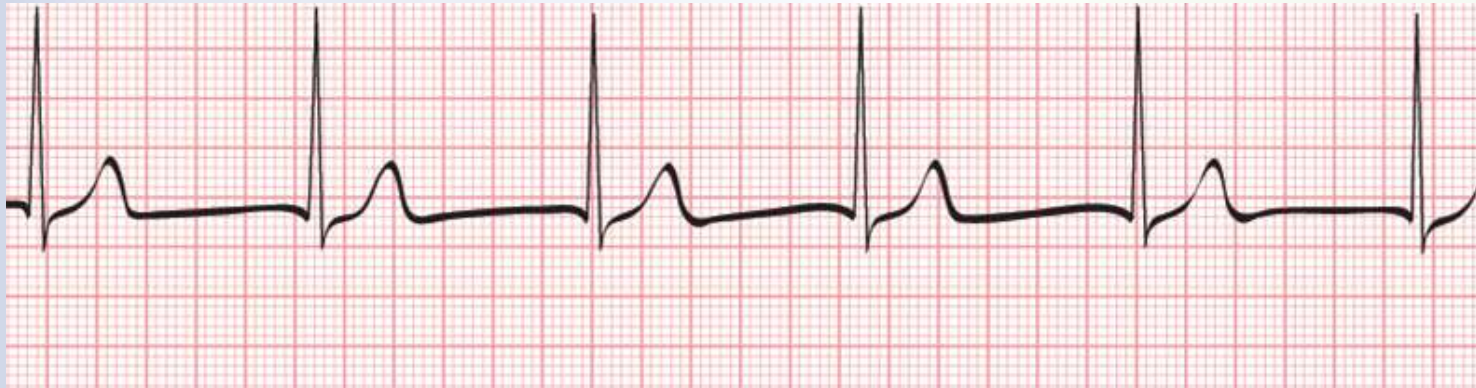
# Practice Makes Perfect

- Determine the type of atrial waveforms



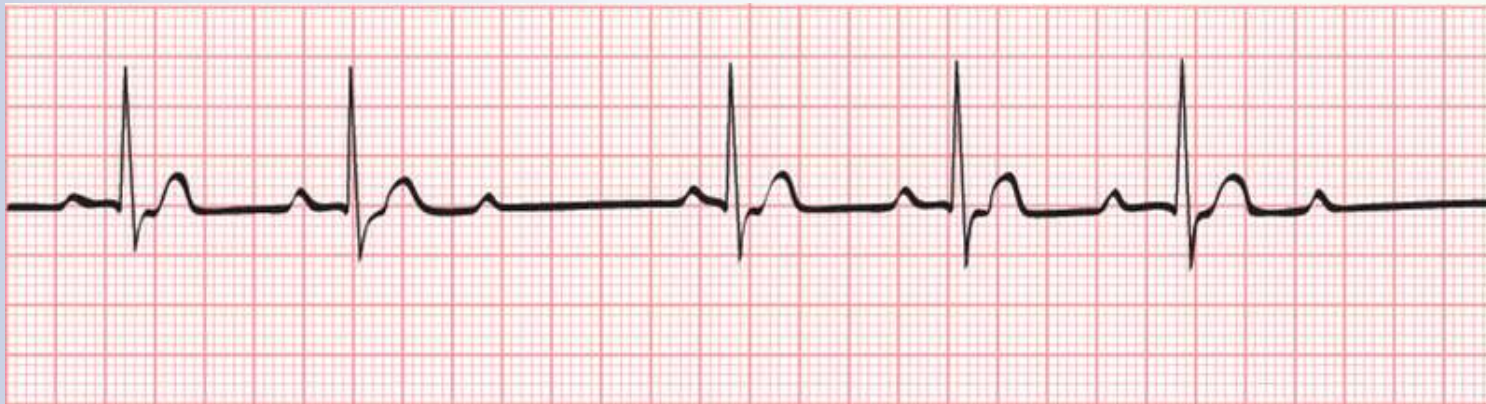
# Practice Makes Perfect

- Determine the type of atrial waveforms



# Practice Makes Perfect

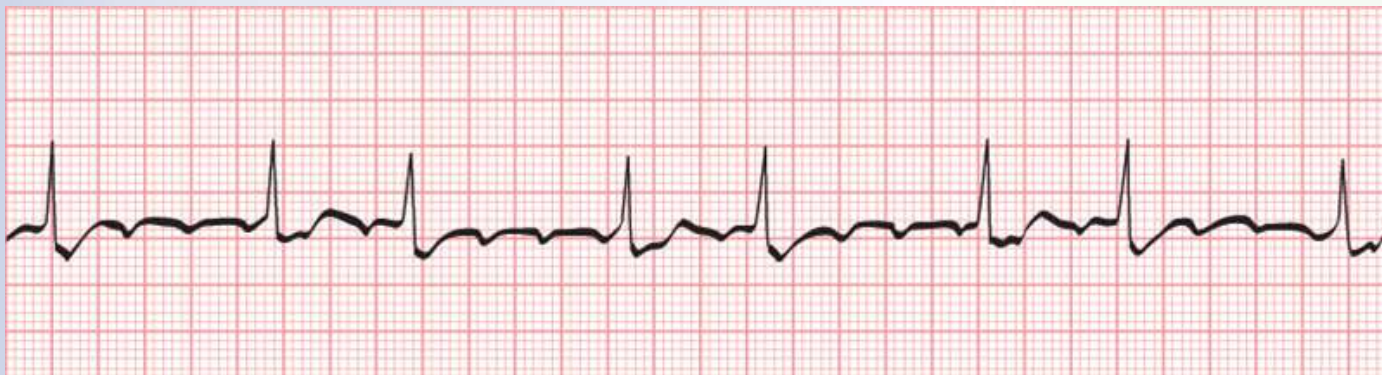
- Determine the type of atrial waveforms





# Practice Makes Perfect

- Determine the type of atrial waveforms



# Summary

- Third step of analyzing an ECG rhythm is examining the P waves.
- The P wave is the first deflection from the baseline at the beginning of the cardiac cycle.
- The amplitude of a normal P wave is 0.5 to 2.5 mm and the duration is 0.06 to 0.10 seconds.

# Summary

- P waves that look different may originate in the SA node but conduct abnormally through altered, damaged atria or may result from a pacemaker site that occurs outside the SA node.
- Impulses that arise from the atria produce P Prime (P') that look different than the sinus P waves.

# Summary

- An impulse that arises from the lower right atrium near the AV node or in the left atria results in retrograde atrial and an inverted P' wave.
- The P' wave in premature atrial complexes (PACs) have a different morphology than the other normal beats.

# Summary

- The P' waves associated with atrial tachycardia look different than normal beats and are often buried in the T wave of the preceding beat.
- P waves that continuously change in their appearance indicate that the site of impulse origin is moving from site to site in the atria.

# Summary

- Flutter waves (F waves) are seen when the impulse arises from atria at a rate of 250 to 350 BPM.
  - These are often described as a “saw-toothed pattern.”
- There is an absence of discernable P waves when the impulses arise from many different sites in the atria at a rate greater than 350 BPM.
  - Instead there is a chaotic looking baseline of “f” waves preceding the QRS complexes.

# Summary

- Impulses that arise from the AV junction or ventricles produce an inverted P' wave that may immediately proceed, occur during or follow the QRS.
- More P waves than QRS complexes indicate that the impulse was initiated in the SA node or atria but was blocked and did not reach the ventricles.