



# ADVANCED ASSESSMENT ECG INTERPRETATION

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Hamilton Base Hospital

**References – Emergency Medicine**

# Lecture Overview

- \* Anatomy review
- \* Electrical impulse conduction
- \* ECG paper constants
- \* Limb placements
- \* Heart rate determination
- \* Steps to rhythm strip analyzes
- \* ECG interpretations!

# Objectives

- \* To gain a basic knowledge of cardiac electrophysiology
- \* To understand the representations of the cardiac cycle on the ECG
- \* To master techniques used for learning the characteristics of the different dysrhythmias
- \* To learn measurement and count techniques essential for dysrhythmia interpretation

# Lead Placement and ECG “View”

- \* Our cardiac monitors have the ability to display ECG rhythms
- \* In manual mode it is possible to capture various leads or “views” of the electrical activity
- \* No matter which view is being displayed, the underlying rhythm does **NOT** change

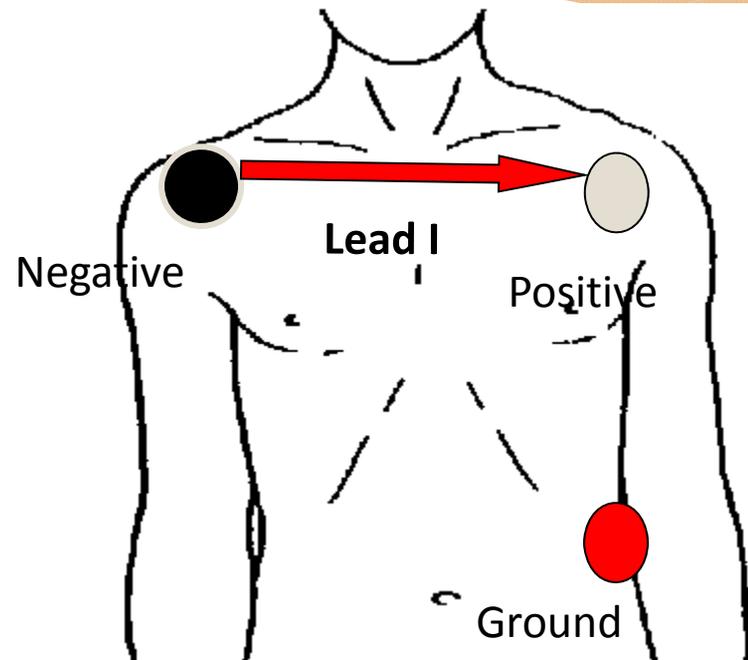
# Bipolar Leads or Limb Leads (I,II,III)

# Limb Leads

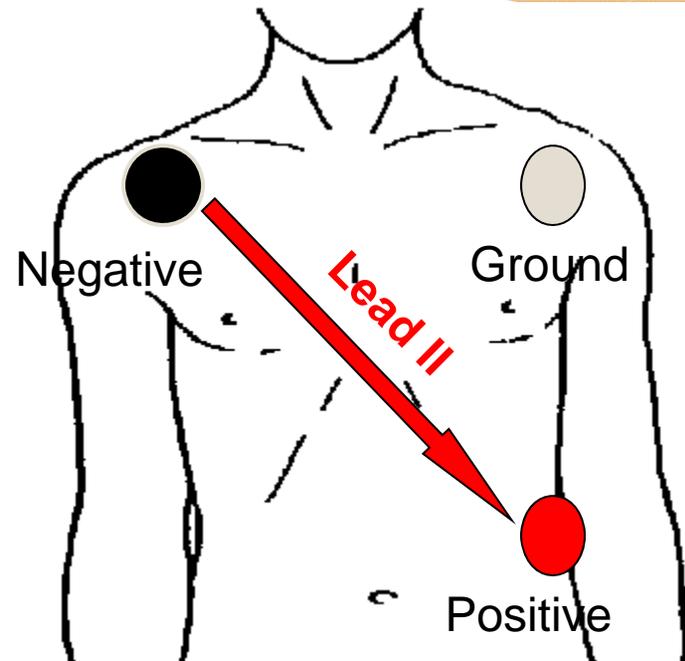
Einthoven's triangle is composed of the standard (bipolar) limb leads:

- \* Lead I: negative pole is right arm & positive is left arm
- \* Lead II: negative pole is right arm & positive left leg
- \* Lead III: negative pole is left arm & positive left leg

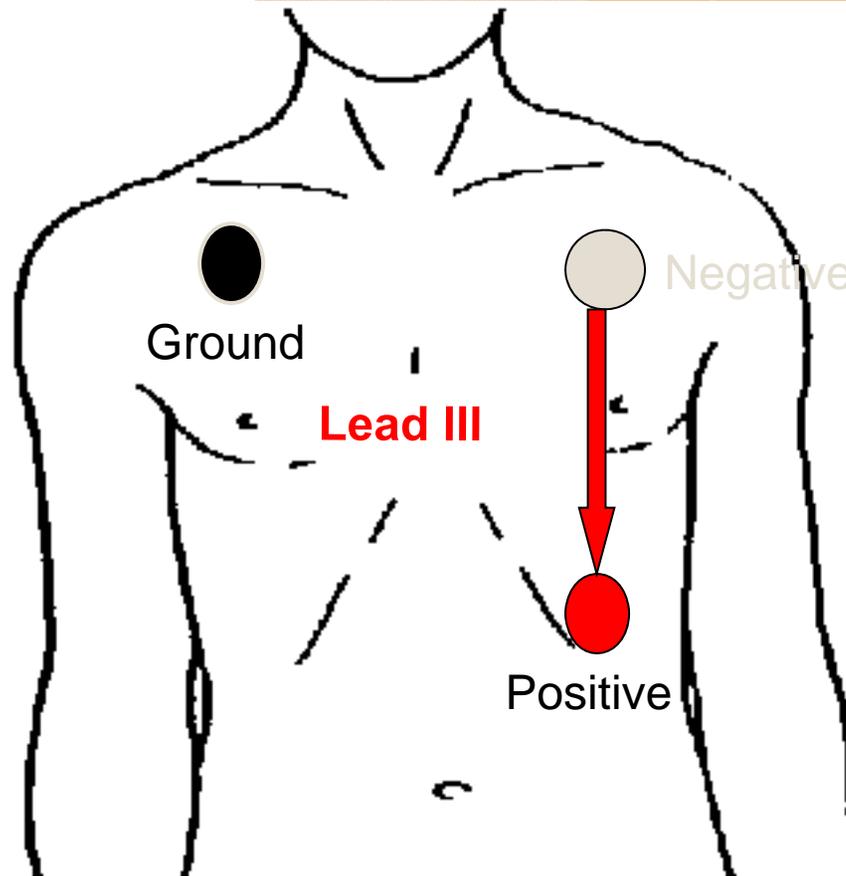
# Lead Placement and Views



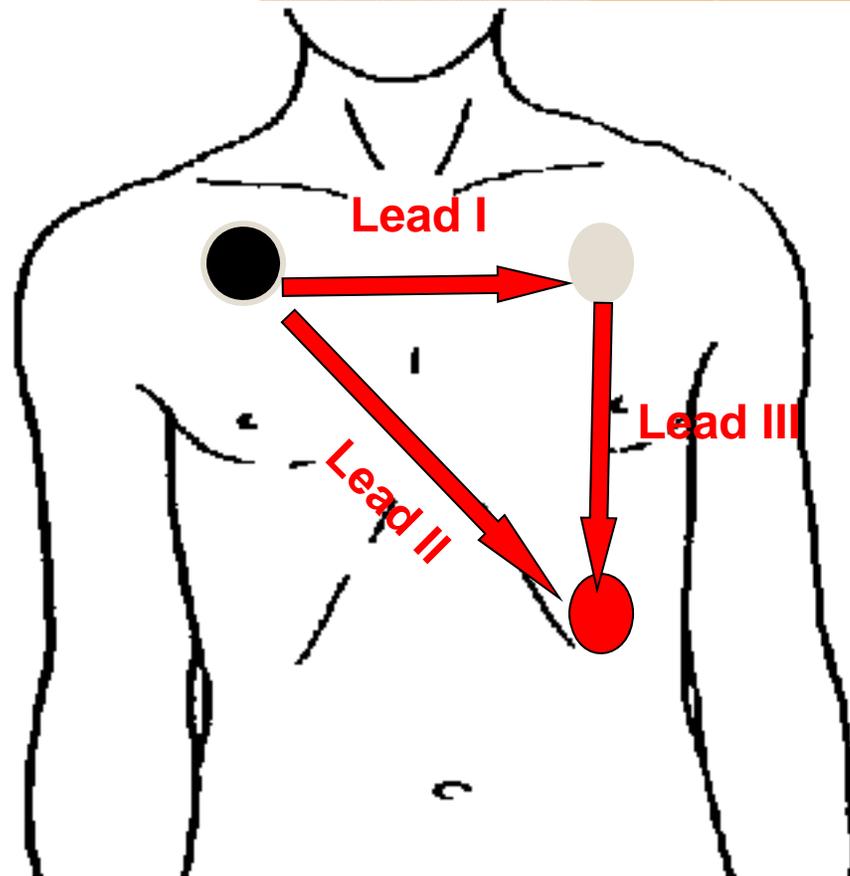
# Lead Placement and Views



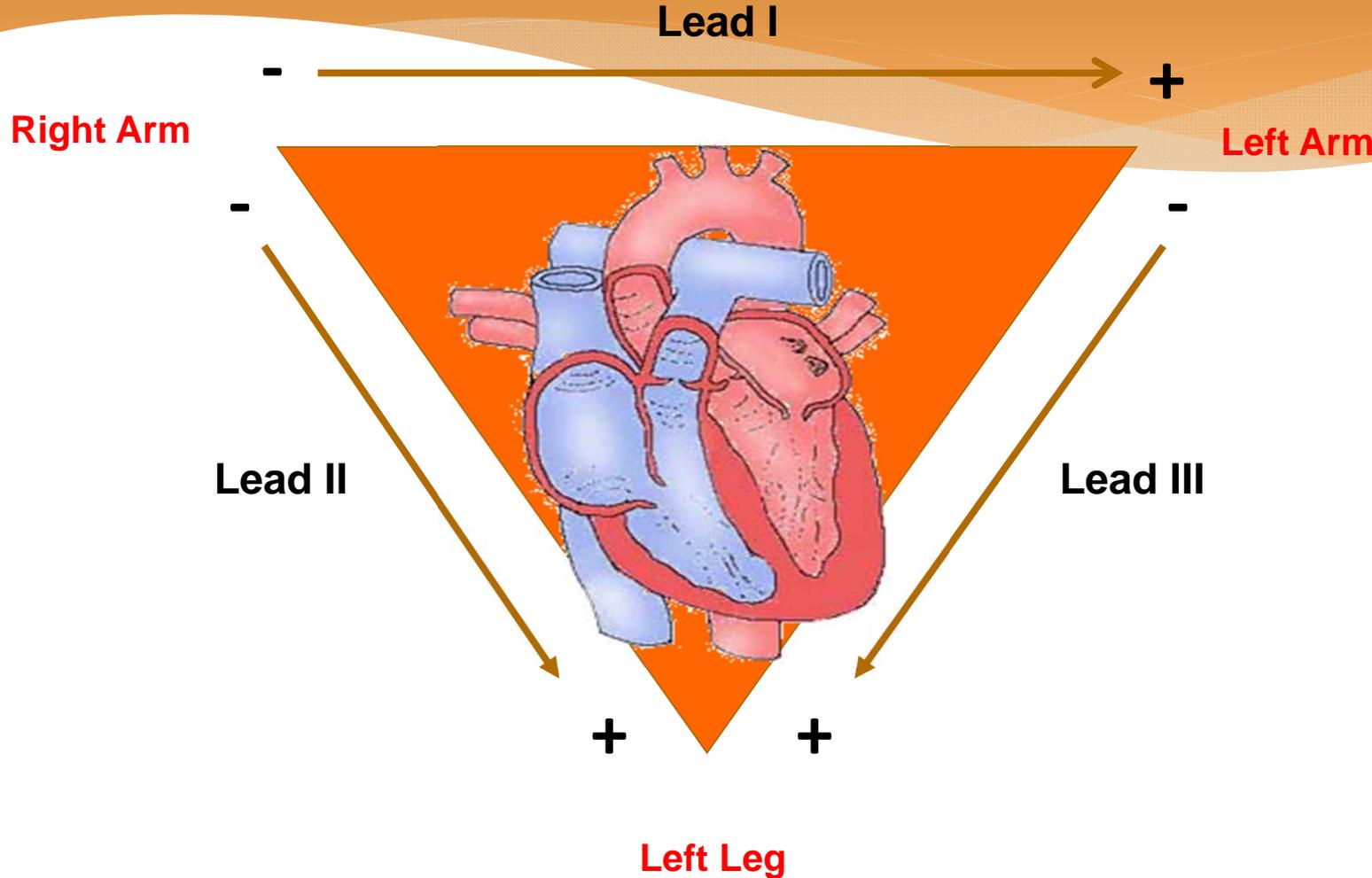
# Lead Placement and Views



# BiPolar Leads I, II & III



# Limb Leads

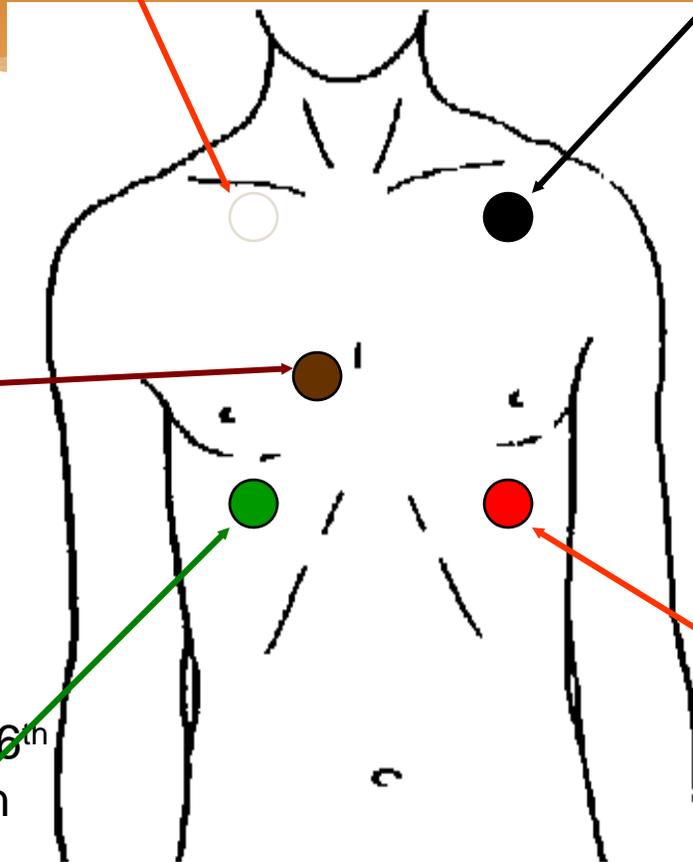


# Cardiac Monitoring and Lead Placement

# 5 Lead Electrode Placement

RA (White): Place near right mid-clavicular line, directly below the clavicle.

LA (Black): Place near left mid-clavicular line, directly below the clavicle

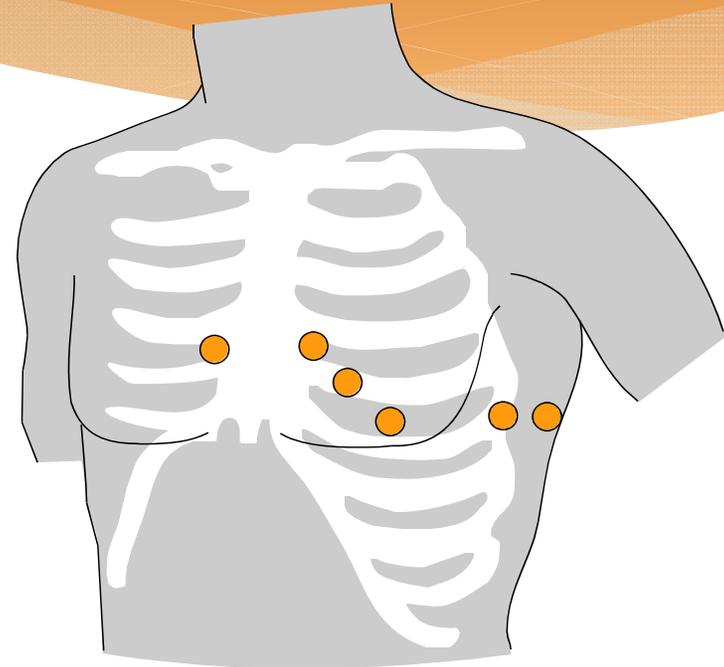
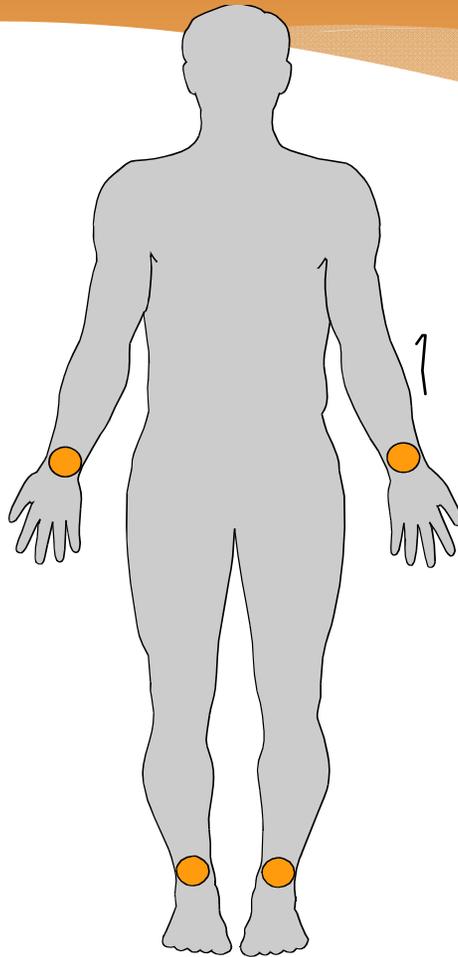


V (Brown): Place to Right of sternum at the 4<sup>th</sup> intercostal Space

RL (Green): Place between 6<sup>th</sup> and 7<sup>th</sup> intercostal Space, on right mid-clavicular line

LL (Red): Place between 6<sup>th</sup> & 7<sup>th</sup> intercostal Space on left mid-clavicular line

# 12 Lead Electrode Placement



# Lead Groups

<b>I</b>	<b>aVR</b>	<b>V1</b>	<b>V4</b>
<b>II</b>	<b>aVL</b>	<b>V2</b>	<b>V5</b>
<b>III</b>	<b>aVF</b>	<b>V3</b>	<b>V6</b>

Limb Leads

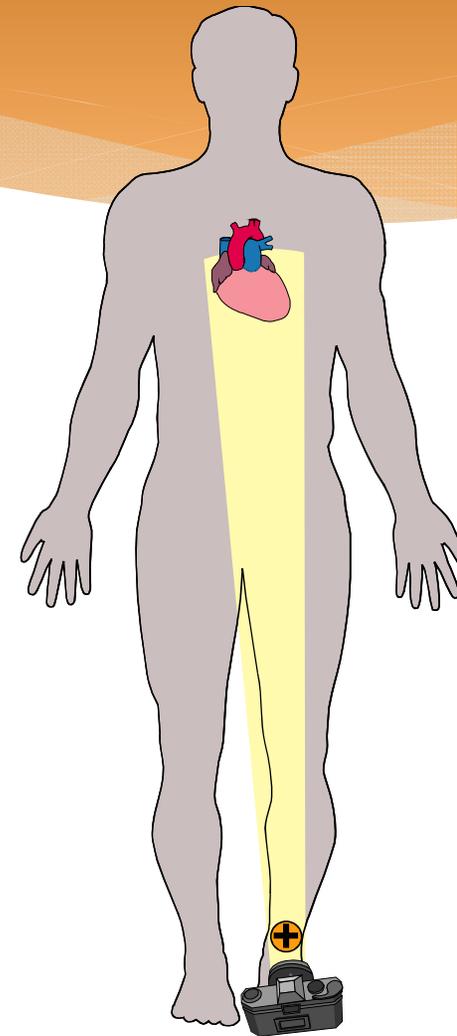
Chest Leads

# Inferior Wall

\* II, III and aVF

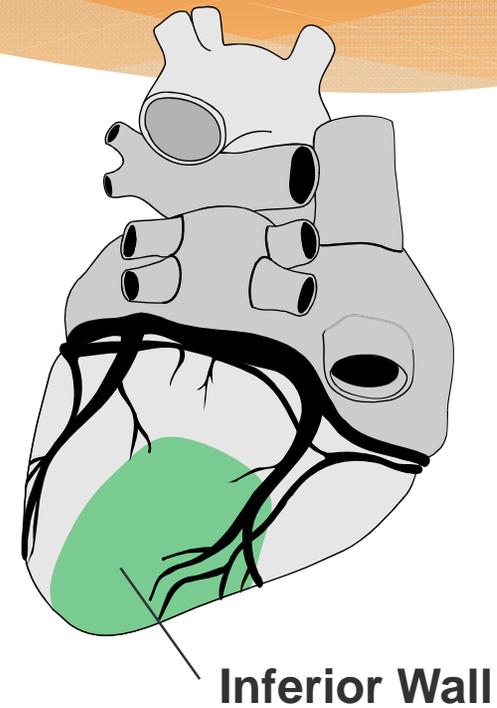
\* Left Leg

I	aVR	V1	V4
II	aVL	V2	V5
III	aVF	V3	V6



# Inferior Wall

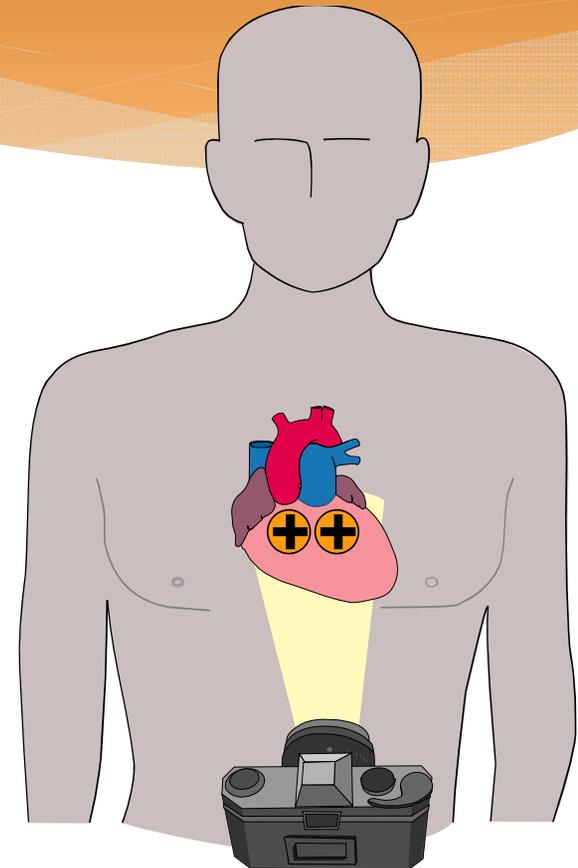
I	aVR	V1	V4
II	aVL	V2	V5
III	aVF	V3	V6



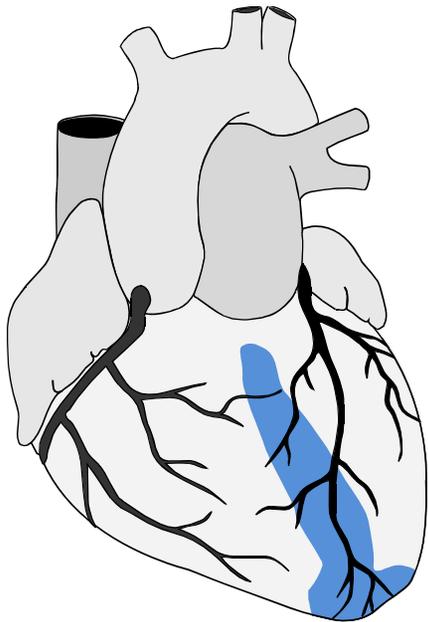
# Septal Wall

- \* V1, V2
- \* Along sternal borders

I	aVR	V1	V4
II	aVL	V2	V5
III	aVF	V3	V6



# Septal Wall



- **V1,V2**

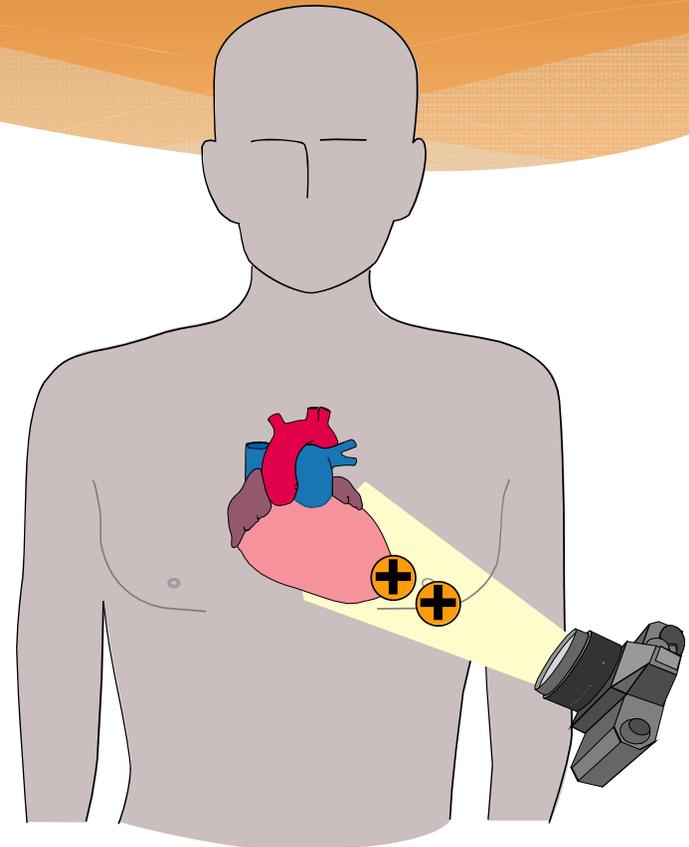
I	aVR	V1	V4
II	aVL	V2	V5
III	aVF	V3	V6

# Anterior Wall

## \* V3 and V4

\* Left anterior chest

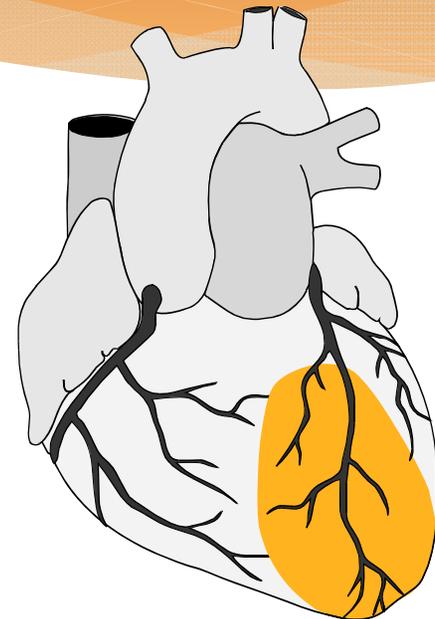
I	aVR	V1	V4
II	aVL	V2	V5
III	aVF	V3	V6



# Anterior Wall

- V3 and V4

I	aVR	V1	V4
II	aVL	V2	V5
III	aVF	V3	V6

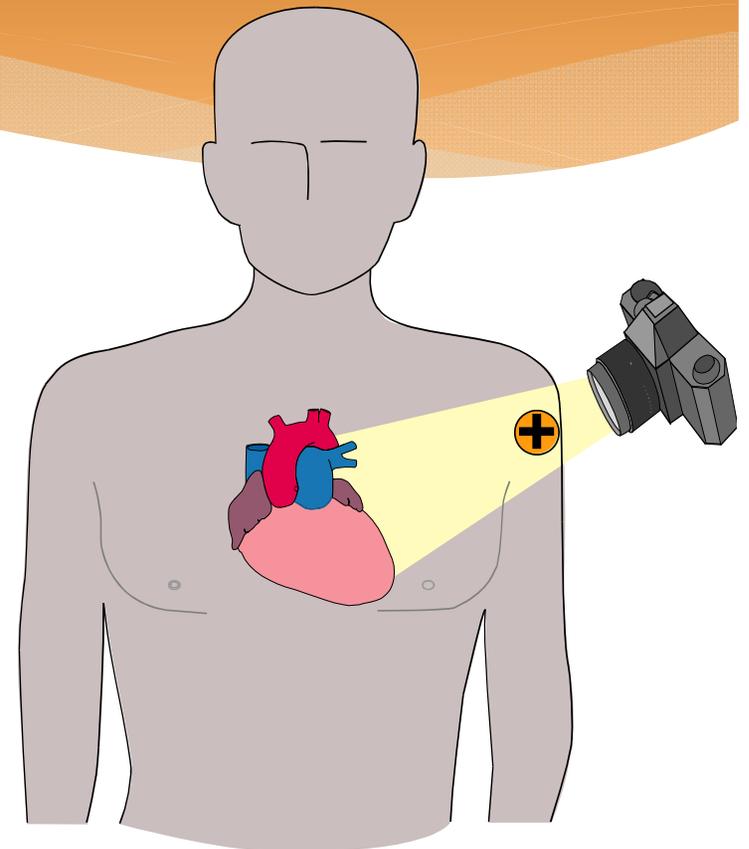


# Lateral Wall - High

\* I and aVL

\* Left Arm

I	aVR	V1	V4
II	aVL	V2	V5
III	aVF	V3	V6

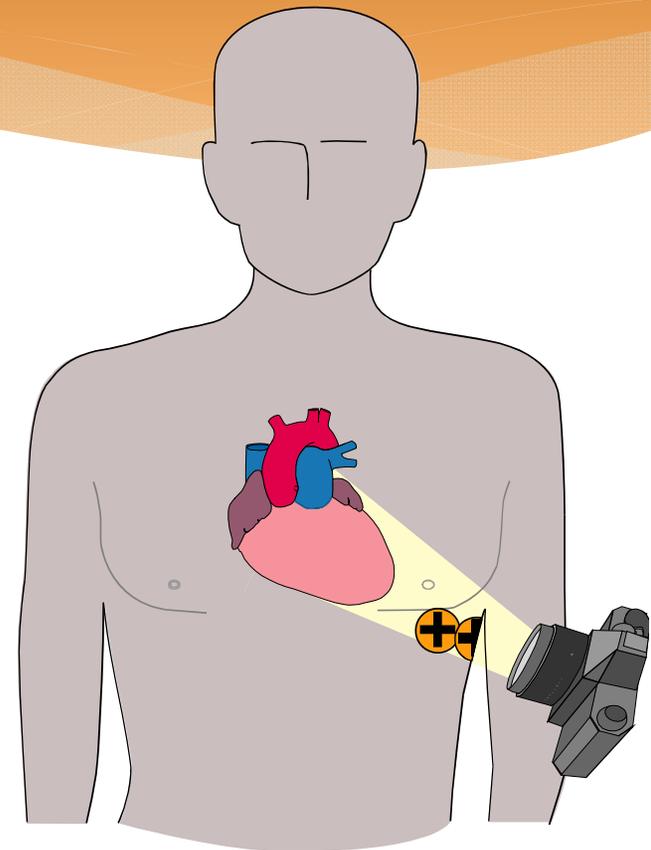


# Lateral Wall - Low

## \* V5 and V6

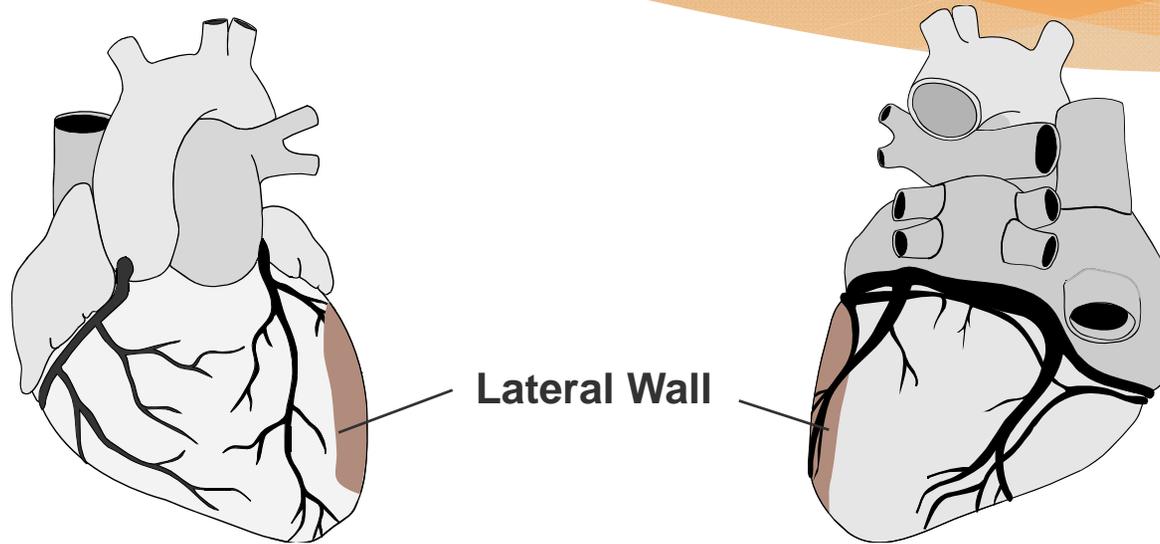
\* Left lateral chest

I	aVR	V1	V4
II	aVL	V2	V5
III	aVF	V3	V6



# Lateral Wall

\* I, aVL, V5 and V6



I	aVR	V1	V4
II	aVL	V2	V5
III	aVF	V3	V6

# Cardiac Conduction

# Cardiac Conduction

- \* Essentially 2 pumps
  - \* Atria
  - \* Ventricles
- \* Must operate in unison and in order
- \* Three Primary Pacemakers
  - \* Sinoatrial Node
  - \* Atrio-Ventricular Junction
  - \* Purkinje System

# Electromechanics

- \* Resting cells: negative interior, positive exterior
- \* Changes in this resting state cause depolarization and repolarization

# Electrical Flow

- \* Towards negative electrode: **downward** deflection on paper
- \* Towards positive electrode: **upward** deflection on paper
- \* As energy travels away from this axis amplitude on the ECG decreases

# ECG “View” and Electrical Flow

- \* Lead II offers the best “view”
- \* The normal electrical axis travels the 11-5 o’clock vector which is 59 degrees
- \* Lead II is at 60 degrees

# SinoAtrial Node

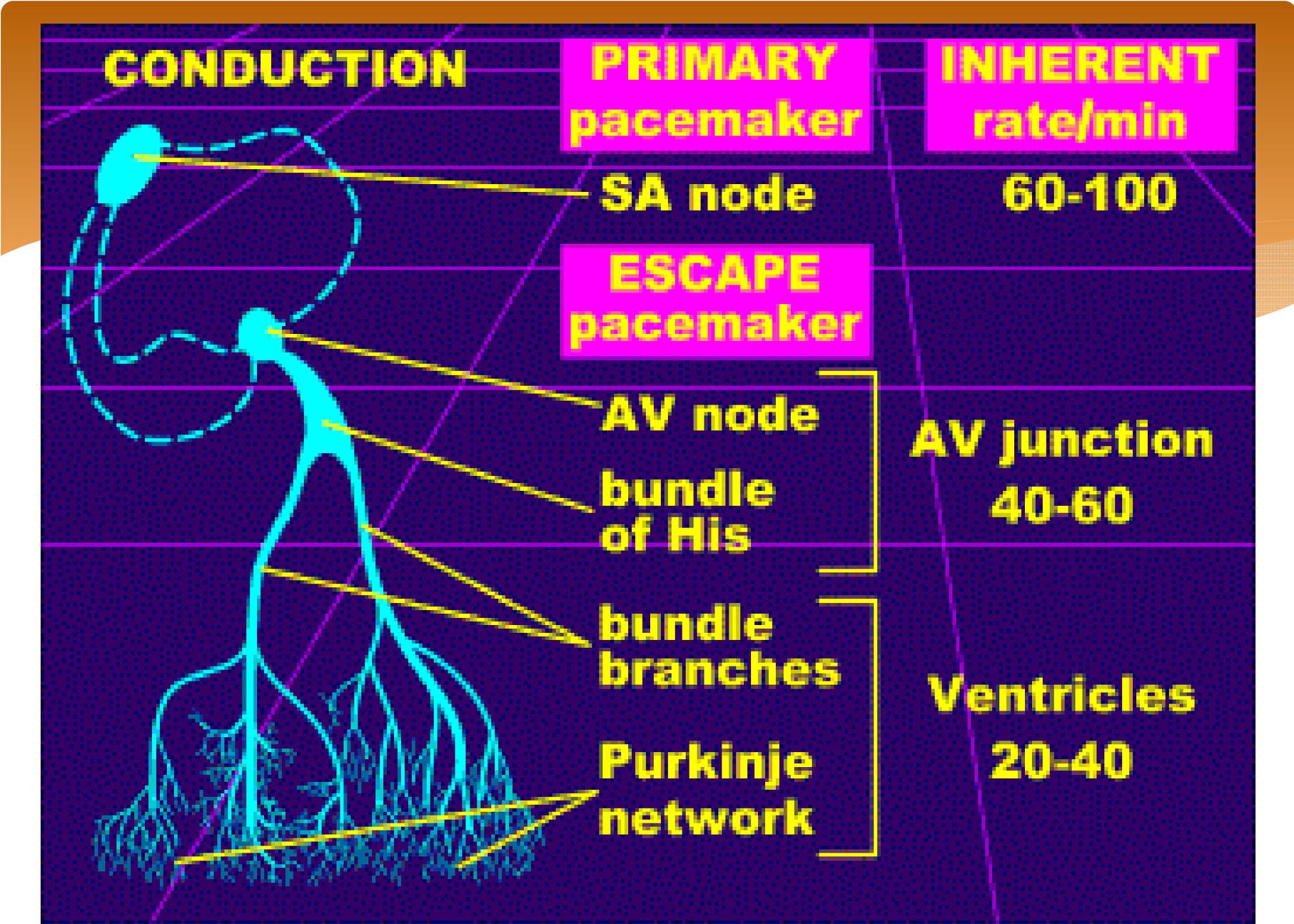
- \* Contraction of the Atria
- \* Normally depolarizes 60-80 times/min.
- \* Can depolarize up to 300 times/min.
- \* Follows special pathways –
  - IntraAtrial:
    - \* Anterior, Middle, Posterior Internodal Tracts

# AtrioVentricular Node

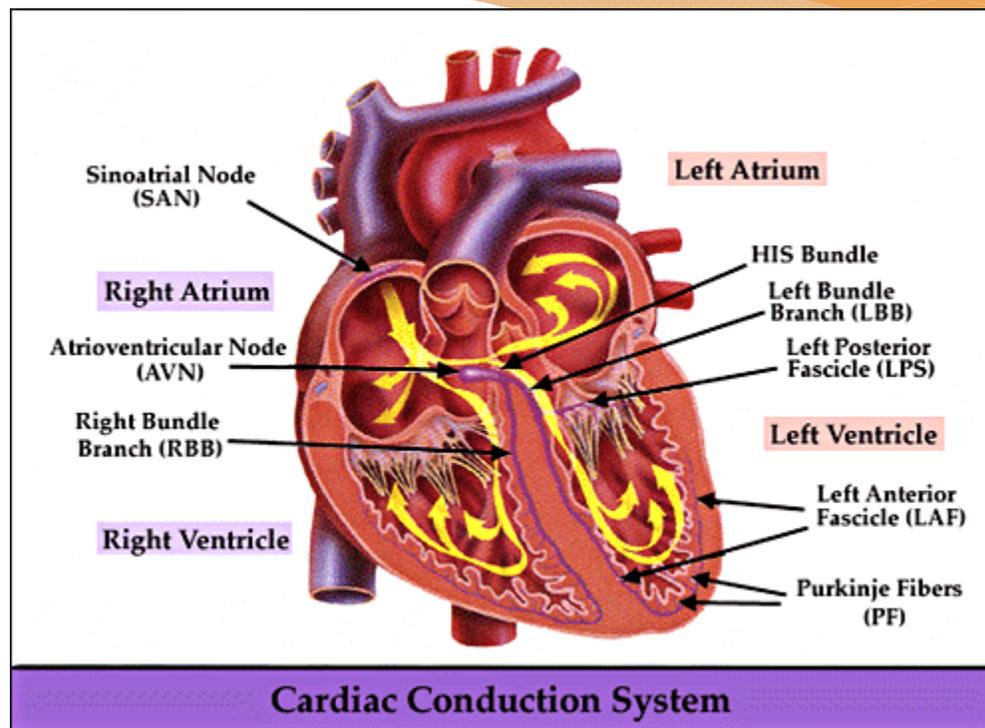
- \* Pauses depolarization to allow ventricular filling
- \* Capable of depolarizing 40-60 times/min. (in the absence of the SA Node input)

# Ventricular Pathways

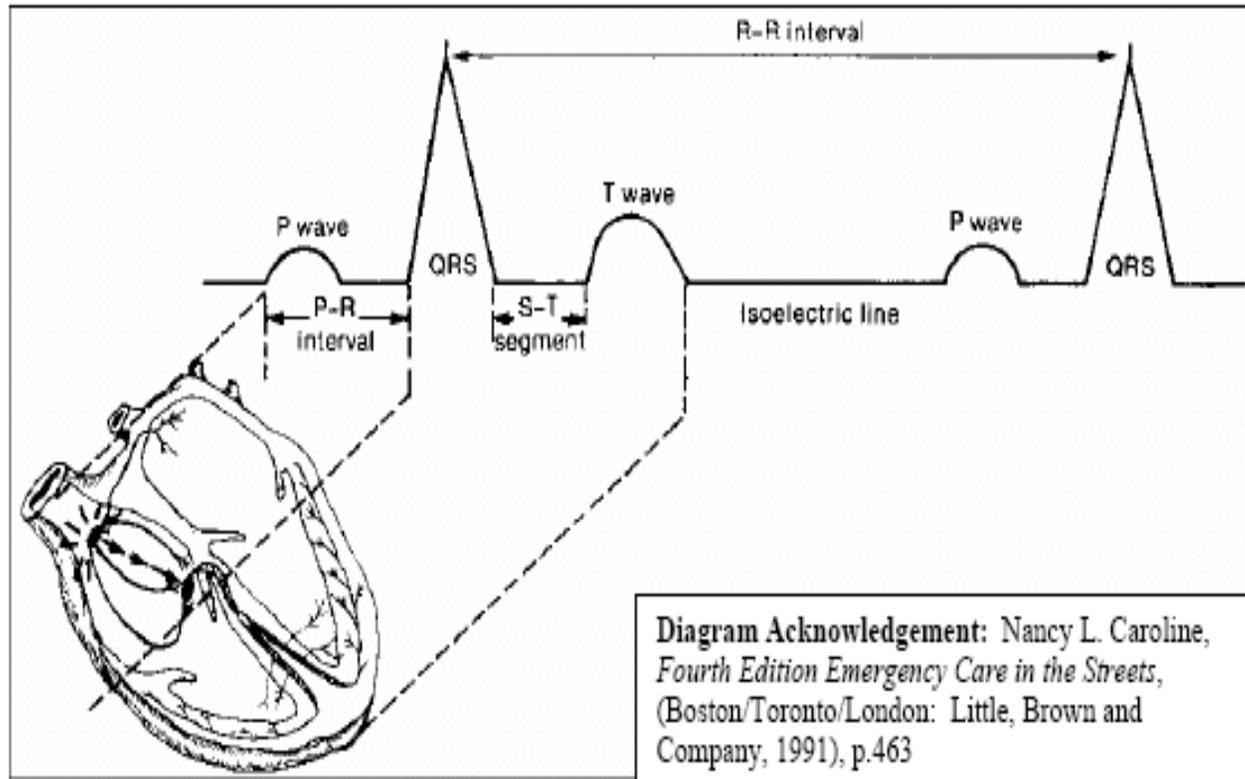
- \* Bundle of His
- \* Left and Right Bundle Branches
- \* Left bundle gives rise to anterior and posterior fascicles
- \* Ends at the Purkinje fibers
- \* Inherent depolarization rate  $< 40/\text{min}$ .



# Conduction Pathways



# Pathway – structure relationship



Slide courtesy of York BH

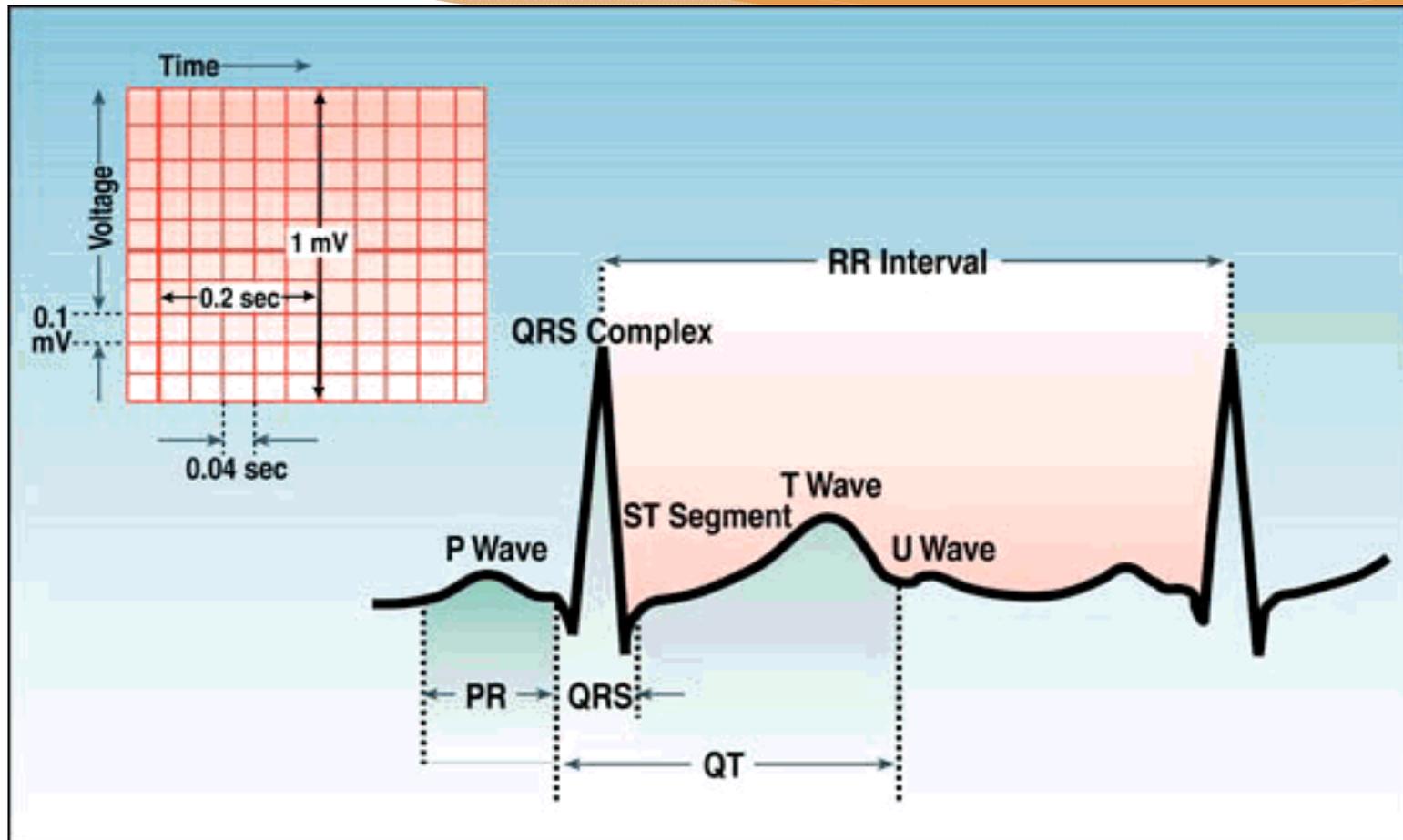
# ECG Paper

- \* **Horizontal lines:** distance in millimeters and time in seconds
- \* **Vertical lines:** voltage (amplitude) in millimeters
- \* Uses the Metric system
- \* Is very good for accuracy

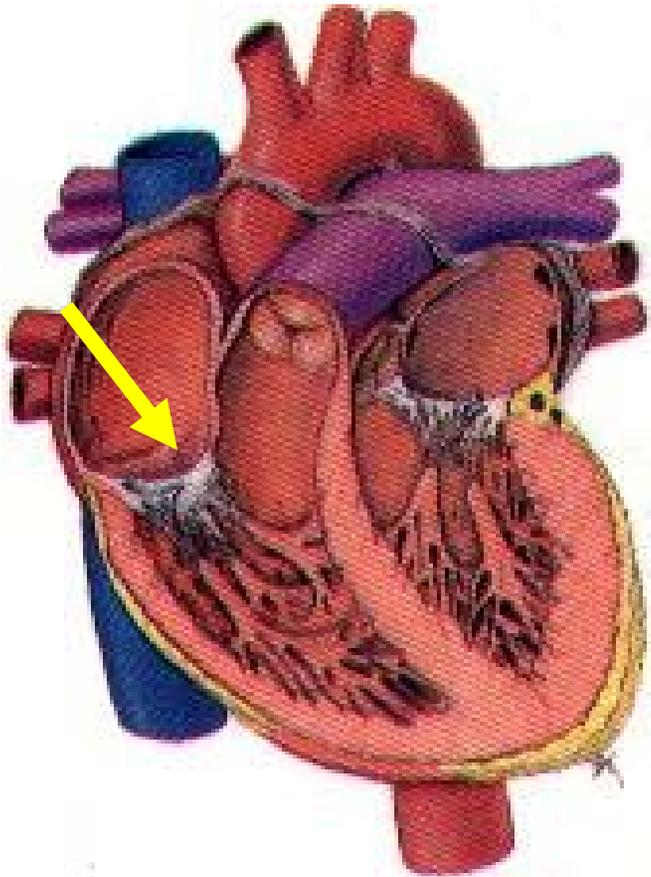
# ECG Paper

- \* Light vertical lines are 0.04 second (1 mm) apart
- \* Dark vertical lines are 0.20 second (5 mm) apart
- \* 5 dark squares is 1 second

# Cardiac Conduction

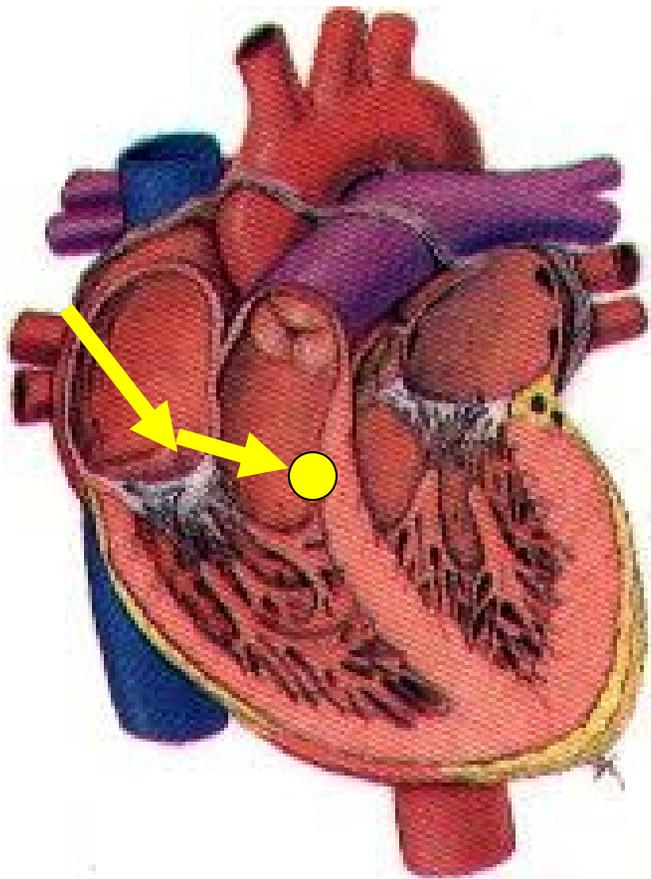


# Cardiac Conduction: P Wave



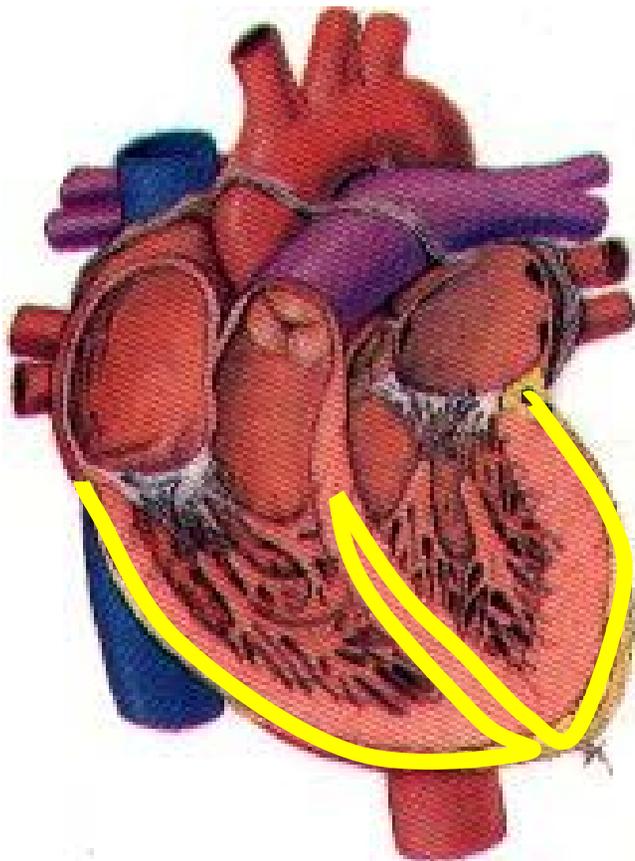
P Wave: Atrial Impulse  
.04 - .08 Seconds

# Cardiac Conduction: PR Interval



P Wave .04 - .08 Sec.  
PRI .12-.20 Sec.

# Cardiac Conduction: QRS Complex



P Wave .04 - .08 Sec.

PRI .12 - .20 Sec.

QRS .06 - .12 Sec.

# Analyzing a Rhythm Strip

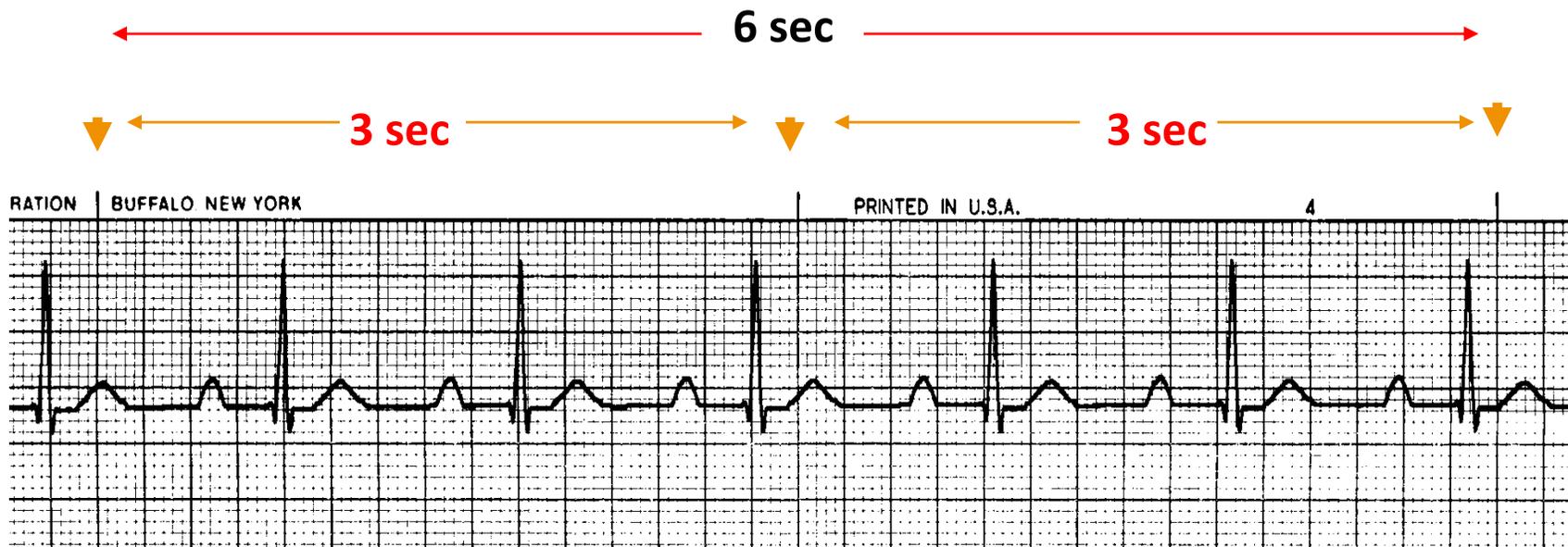
# Dysrhythmia Interpretation: 5 Step Approach

- \* Step 1: What is the rate?
- \* Step 2: Is the rhythm regular or irregular?
- \* Step 3: Is the P wave normal?
- \* Step 4: P-R Interval/relationship?
- \* Step 5: Normal QRS complex?

# Step 1- Rate

## Method 1

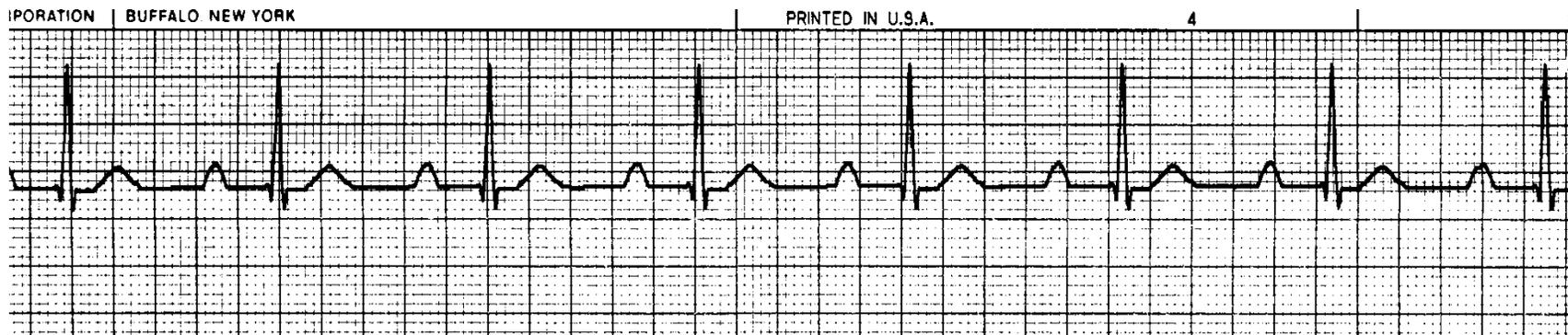
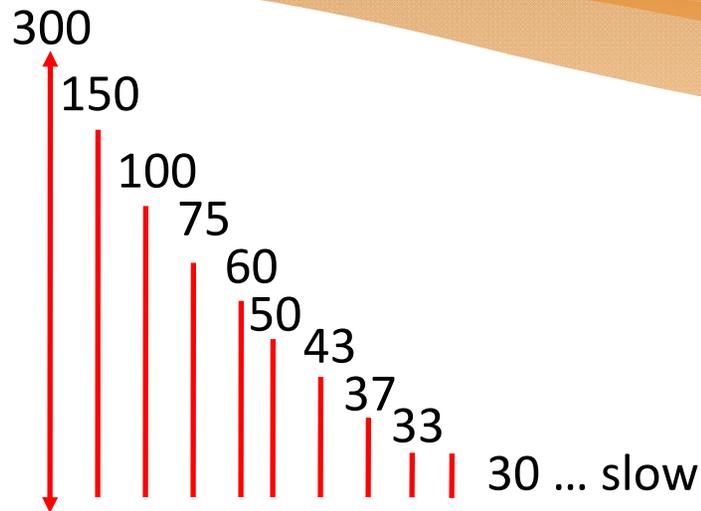
Count the number of R waves for a six second interval and multiply by ten.



(can be used for regular & irregular)

# Step 1 - Rate

Method 2: Count the number of 5mm squares and divide into 300 (or memorize)



# Step 1 - Rate

## RATE:

- \* Tachycardia exists if the rate is greater than 100 beats/min.
- \* Bradycardia exists if the rate is less than 60 beats/min.

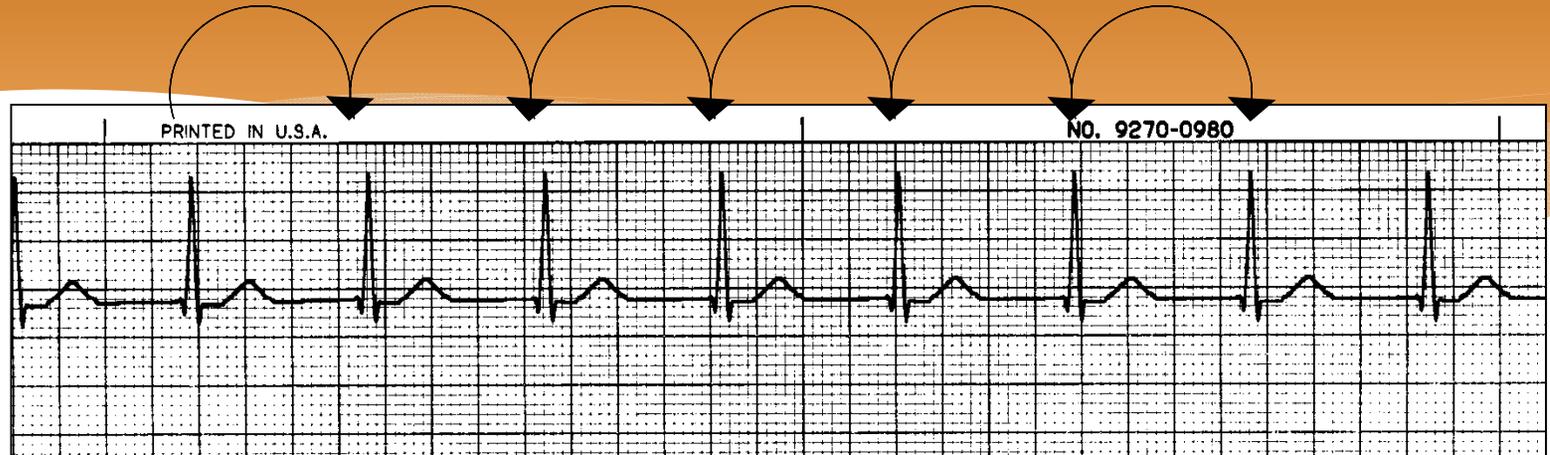
## Step 2 - Rhythm

### RHYTHM:

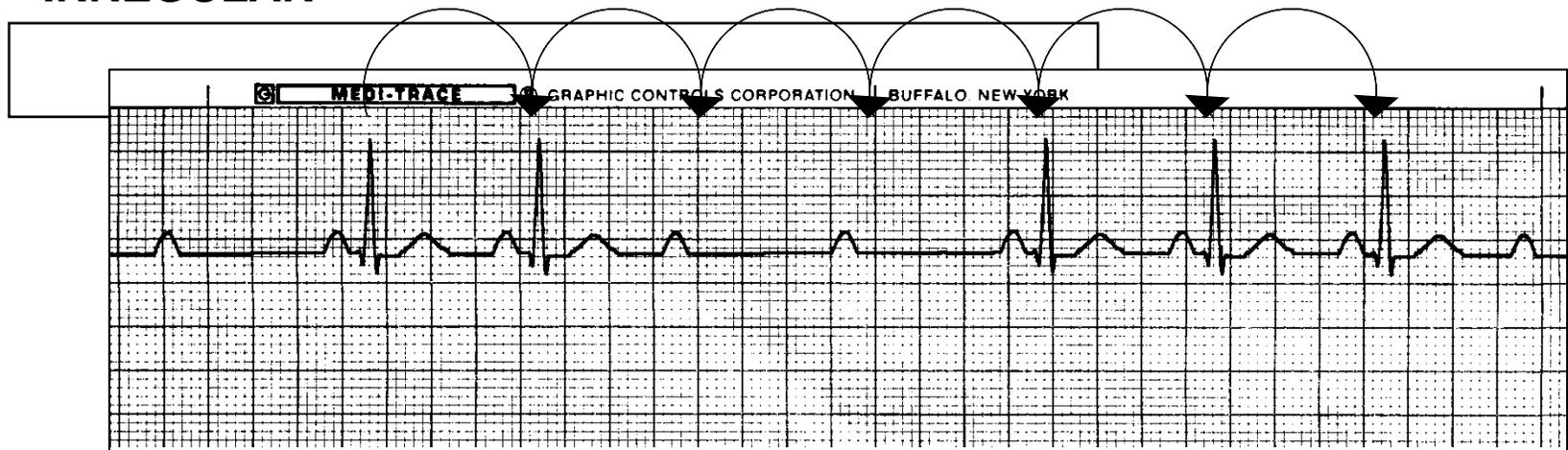
- \* Determine if the ventricular rhythm is regular or irregular (pattern to irreg.?)
- \* R-R intervals should measure the same
- \* P-P intervals should also measure the same

# Step 2 - Rhythm

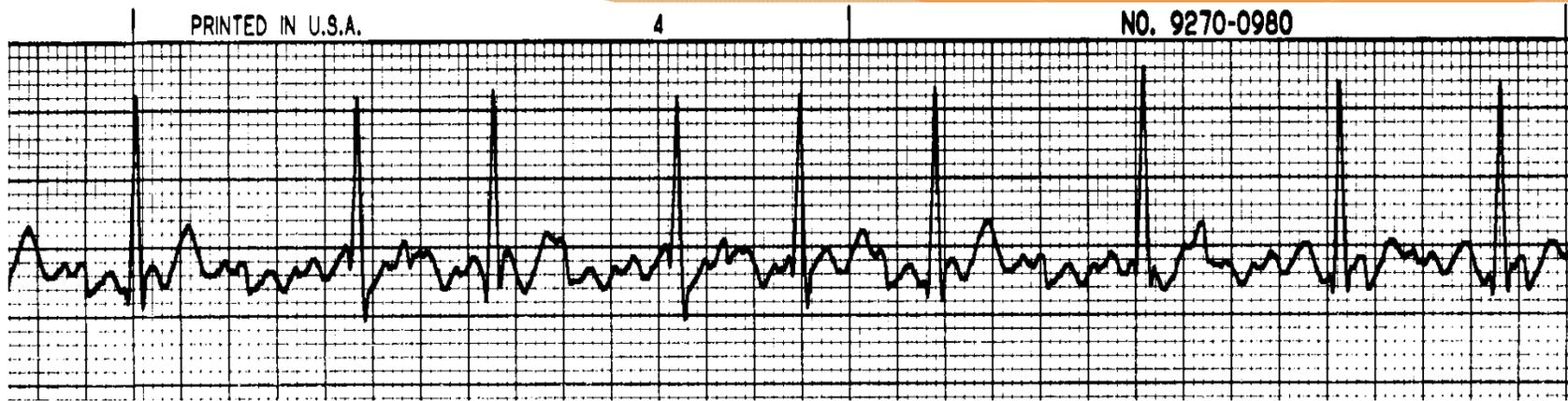
**REGULAR**



**IRREGULAR**



# STEP 2 - Rhythm Example



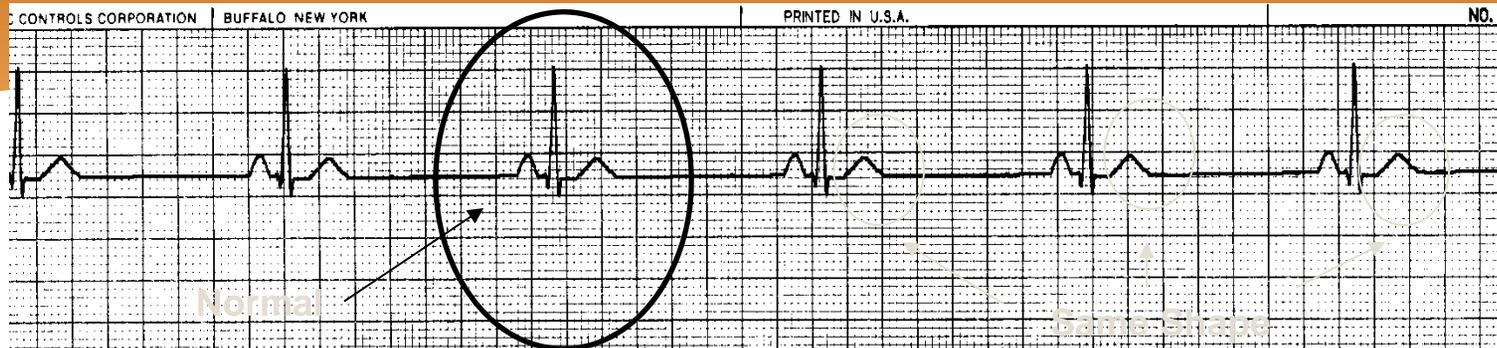
\* Irregularly Irregular

# STEP 3 – Is the P Wave Normal

Identify and examine P waves:

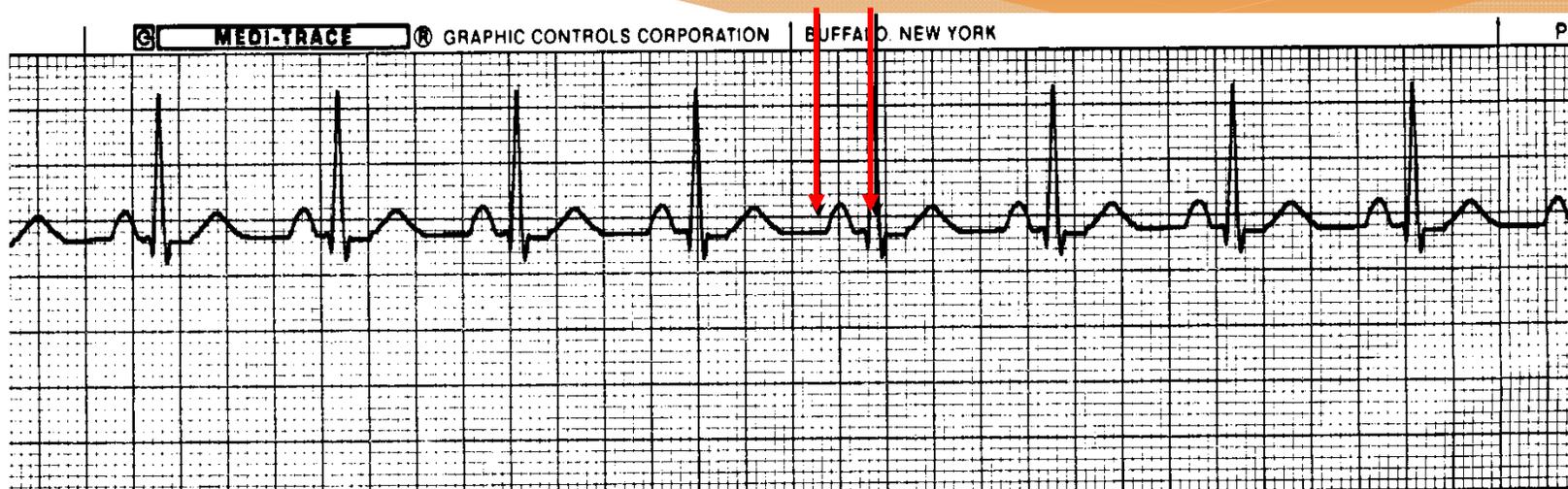
- \* Present?
- \* Appearance?
- \* Consistency?
- \* Relation to QRS?

# STEP 3 - Is the P Wave Normal



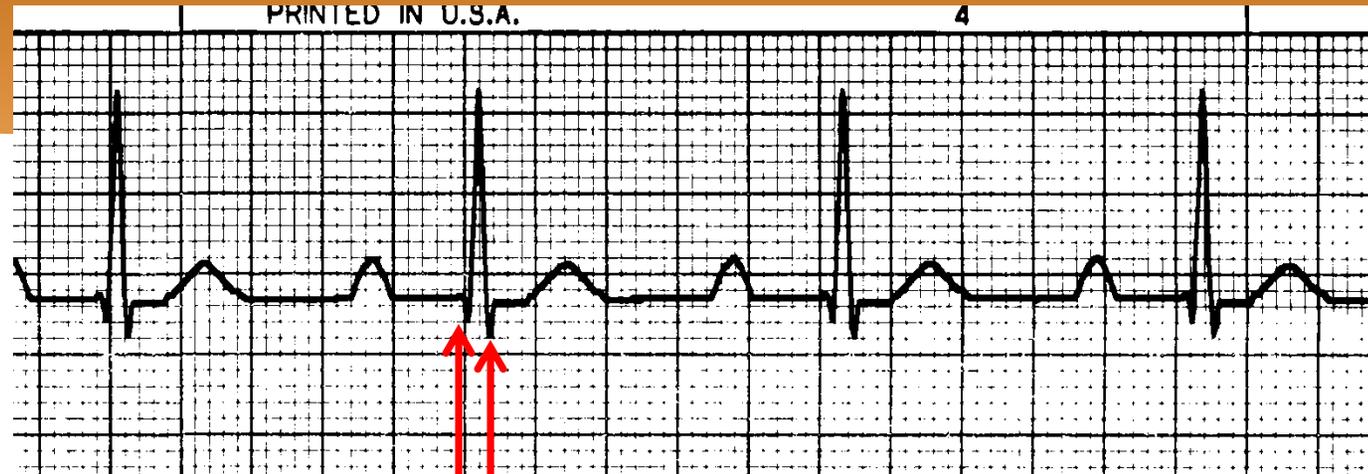
Associated with a  
QRS Complex?

# STEP 4 – PR Interval/Relationship



Consistent PRI of  $<.20$  secs  
is normal,  
lengthened or variant PRI's  
could indicate an AV block

# STEP FIVE –QRS DURATION

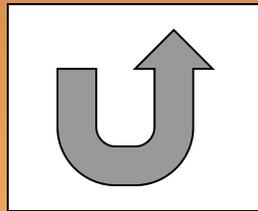


- A narrow QRS complex ( $< 0.12$ ), indicates the impulse has followed the normal conduction pathway
- A widened QRS complex ( $> 0.12$ ), may indicate the impulse was generated somewhere in the ventricles

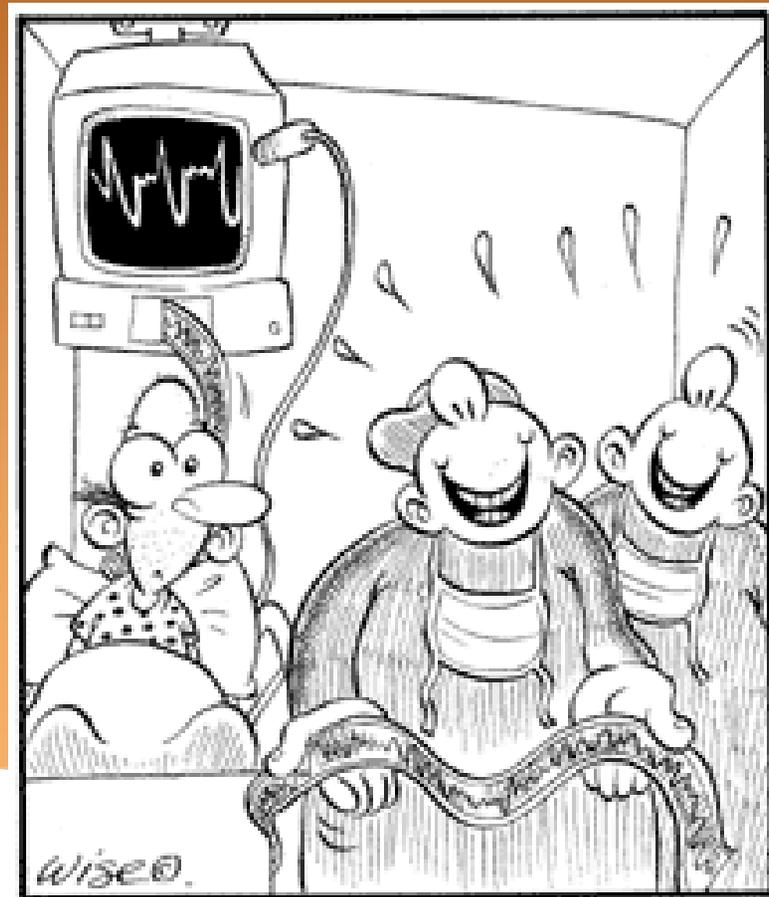
# REMEMBER!!!

- \* Use a systematic approach
- \* Go through all the steps
- \* Take your time!
- \* Compare with your characteristics list
- \* Interpret the dysrhythmia

# QUESTIONS?



# Let's Have Some Fun!



# Sinus Mechanisms

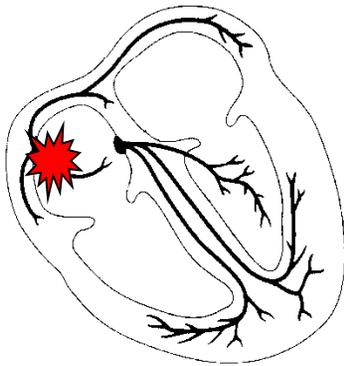
# Sinus Node

- \* Normal Sinus Rhythm (NSR)
- \* Sinus Bradycardia
- \* Sinus Tachycardia
- \* Sinus Arrhythmia
- \* Sinus Arrest/Pause
- \* Sinoatrial Exit Block

# Normal Sinus Rhythm (NSR)

- \* **Rate:** 60-100 beats/min
- \* **Rhythm:** regular
- \* **P waves:** uniform, + (upright) in lead II, one precedes each QRS complex
- \* **PR interval:** 0.12 - 0.20 seconds and constant
- \* **QRS duration:** < 0.12 sec

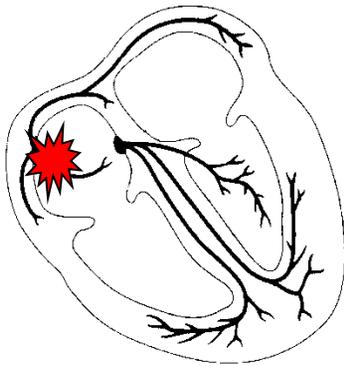
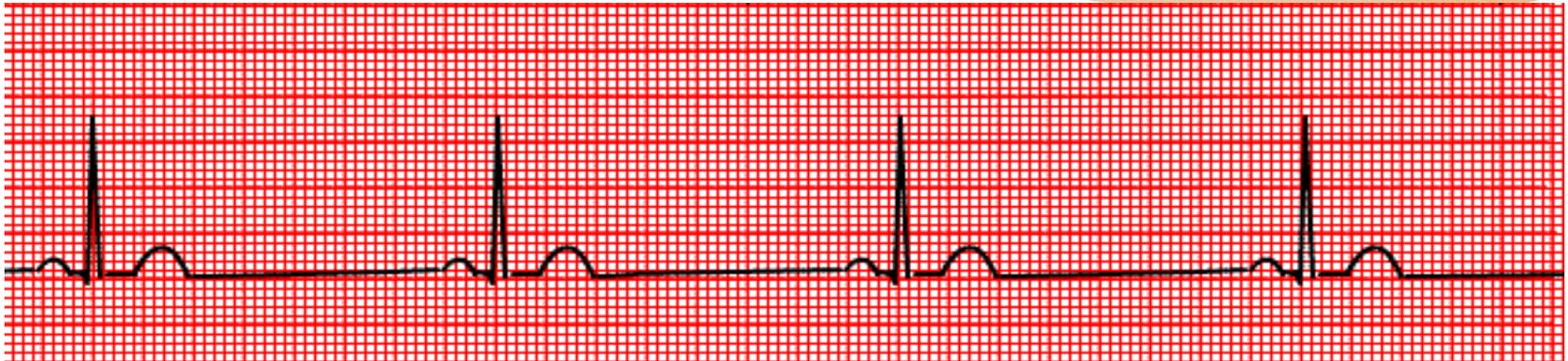
# Normal Sinus Rhythm (NSR)



# Sinus Bradycardia

- \* **Rate:** *less than 60 beats/min*
- \* **Rhythm:** regular
- \* **P waves:** uniform in appearance, upright and one precedes each QRS complex
- \* **PR interval:** 0.12 - 0.20 sec and constant
- \* **QRS duration:** < 0.12 sec

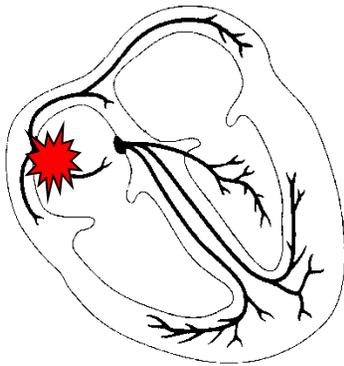
# Sinus Bradycardia



# Sinus Tachycardia

- \* **Rate:** *greater than 100-150 beats/min*
- \* **Rhythm:** regular
- \* **P waves:** uniform, upright, one precedes each QRS
- \* **PR interval:** 0.12 - 0.20 sec and constant
- \* **QRS duration:** < 0.12 sec

# Sinus Tachycardia



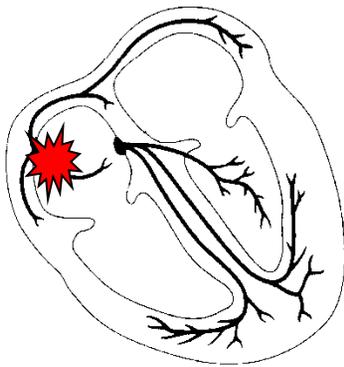
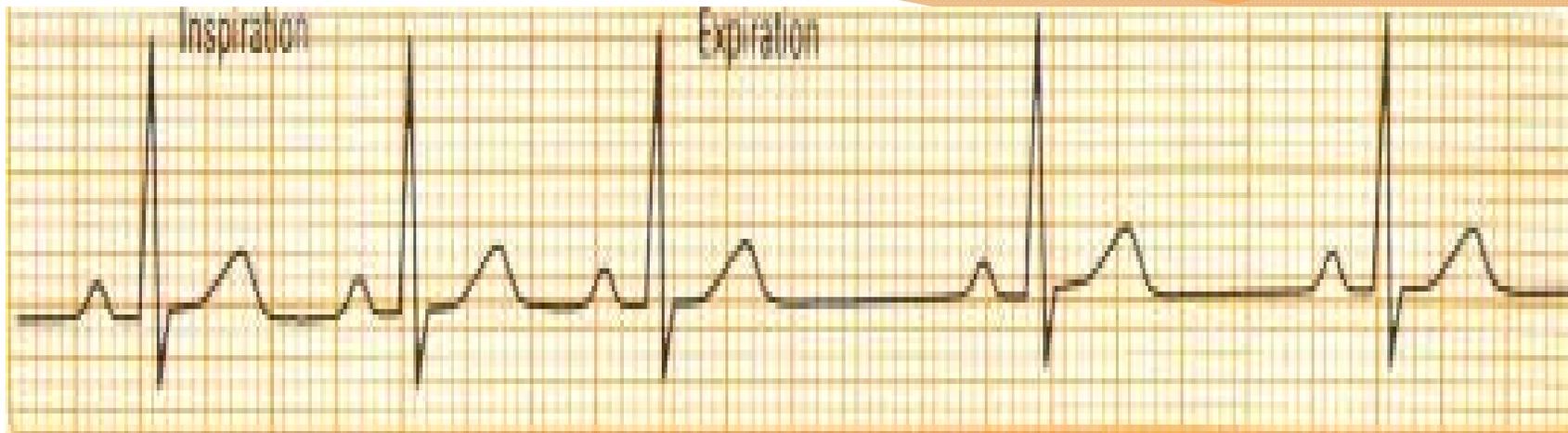
# ENOUGH OF SINUS



# Sinus Arrhythmia

- \* **Rate:** 60-100 beats/min
- \* **Rhythm:** *irregular*
- \* **P waves:** uniform in appearance, upright, one precedes each QRS
- \* **PR interval:** 0.12 - 0.20 sec and constant
- \* **QRS duration:** < 0.12 sec

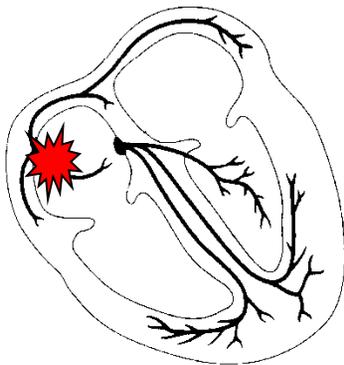
# Sinus Arrhythmia



# Sinus Arrest/Pause

- \* **Rate:** *usually normal but varies due to the arrest*
- \* **Rhythm:** *irregular; the arrest is of undetermined length*
- \* **P waves:** uniform in appearance, upright, one precedes each QRS
- \* **PR interval:** 0.12 - 0.20 sec and constant
- \* **QRS duration:** < 0.12 sec

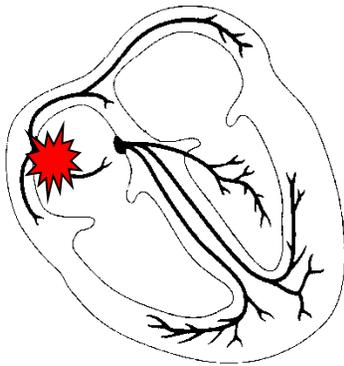
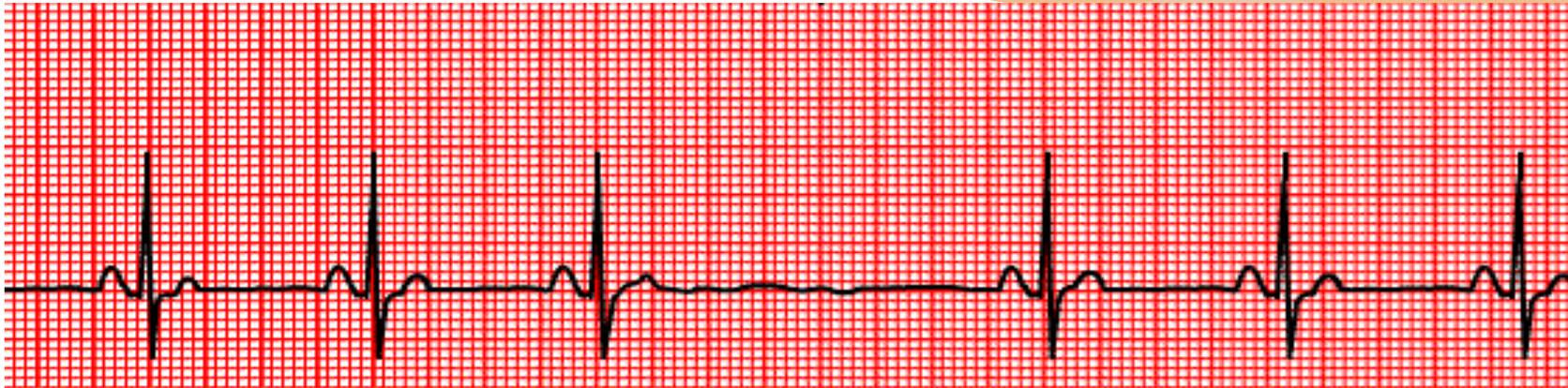
# Sinus Arrest/Pause



# Sinoatrial Exit Block

- \* **Rate:** *varies due to the pause*
- \* **Rhythm:** *irregular; each pause is the same as the distance between two other P-P intervals*
- \* **P waves:** uniform in appearance, upright, one precedes each QRS
- \* **PR interval:** 0.12 - 0.20 sec and constant
- \* **QRS duration:** < 0.12 sec

# Sinoatrial Exit Block



# Atrial Dysrhythmias

# Atrial Dysrhythmias

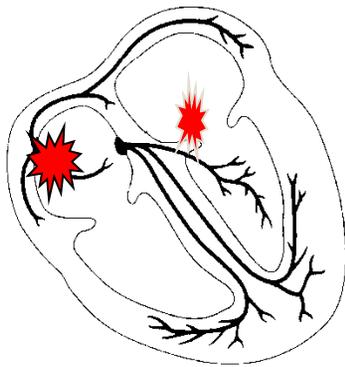
- \* Premature Atrial Complexes (PACs)
- \* Wandering Atrial Pacemaker (WAP)
- \* Supraventricular Tachycardia (SVT)
- \* Wolff-Parkinson-White Syndrome (WPW)
- \* Atrial Flutter
- \* Atrial Fibrillation (A-Fib)

# Premature Atrial Complexes (PACs)

- \* **Rate:** *depends on underlying rhythm*
- \* **Rhythm:** *regular with premature beats*
- \* **P waves:** *premature (earlier than expected) and may differ in shape from sinus P waves*
- \* **PR interval:** 0.12 - 0.20 sec and constant
- \* **QRS duration:** < 0.12 sec

Note: Ectopic complex

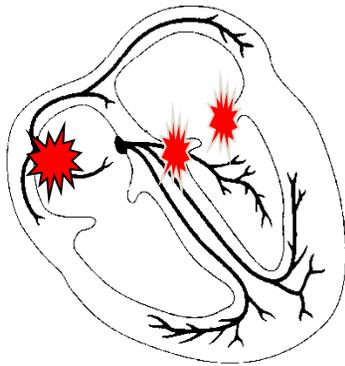
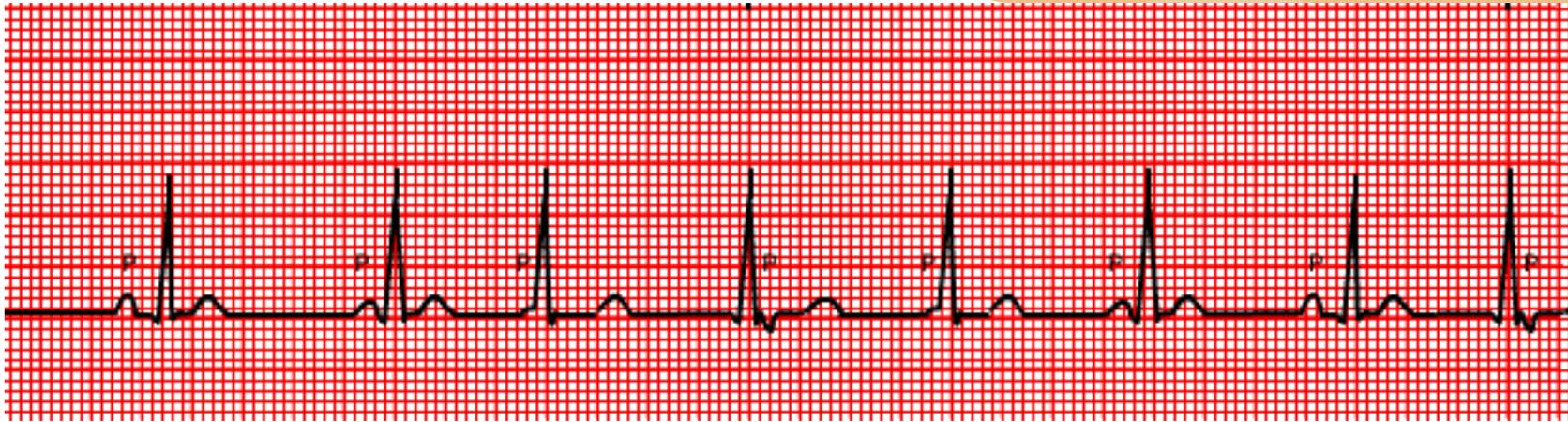
# Premature Atrial Complexes (PACs)



# Wandering Atrial Pacemaker (WAP)

- \* **Rate:** usually 60-100 beats/min; *if greater than 100 beats/min, it's termed multifocal atrial tachycardia*
- \* **Rhythm:** *may be normal or irregular due to shift in ectopic atrial locations*
- \* **P waves:** *size, shape and direction change (3 or more different P waves)*
- \* **PR interval:** *may be normal or variable*
- \* **QRS duration:** < 0.12 sec

# Wandering Atrial Pacemaker (WAP)

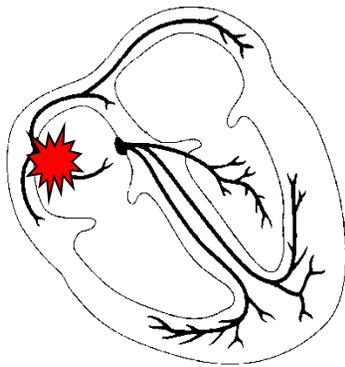
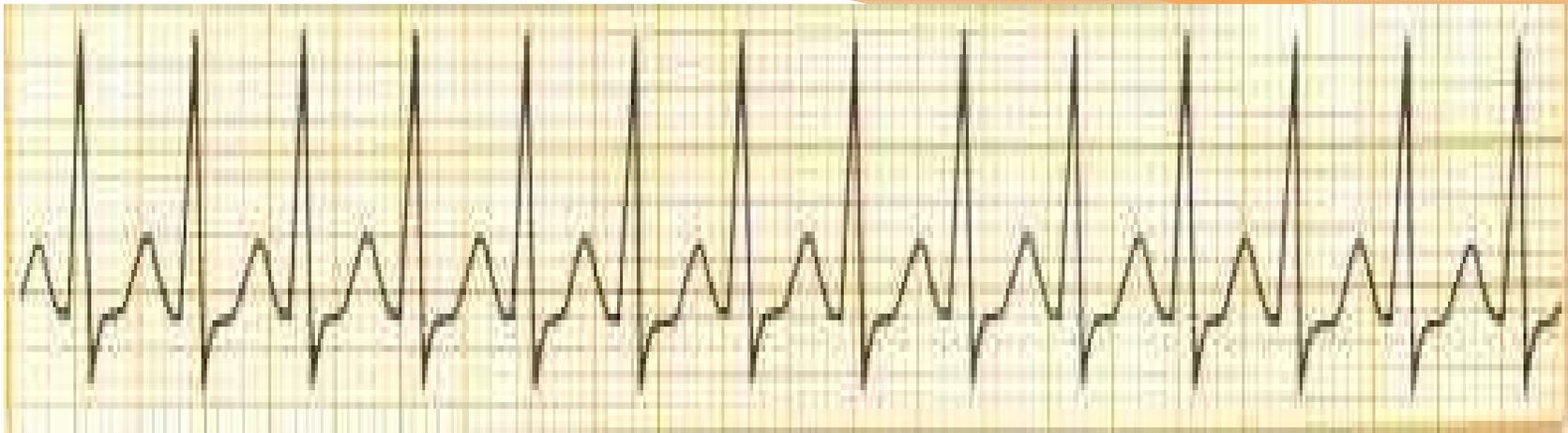


# Supraventricular Tachycardia (SVT/PSVT)

- \* **Rate:** *120-250 beats/min*
- \* **Rhythm:** regular
- \* **P waves:** *not present*
- \* **PR interval:** *not measurable*
- \* **QRS duration:** < 0.12 sec

Note: PSVT is an SVT  
that starts/ends suddenly

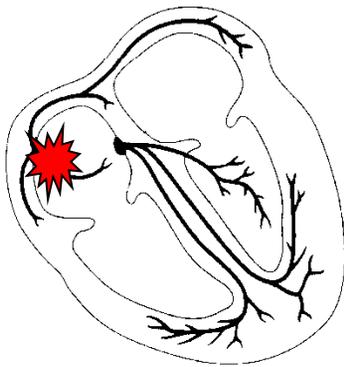
# Supraventricular Tachycardia (SVT)



# Wolff-Parkinson-White Syndrome (WPW)

- \* **Rate:** usually 60-100 beats/min (can be associated with runs/episodes of A-Fib)
- \* **Rhythm:** regular
- \* **P waves:** uniform in appearance, upright, one precedes each QRS
- \* **PR interval:** 0.12 - 0.20 sec and constant
- \* **QRS duration:** *usually > 0.12 sec; slurred upstroke of the QRS complex (delta wave)*

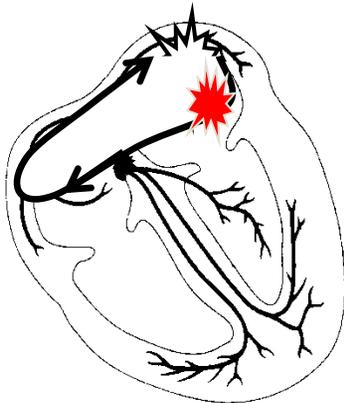
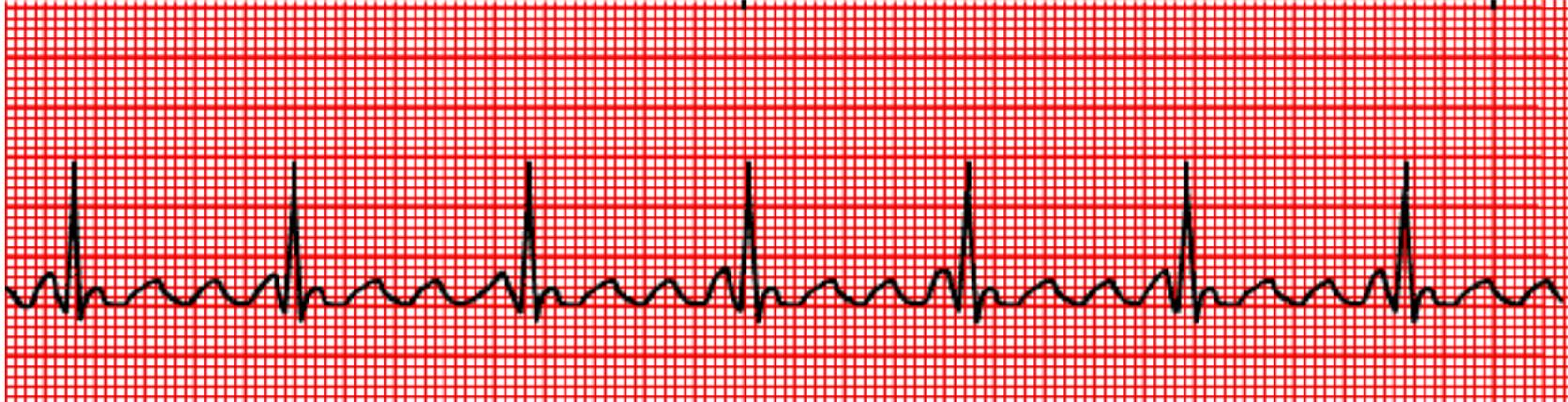
# Wolff-Parkinson-White Syndrome (WPW)



# Atrial Flutter

- \* **Rate:** *atrial rate 250-450 beats/min; ventricular rate will not usually exceed 180 beats/min*
- \* **Rhythm:** *atrial regular; ventricular regular or irregular*
- \* **P waves:** *saw-toothed “flutter” waves*
- \* **PR interval:** *not measurable*
- \* **QRS duration:**  $< 0.12$  sec

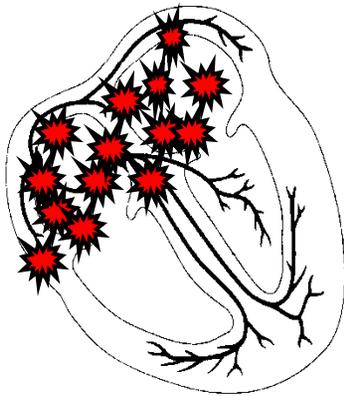
# Atrial Flutter



# Atrial Fibrillation (A-fib)

- \* Rate: *variable*
- \* Rhythm: *irregularly irregular*
- \* P waves: *no identifiable P waves*
- \* PR interval: *not measurable*
- \* QRS duration: < 0.12 sec

# Atrial Fibrillation (A-fib)



# Junctional Rhythms

# Junctional Rhythms

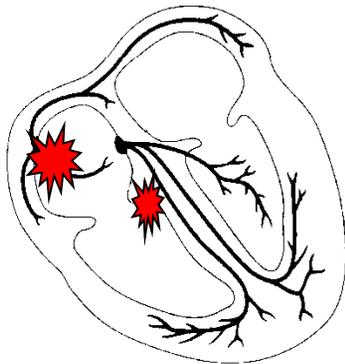
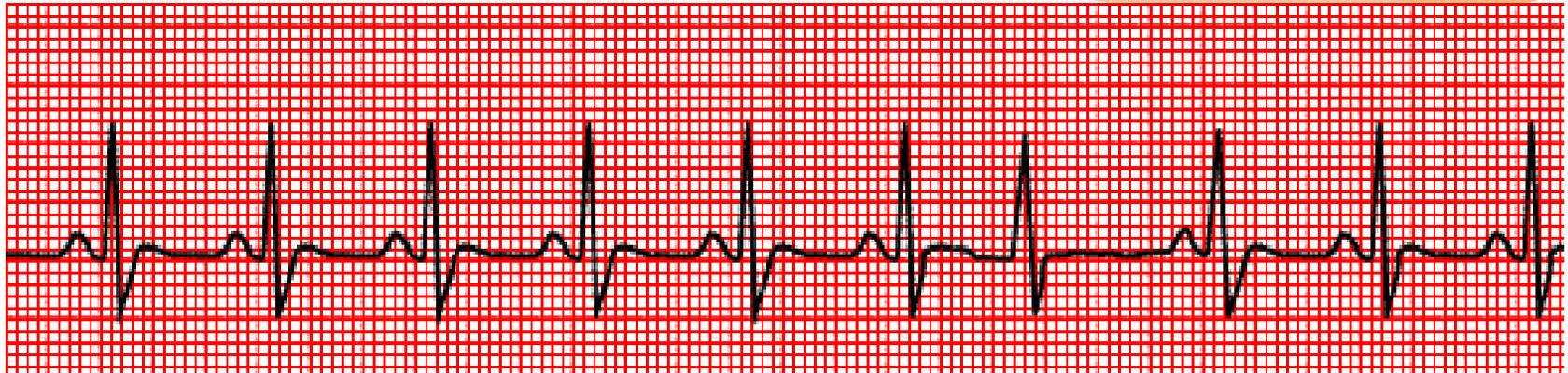
- \* Premature Junctional Complex (PJC)
- \* Junctional Rhythm
- \* Accelerated Junctional Rhythm
- \* Junctional Tachycardia

# Premature Junctional Complexes (PJC)

- \* **Rate:** usually normal but depends on the underlying rhythm
- \* **Rhythm:** *regular with premature beats*
- \* **P waves:** *may occur before, during or after the QRS (inverted if visible)*
- \* **PR interval:** *if P visible, < or = to 0.12 sec*
- \* **QRS duration:** < 0.12 sec

Note: Ectopic complex

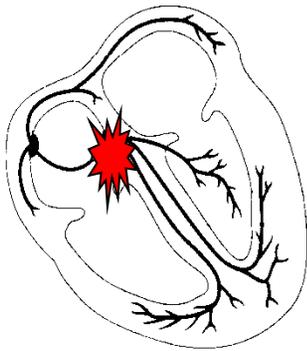
# Premature Junctional Complexes (PJC)



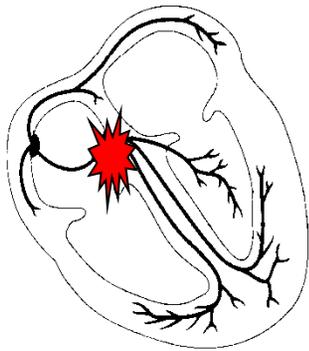
# Junctional Rhythm

- \* **Rate:** *40-60 beats/min*
- \* **Rhythm:** regular
- \* **P waves:** *not present or may occur before, during or after the QRS (inverted if present)*
- \* **PR interval:** *not measurable, but if present usually < or = to 0.12 sec*
- \* **QRS duration:** < 0.12 sec

# Junctional Rhythm



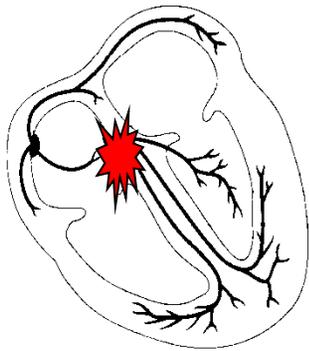
# Junctional Rhythm



# Accelerated Junctional Rhythm

- \* **Rate:** *61-100 beats/min*
- \* **Rhythm:** regular
- \* **P waves:** *not present or may occur before, during or after the QRS (inverted if present; may be notched or S waved)*
- \* **PR interval:** *not measurable, but if present usually < or = to 0.12 sec*
- \* **QRS duration:** < 0.12 sec

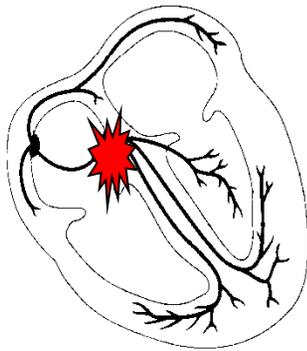
# Accelerated Junctional Rhythm



# Junctional Tachycardia

- \* **Rate:** *101-180 beats/min*
- \* **Rhythm:** regular
- \* **P waves:** *not present or may occur before, during or after the QRS (inverted if present)*
- \* **PR interval:** *not measurable, but if present usually < or = to 0.12 sec*
- \* **QRS duration:** < 0.12 sec

# Junctional Tachycardia



# Ventricular Rhythms

# Ventricular Rhythms

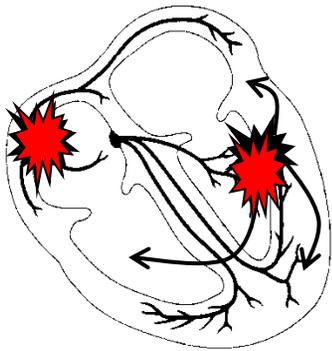
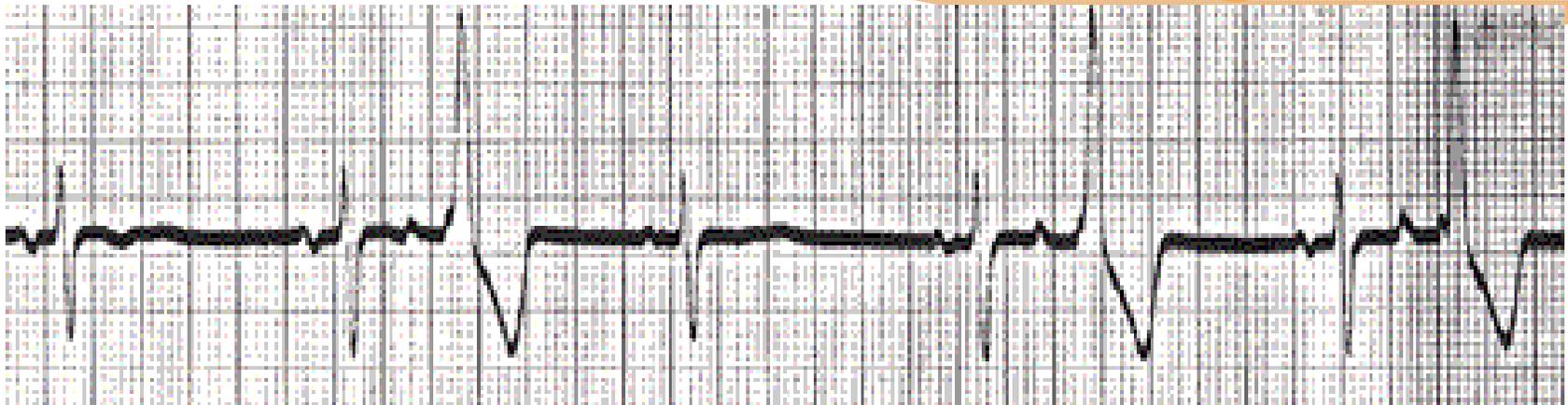
- \* Premature Ventricular Complexes (PVC's)
- \* Idioventricular Rhythm
- \* Ventricular Tachycardia (VT)
- \* Torsades de Pointes (TdP)
- \* Ventricular Fibrillation (VF)
- \* Asystole

# Premature Ventricular Complexes (PVC's)

- \* **Rate:** *depends on underlying rhythm*
- \* **Rhythm:** *regular with premature beats*
- \* **P waves:** *absent*
- \* **PR interval:** *none*
- \* **QRS duration:** *> 0.12 sec, wide and bizarre!*

Note: Ectopic complex

# Premature Ventricular Complexes (PVC's)

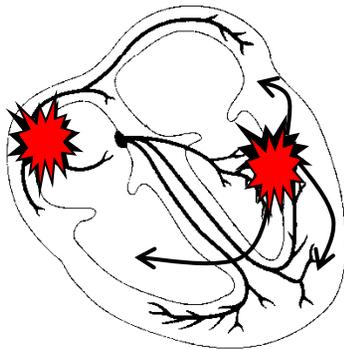


Note – Complexes not  
Contractions

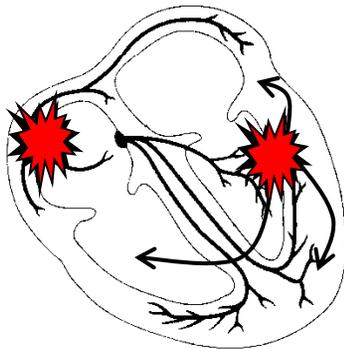
# PVC's

- \* Uniformed/Multiformed
- \* Couplets/Salvos/Runs
- \* Bigeminy/Trigeminy/Quadrageminy

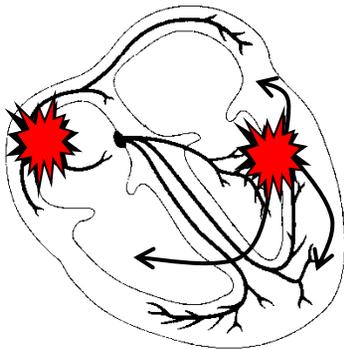
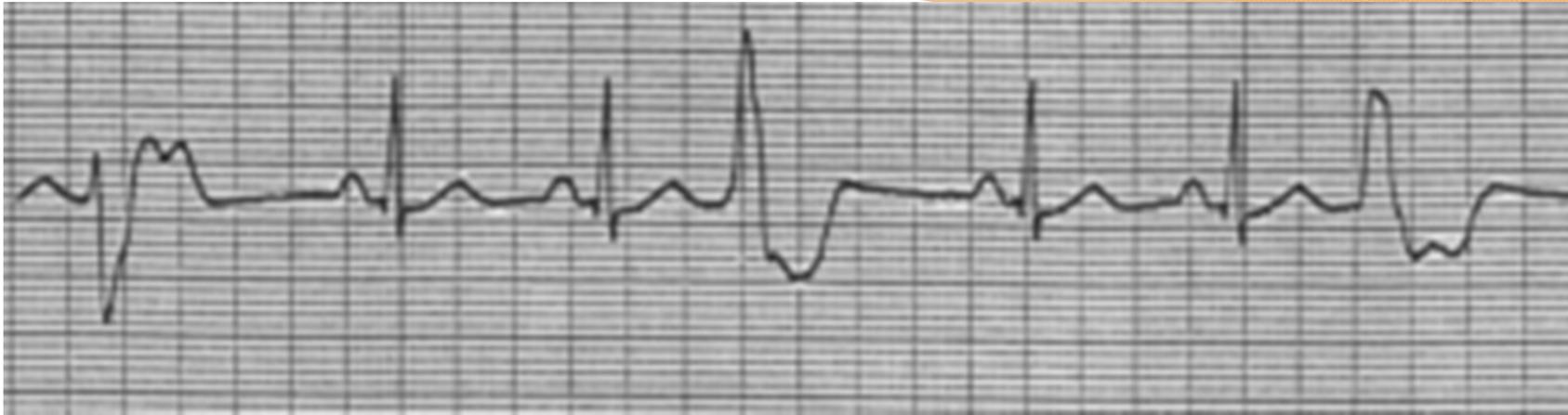
# Uniformed PVC's



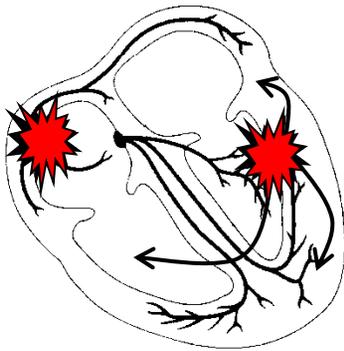
# R on T Phenomena



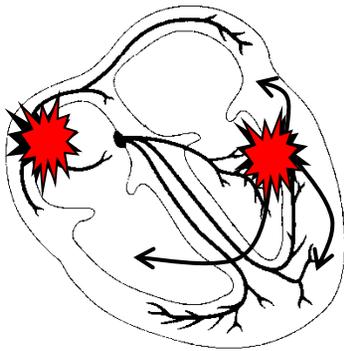
# Multiformed PVC's



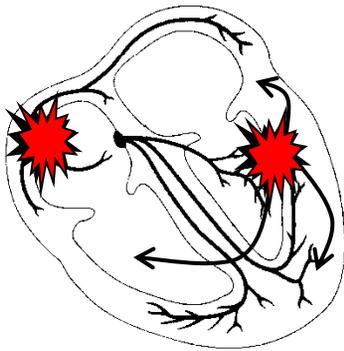
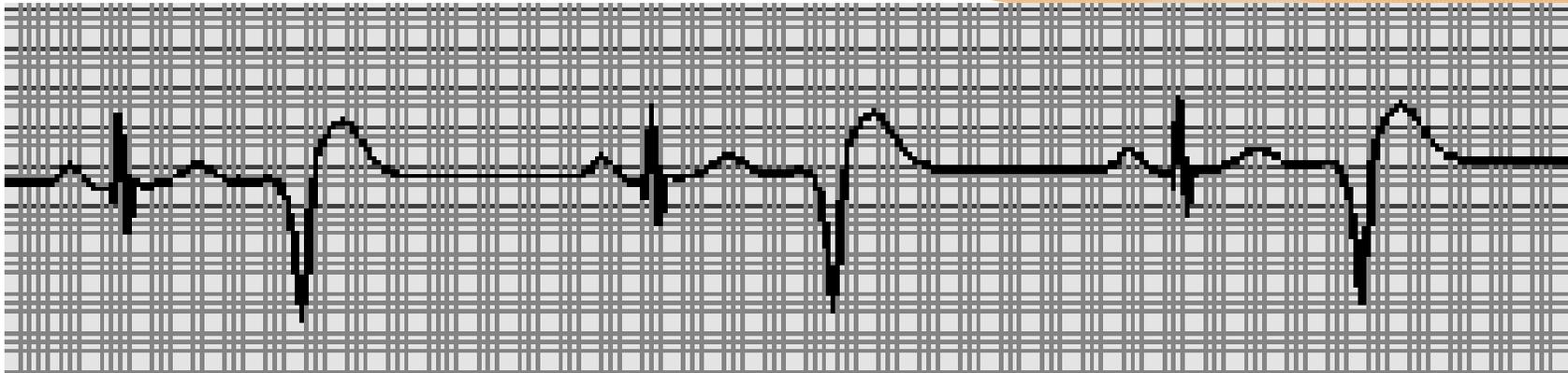
# PVC Couplets



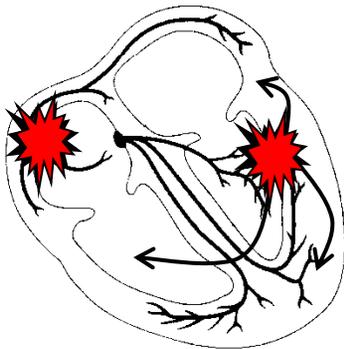
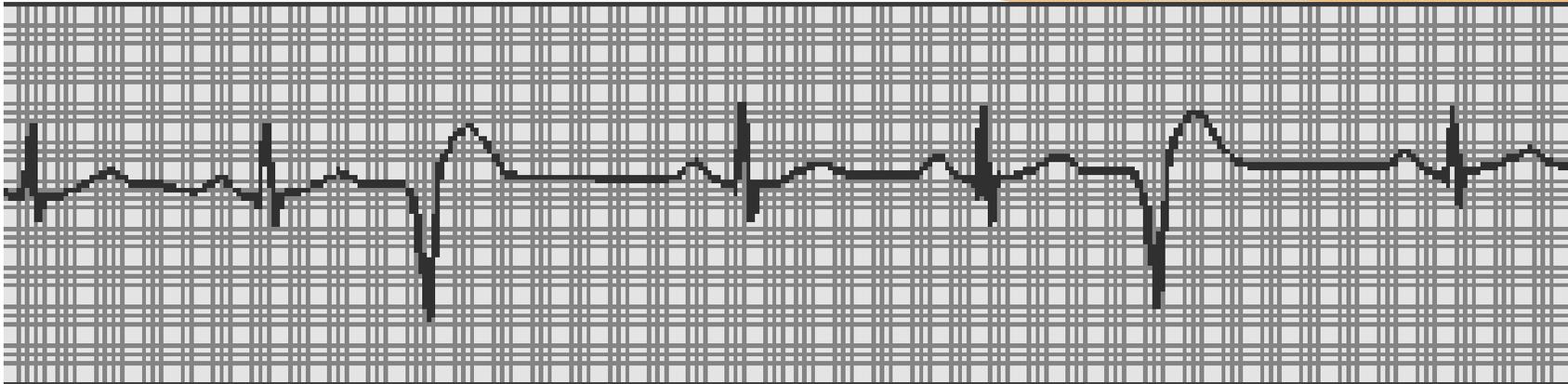
# PVC Salvos and Runs



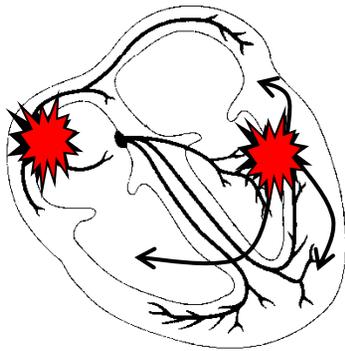
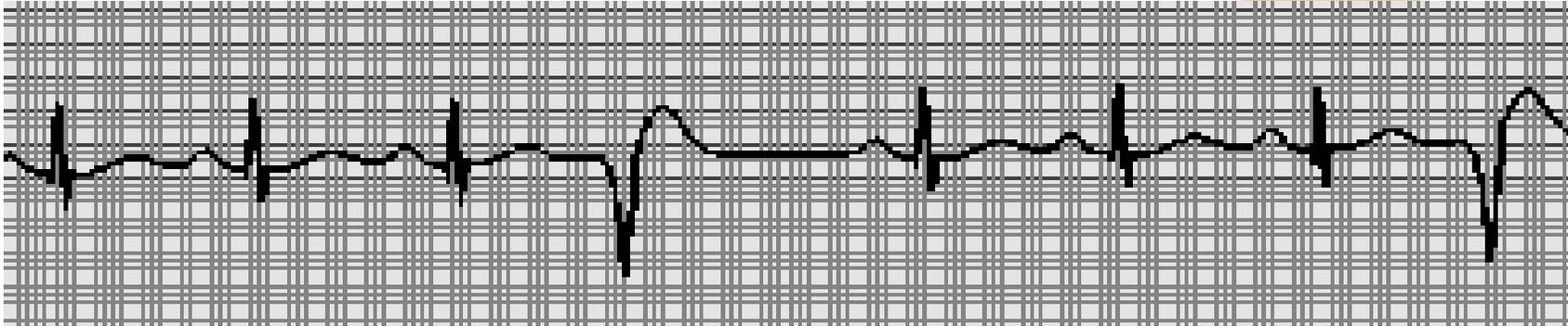
# Bigeminy PVC's



# Trigeminy PVC's



# Quadrageminy PVC's

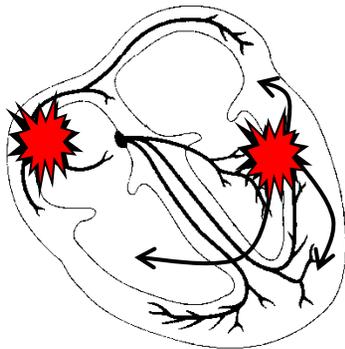


# Ventricular Escape Beats

- \* **Rate:** *depends on underlying rhythm*
- \* **Rhythm:** *regular with late beats; occurs after the next expected sinus beat*
- \* **P waves:** *absent*
- \* **PR interval:** *none*
- \* **QRS duration:** *> 0.12 sec. wide and bizarre*

Note: Ectopic complex

# Ventricular Escape Beats

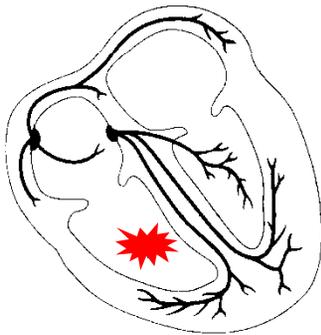
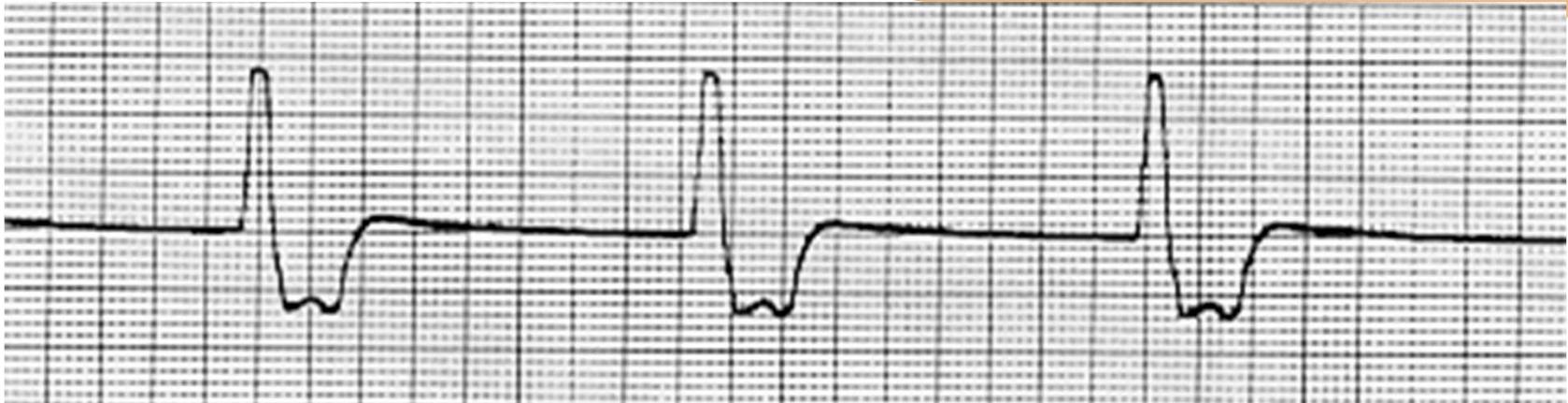


# Idioventricular Rhythm

- \* **Rate:** *20-40 beats/min*
- \* **Rhythm:** regular
- \* **P waves:** *absent*
- \* **PR interval:** *none*
- \* **QRS duration:** *> 0.12 sec*

Note: “Wide and Slow, (Oh No!) it’s Idio”

# Idioventricular Rhythm

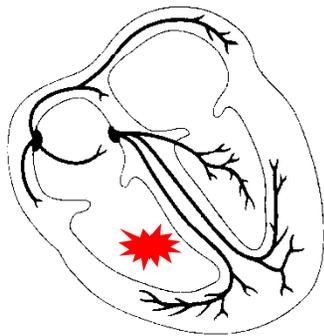
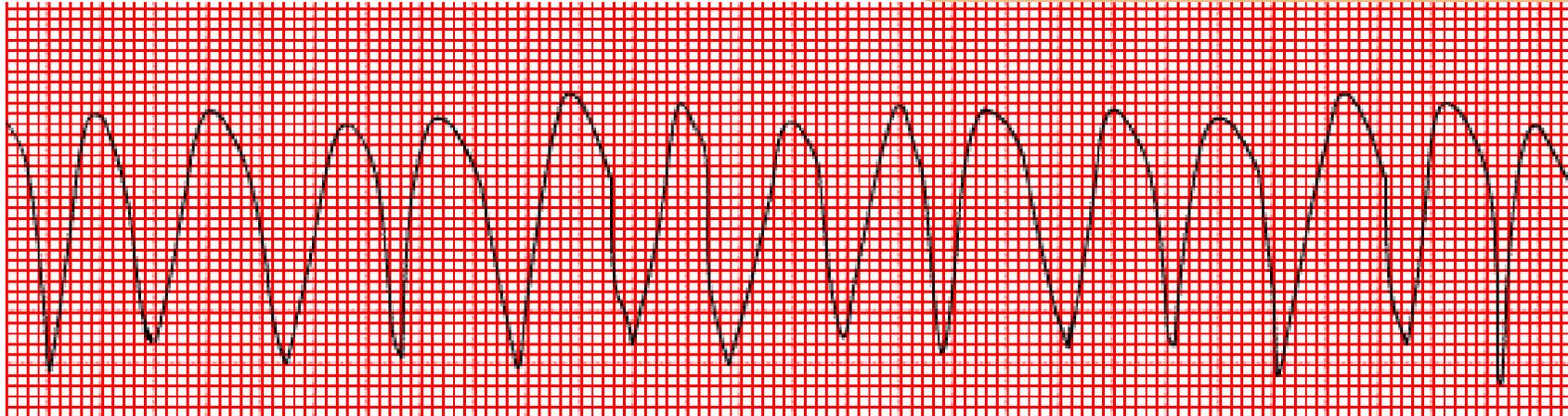


# Ventricular Tachycardia (VT)

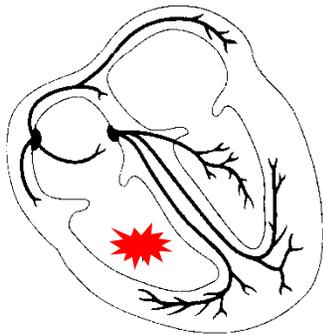
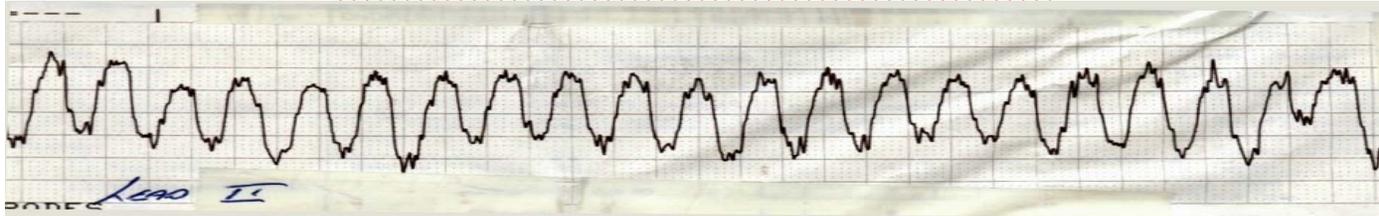
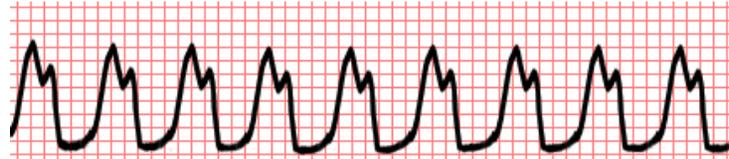
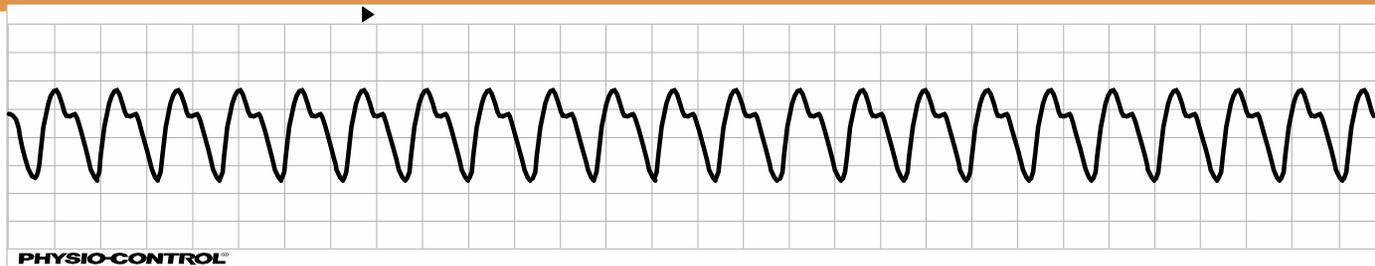
- \* **Rate:** *101-250 beats/min*
- \* **Rhythm:** regular
- \* **P waves:** *absent*
- \* **PR interval:** *none*
- \* **QRS duration:** *> 0.12 sec. often difficult to differentiate between QRS and T wave*

Note: Monomorphic - same shape  
and amplitude

# Ventricular Tachycardia (VT)



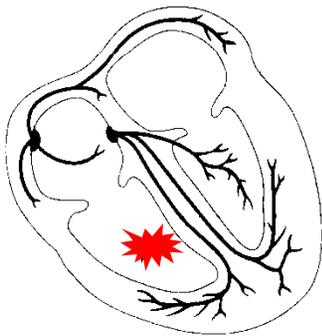
# V Tach



# Torsades de Pointes (TdeP)

- \* **Rate:** *150-300 beats/min*
- \* **Rhythm:** *regular or irregular*
- \* **P waves:** *none*
- \* **PR interval:** *none*
- \* **QRS duration:** *> 0.12 sec. gradual alteration in amplitude and direction of the QRS complexes*

# Torsades de Pointes (TdeP)

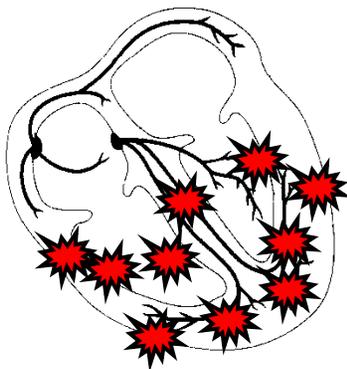
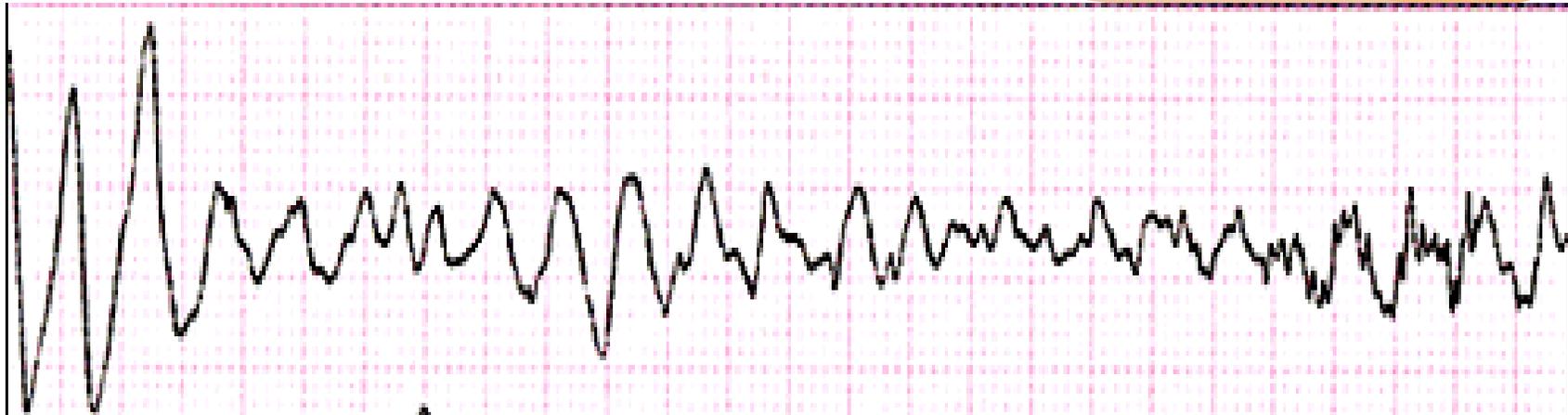


# Ventricular Fibrillation (VF)

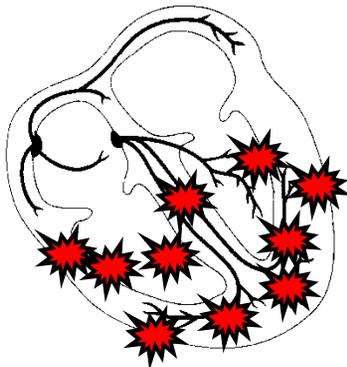
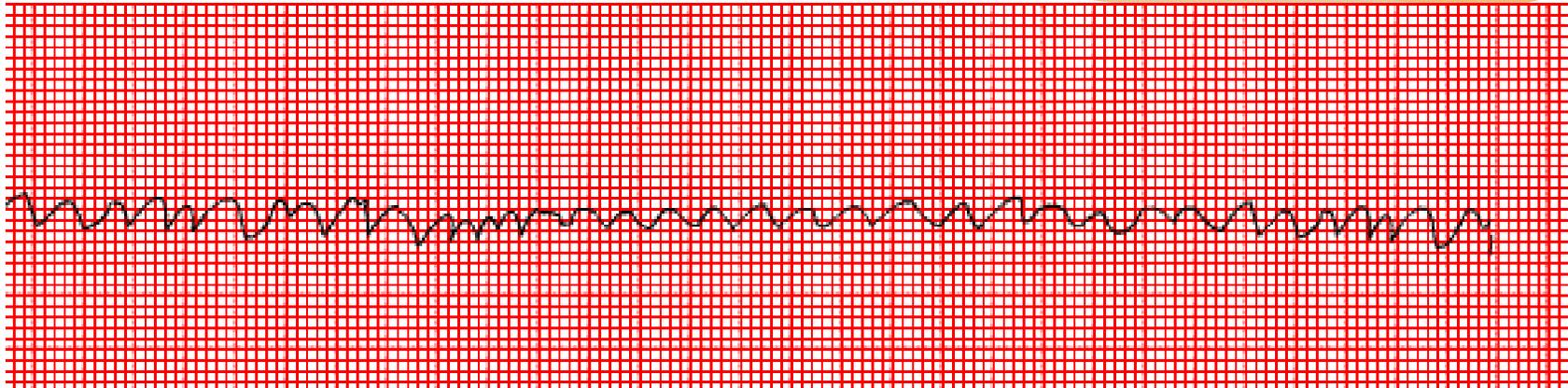
- \* **Rate:** *CNO as no discernible complexes*
- \* **Rhythm:** *rapid and chaotic*
- \* **P waves:** *none*
- \* **PR interval:** *none*
- \* **QRS duration:** *none*

Note: Fine vs. coarse?

# Ventricular Fibrillation (VF)



# Ventricular Fibrillation (VF)



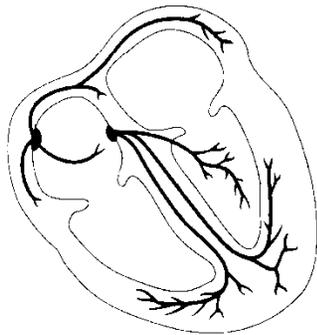
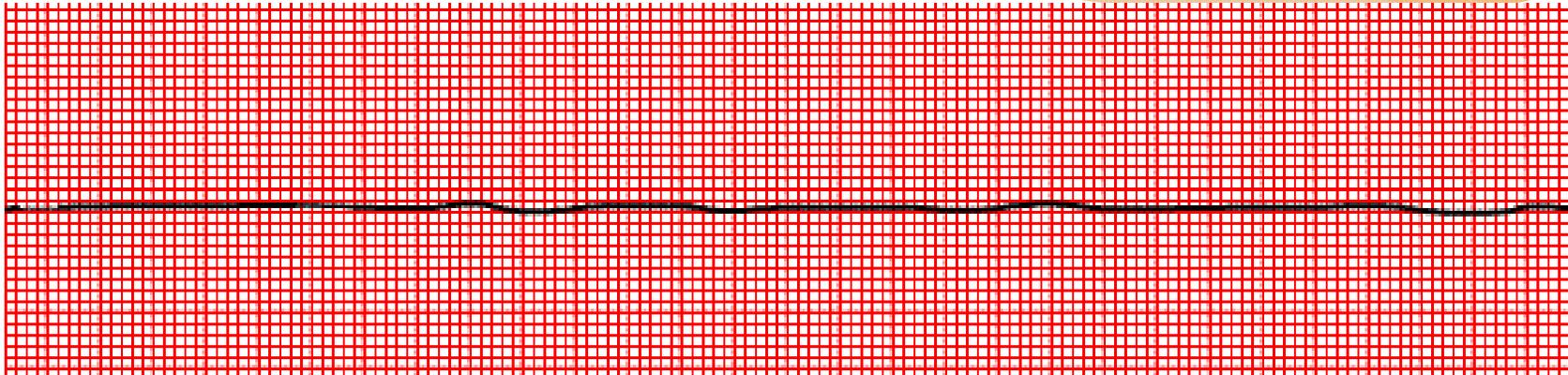


***... "Next time, try to remove his shirt!"***

# Asystole (Cardiac Standstill)

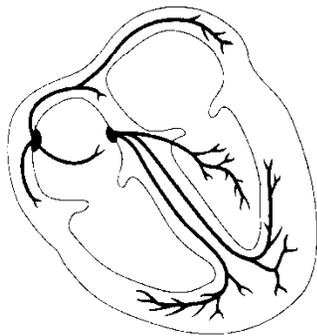
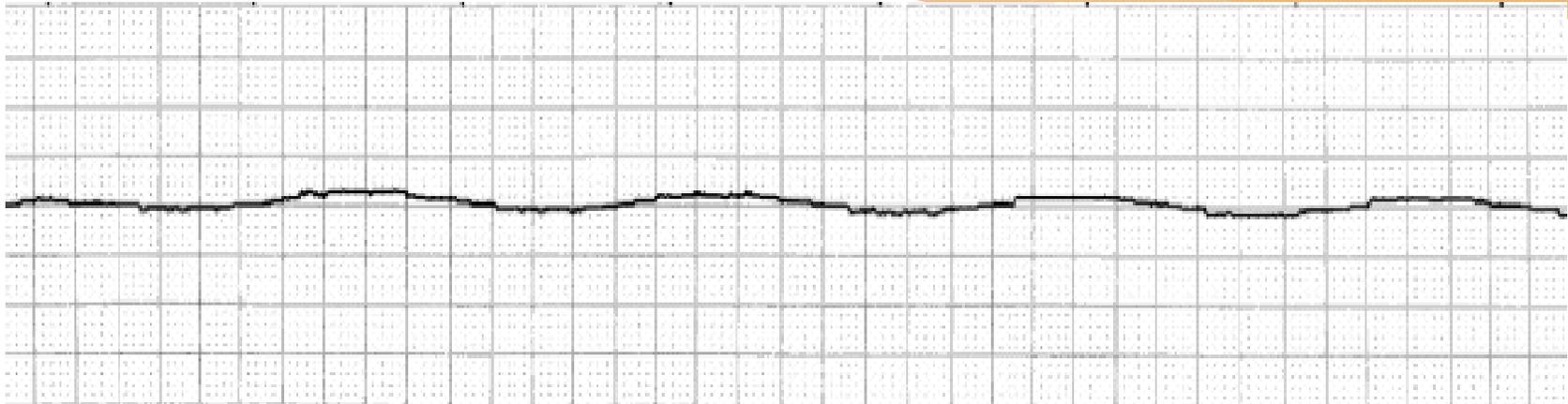
- \* Rate: *none*
- \* Rhythm: *none*
- \* P waves: *none*
- \* PR interval: *not measurable*
- \* QRS duration: *absent*

# Asystole (Cardiac Standstill)

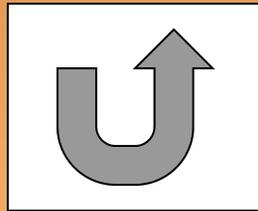


# Asystole

## The Mother of all Bradycardias



# QUESTIONS?



# AtrioVentricular (AV) Blocks

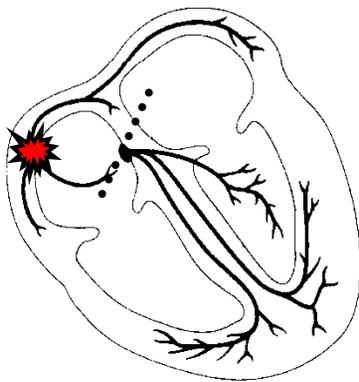
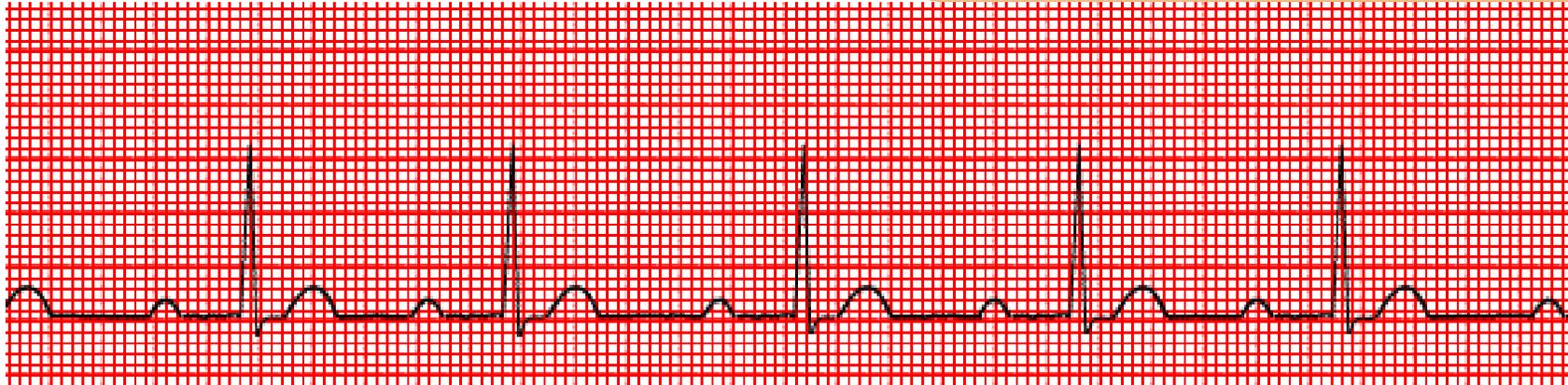
# Atrioventricular (AV) Blocks

- \* First-degree AV block
- \* Second-degree AV block, type I (Wenckebach or Mobitz I)
- \* Second-degree AV block, type II (Mobitz II)
- \* Third-degree AV block (Complete AV Block)

# First-degree AV block

- \* **Rate:** *depends on underlying rhythm (usually regular)*
- \* **Rhythm:** regular
- \* **P waves:** normal in size and shape
- \* **PR interval:** *> 0.20 sec but constant*
- \* **QRS duration:** < 0.12 sec

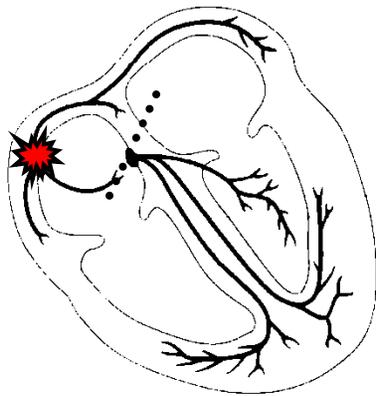
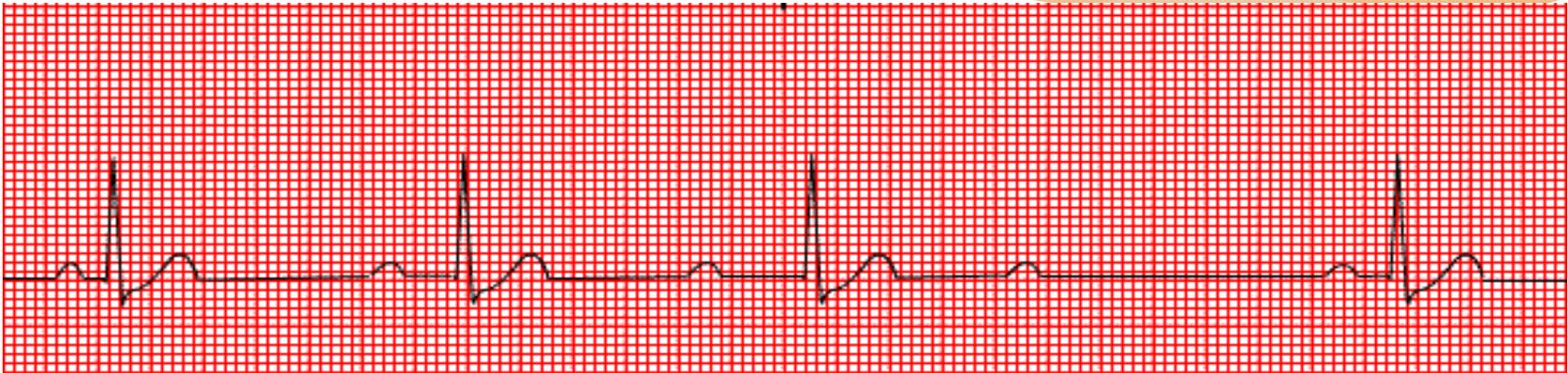
# First-degree AV block



# 2<sup>nd</sup> Degree AV block Type I (Wenckebach/Mobitz Type I)

- \* **Rate:** *atrial rate > ventricular rate*
- \* **Rhythm:** *atrial reg.; ventricular irreg.*
- \* **P waves:** normal in size and shape
- \* **PR interval:** *lengthens with each cycle until a P appears with no QRS complex*
- \* **QRS duration:** *< 0.12 sec (Periodically dropped QRS complex!)*

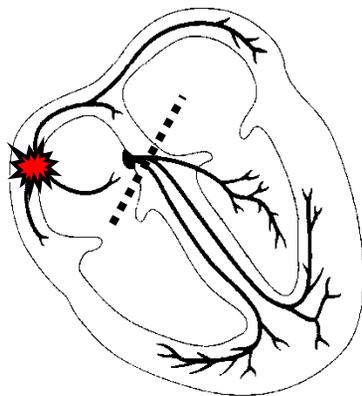
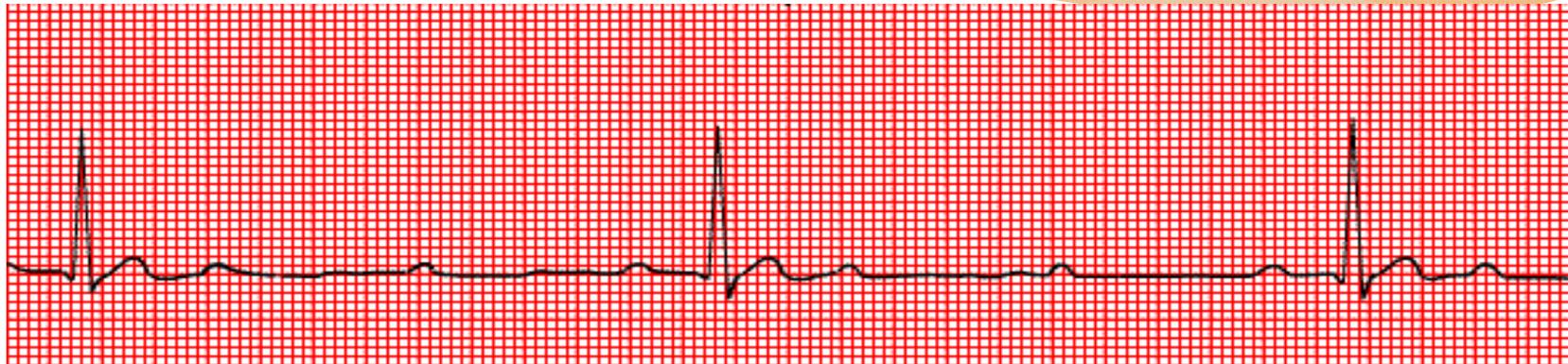
# 2<sup>nd</sup> Degree AV block Type I (Wenckebach/Mobitz Type I)



# 2<sup>nd</sup> Degree AV block Type II (Mobitz Type II)

- \* **Rate:** *atrial rate > the ventricular rate*
- \* **Rhythm:** *atrial reg.; ventricular irreg.*
- \* **P waves:** normal in size and shape
- \* **PR interval:** *within normal limits or slightly prolonged but constant*
- \* **QRS duration:** *< 0.12 sec (Periodically dropped QRS complex!)*

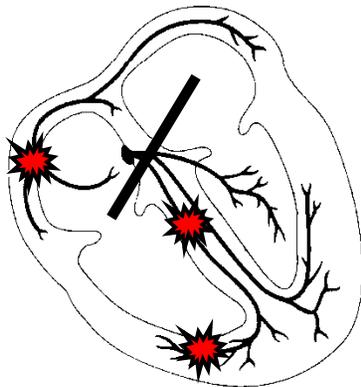
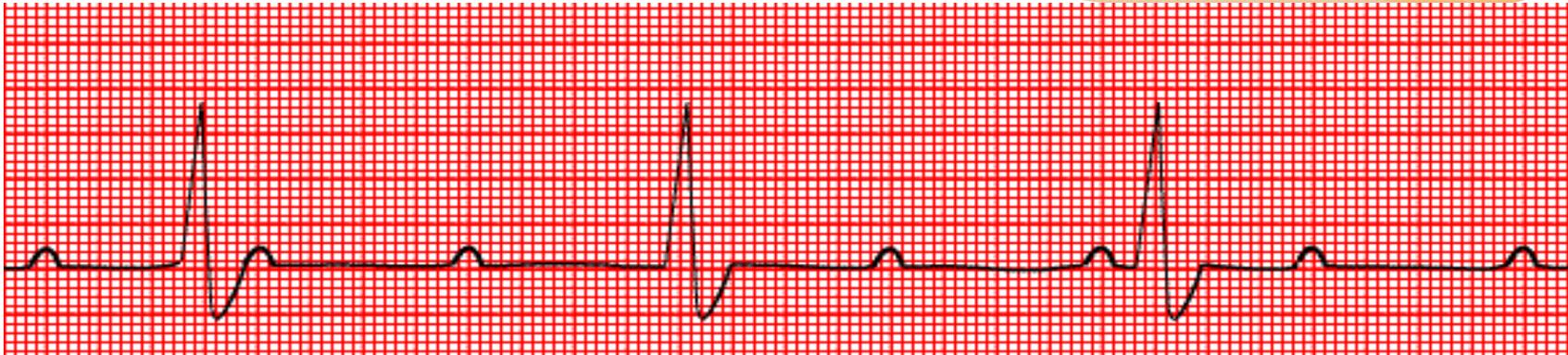
# 2<sup>nd</sup> Degree AV block Type II (Mobitz Type II)



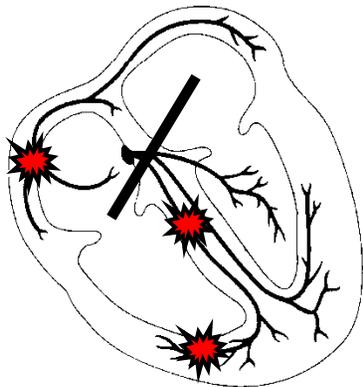
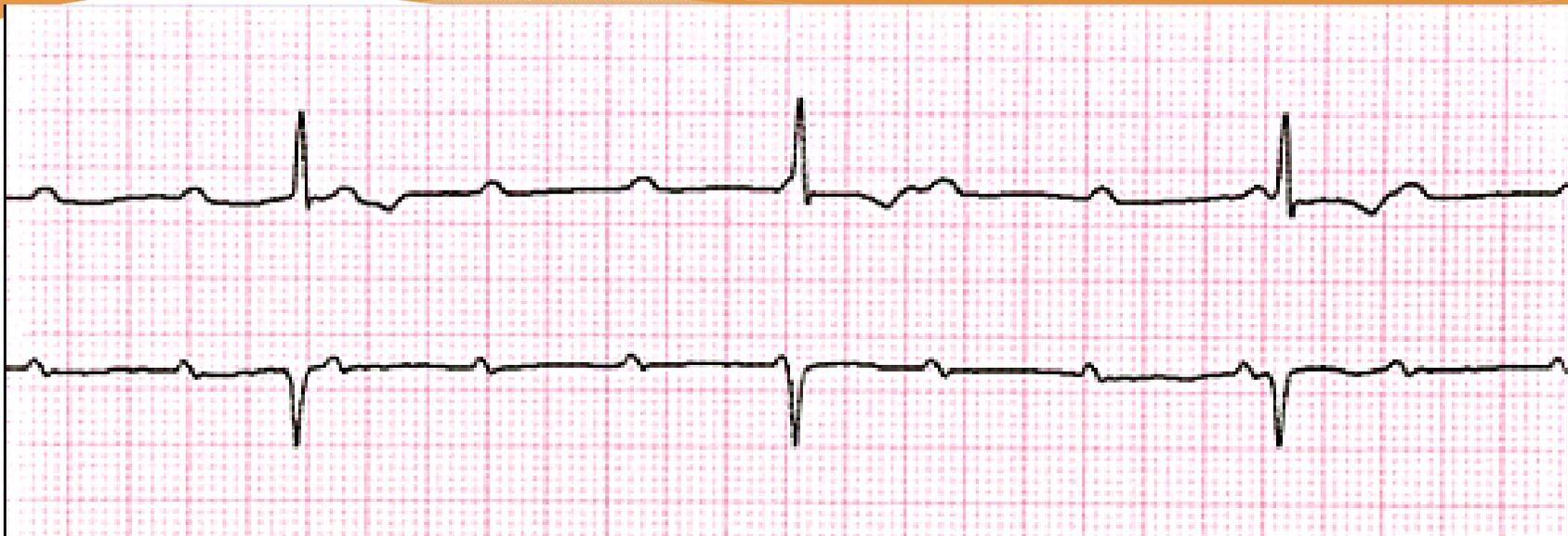
# 3<sup>rd</sup> Degree AV block (Complete AV Block)

- \* **Rate:** *atrial rate is > ventricular rate*
- \* **Rhythm:** *atrial reg.; ventricular reg. (P waves plot through)*
- \* **P waves:** normal in size and shape
- \* **PR interval:** *no relationship (independent)*
- \* **QRS duration:** *narrow or wide depending on location of pacemaker*

# 3<sup>rd</sup> Degree AV block (Complete AV Block)



# 3<sup>rd</sup> Degree AV block



# Pacemaker Rhythms

# Cardiac Pacemakers

- \* Definition

- \* Delivers artificial stimulus to heart
- \* Causes depolarization and contraction

- \* Uses

- \* Bradyarrhythmias
- \* Asystole
- \* Tachyarrhythmias (overdrive pacing)

# Cardiac Pacemakers

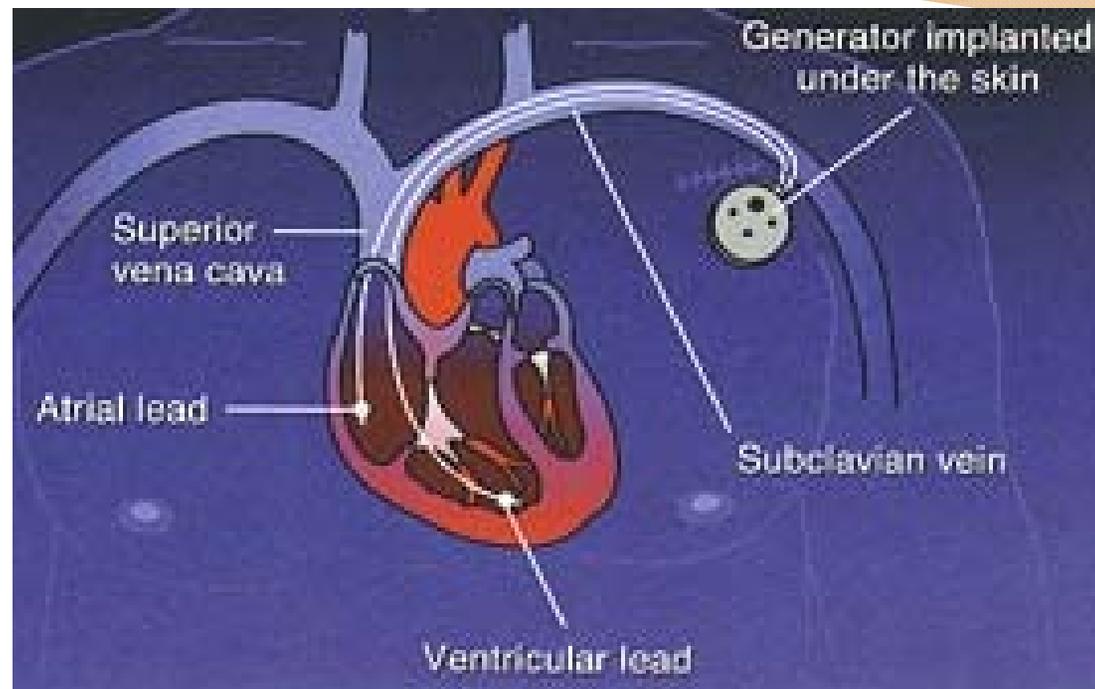
## \* Fixed

- \* Fires at constant rate
- \* Can discharge on T-wave
- \* Very rare

## \* Demand

- \* Senses patient's rhythm
- \* Fires only if no activity sensed after preset interval (escape interval)

# Cardiac Pacemakers



# Cardiac Pacemakers

- \* Demand Pacemaker Types
  - \* Atrial
    - \* Fires atria
    - \* Atria fire ventricles
    - \* Requires intact AV conduction
  - \* Ventricular
    - \* Fires ventricles

# Cardiac Pacemakers

- \* Demand Pacemaker Types
  - \* Atrial Synchronous
    - \* Senses atria
    - \* Fires ventricles
  - \* AV Sequential
    - \* Two electrodes
    - \* Fires atria/ventricles in sequence

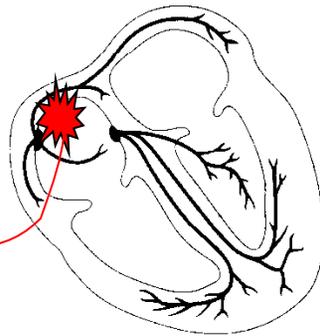
# Cardiac Pacemakers

- \* Special Considerations
  - \* Pacemaker does NOT affect treatment of cardiac arrest
  - \* Do NOT defibrillate directly over pacemaker generator
  - \* Pacemakers may keep AEDs from advising shock

# Atrial Pacemaker (Single Chamber)

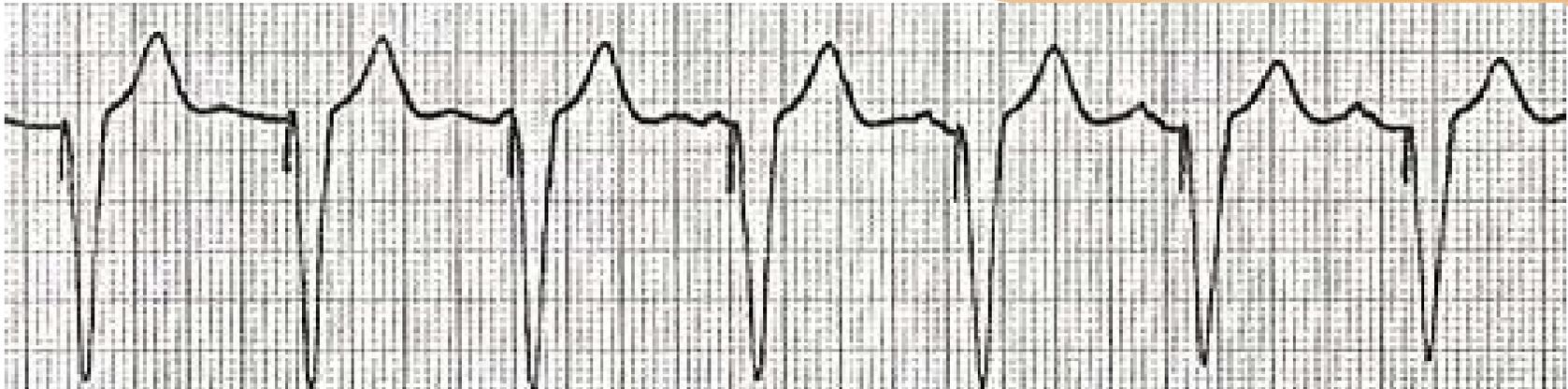


pacemaker

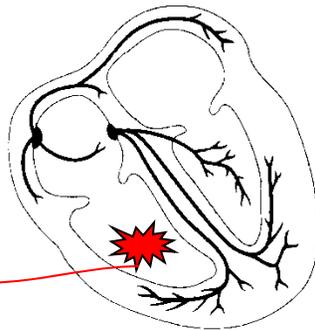


•Capture?

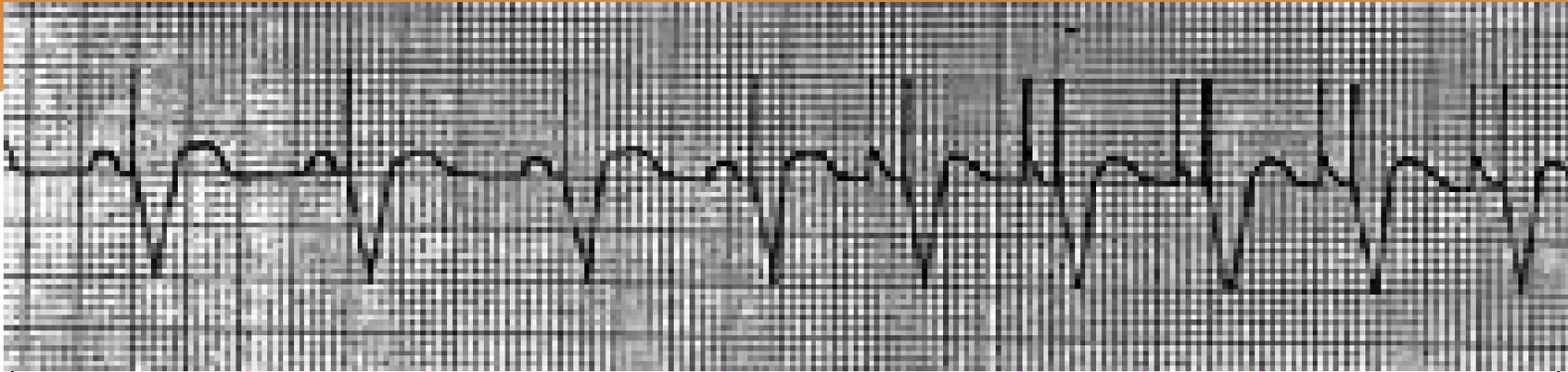
# Ventricular Pacemaker (Single Chamber)



pacemaker

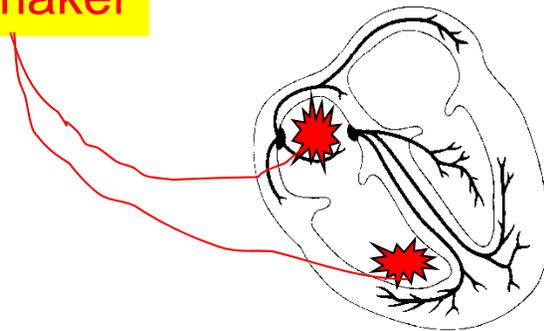


# Dual Paced Rhythm



One spike followed by an abnormal P (atrial capture) followed by a Second spike producing a wide QRS (ventricular capture).

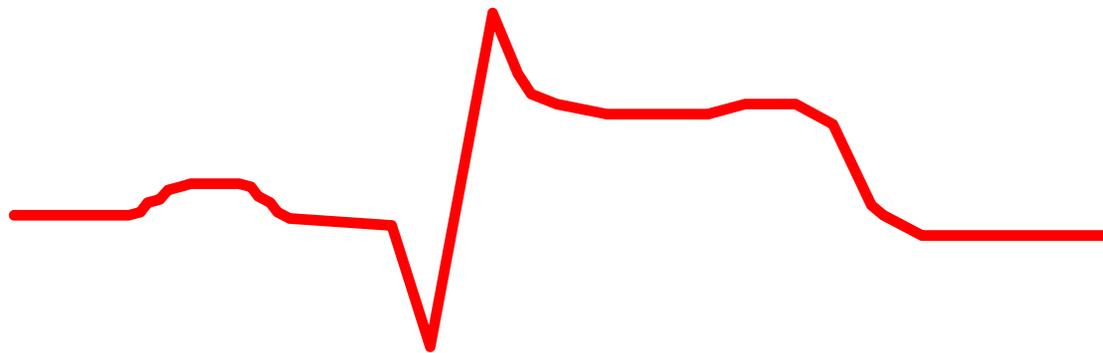
pacemaker



# Special Notes

# S-T Elevation

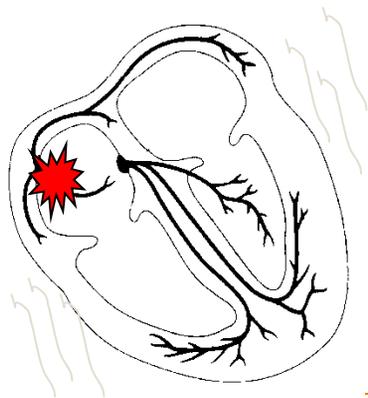
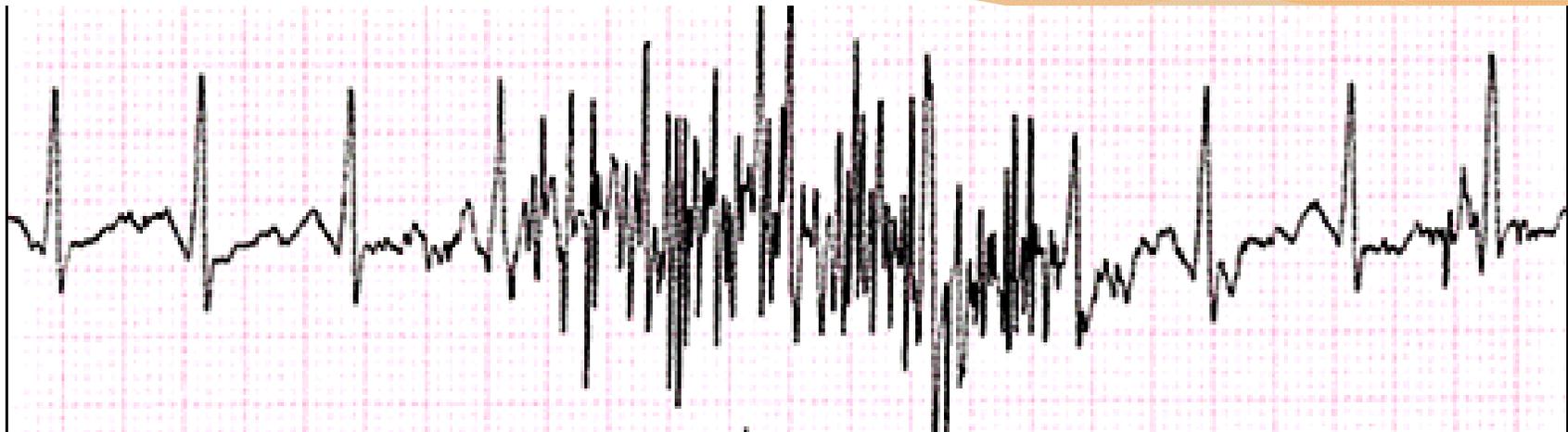
- \* S-T elevation is not significant without a 12 lead interpretation
- \* Should not be reported!



# S-T Elevation

- \* Monitors filter rhythms and show you what they think it should
- \* ST elevation is common on Pts. who show no elevation on 12 Lead

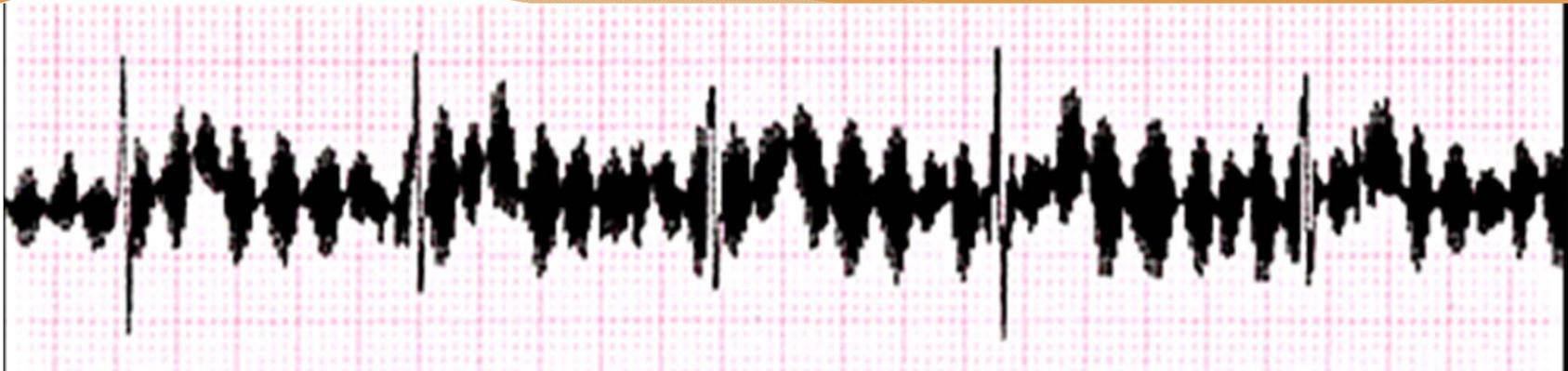
# Artifact



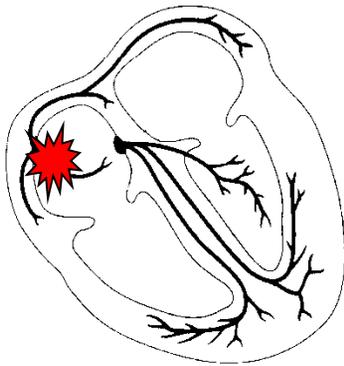
# 60 Cycle Interference

- \* 60 cycle artifact (noise)
- \* Problem solve causes
- \* Electromagnetic emanations:  
i.e. TV's, electric motors, fluorescent lights

# 60 Cycle Interference



**Sixty even, regular spikes in a 1 second interval caused by electrical current near the patient**

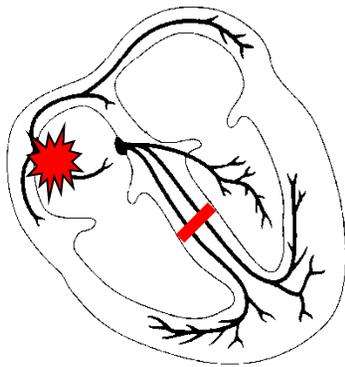
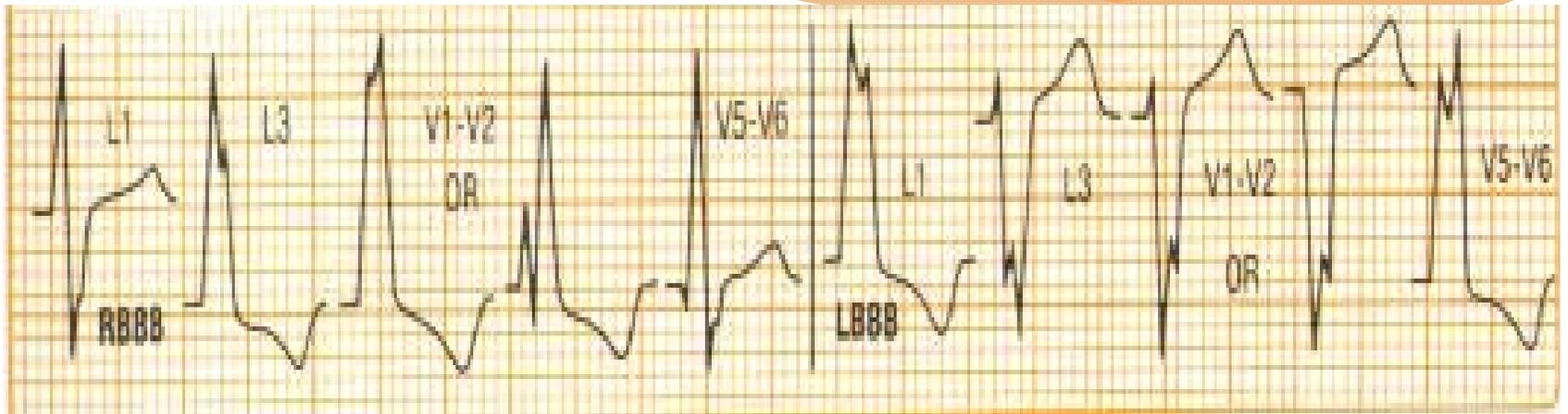


# Aberrancy

## Bundle Branch Block

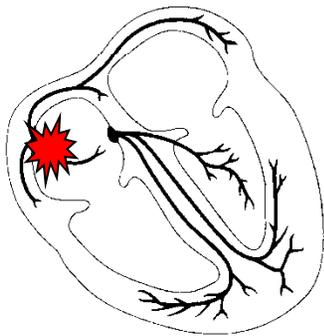
- \* 12 Lead ECG required to diagnose BBB (Left or right BBB?)
- \* Describe widened QRS ( $>0.12$  sec) as “aberrant” unless using 12 lead

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# Pulseless Electrical Activity (PEA)

- \* The absence of a detectable pulse and blood pressure
- \* Presence of electrical activity of the heart as evidenced by ECG rhythm, but not VF or VT



+



= 0/0 mmHg

Practice  
Practice  
Practice  
USE IT OR LOSE IT!!!!

**NOT TO WORRY, MA'AM... NO CHARGE.  
WE HADN'T THE FOGGIEST IDEA WHAT  
WE WERE DOING.**



# Well Done!

Ontario Base Hospital Group  
Self-directed Education Program

