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## **EKG INTERPRETATION & ARRHYTHMIAS**

Handmade Notes to help you ace your nursing exam!

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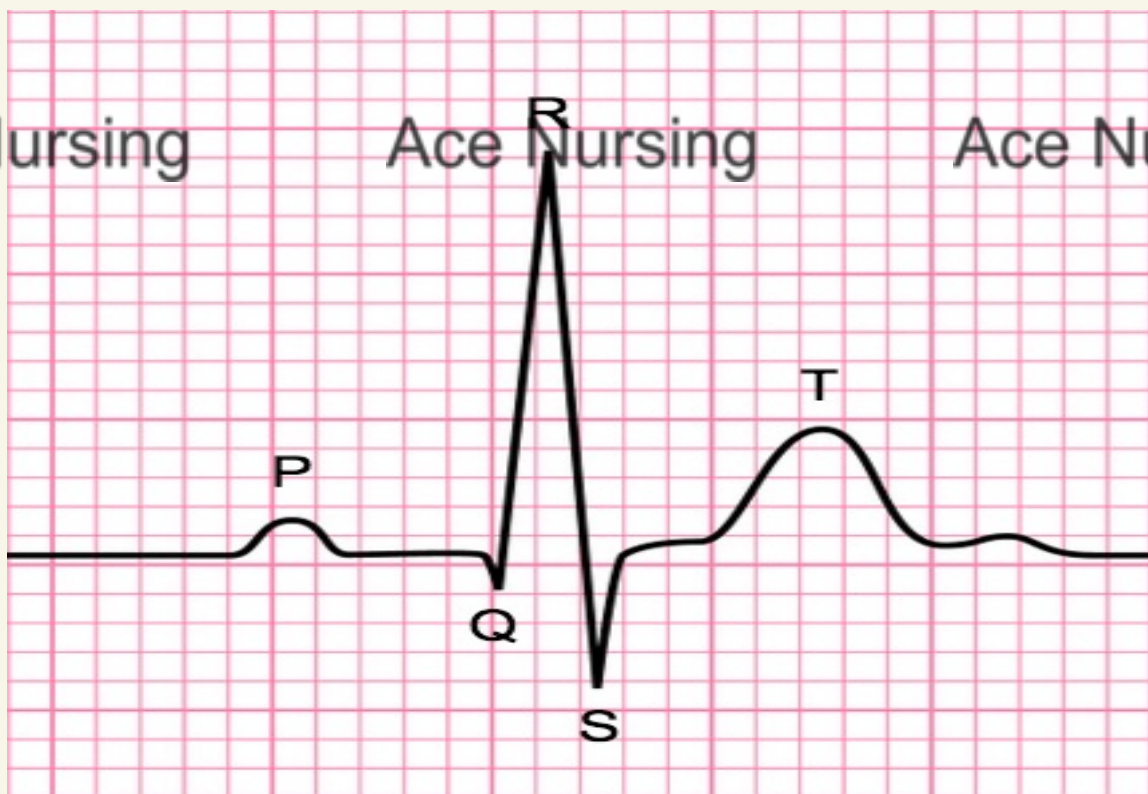
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# Electrical Conduction of the heart

- **SA node:** pacemaker of the heart and initiates contraction at 60–100 BPM.
- **AV node:** receives impulses from the SA node; If the SA node fails, it initiates and sustains impulses at 40–60 BPM.
- **Bundle of His:** continuation of the AV node and branches into the bundle branches (left bundle branch and right bundle branch) which terminate in the Purkinje fibers.
- **Purkinje fibers:** network of conducting strands beneath the ventricular endocardium. They can act as a pacemaker when the SA and AV fail as pacemakers. They can sustain at 20–40 BPM.

## EKG Interpretation

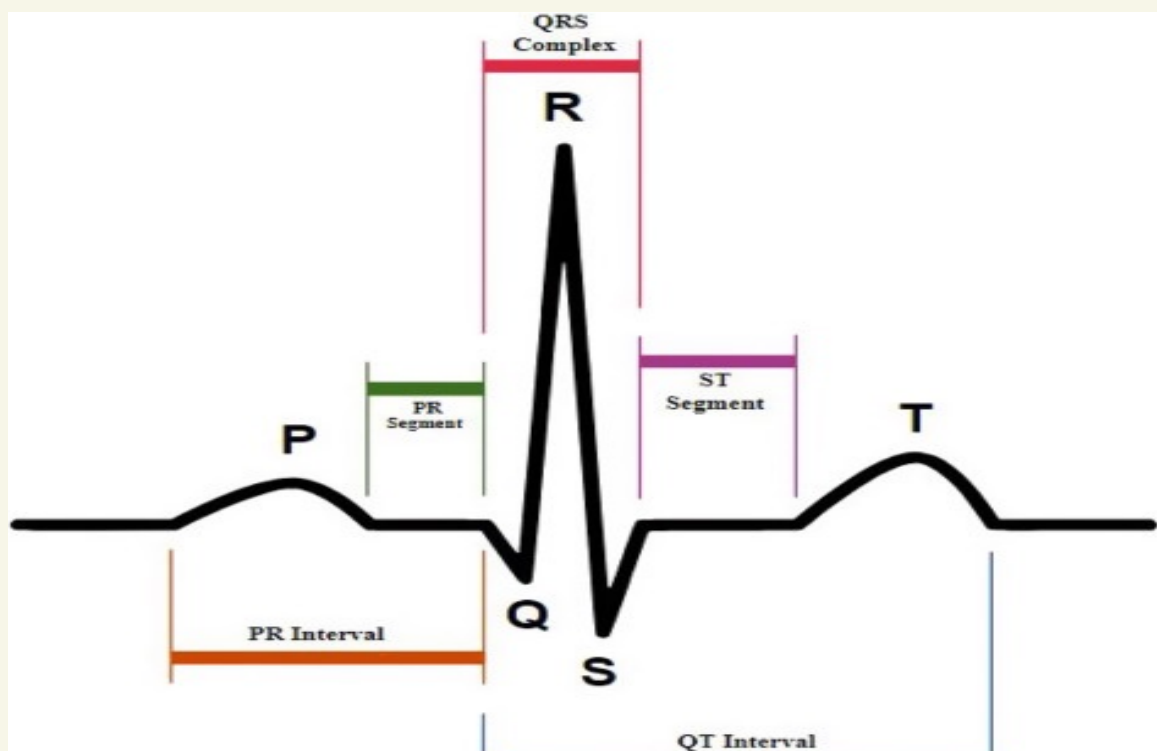


- **P wave:** Atrial depolarization (contraction of atria)
- **QRS complex:** Ventricular depolarization (contraction of ventricles)
- **T wave:** Ventricular repolarization (relaxation of ventricles)

# 5 steps of EKG Interpretation:

1. Is there a 1 P-wave present before each QRS complex?
2. Is the PR interval between 0.12–0.20 seconds?
3. Is the QRS complex less than 0.12 seconds?
4. Is the rate between 60–100?
5. Is the rhythm regular?

| Heart rate                                                                                                 | Rhythm             | P wave                                                                                                                               | PR interval<br>(in seconds)                                                                                                                                          | QRS Complex<br>(in seconds)                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Normal:<br/>60 –100/<br/>min</p> <p>Tachycardia:<br/>&gt;100 BPM</p> <p>Bradycardia:<br/>&lt;60 BPM</p> | Must be<br>Regular | <p>Represents<br/>the atrial<br/>rhythm and<br/>rate (atrial<br/>contraction)</p> <p>Present<br/>before<br/>each QRS<br/>complex</p> | <p>the time it takes<br/>between atrial<br/>contractions &amp;<br/>ventricular<br/>contractions</p> <p>Normal= 0.12 –<br/>0.20 seconds<br/>(&lt;5 small squares)</p> | <p>Represents the<br/>ventricular rhythm<br/>and rate (Ventricular<br/>contraction)</p> <p>Should be in Normal<br/>shape (not wide or<br/>narrow)<br/>&amp; &lt; 0.12 seconds</p> |

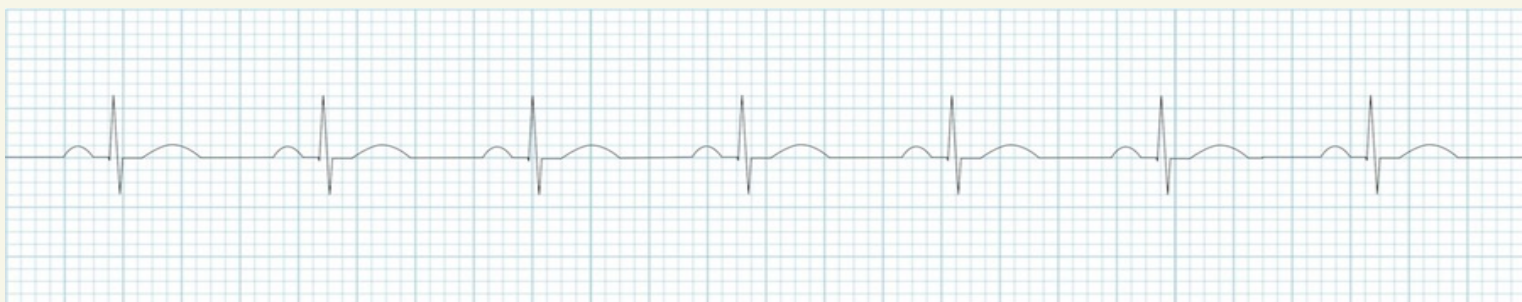


## 1. Heart Rate

- Normal Sinus Rhythm
- Rate - 60 -100
- count the peaks - we have 7 here
- 7 multiplied by 10 = 70 beats

## 2. Rhythm

- R peaks are evenly spaced apart.
- To measure this grab some paper & mark 2 R peaks then just march it out OR count the boxes between R peaks.
- The R peaks should be even every time.



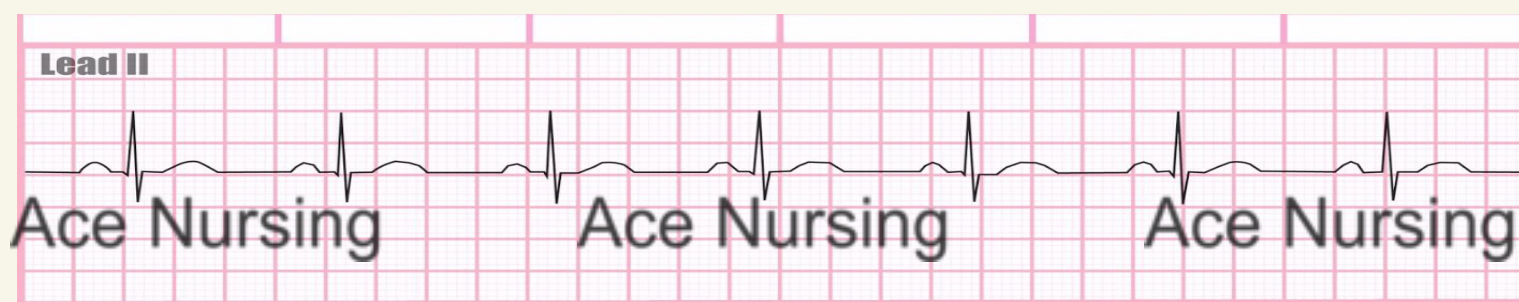
## 3. P Wave

- P wave - which is our atria contracting - is it present? & does it have a QRS complex right after?
- we need a P with QRS every time.
- The ECG represents a P wave present before every QRS complex.



## 4. PR interval (in seconds)

- PR interval - measures the time it takes between atrial contractions & ventricular contractions
- Measured from the beginning of P wave to the beginning of QRS complex.
- Should be from 3-5 mini boxes or less (0.12 - 0.20 seconds)
- The ECG below represents the 5 mini boxes=0.20seconds.



### 5. QRS Complex (in seconds)

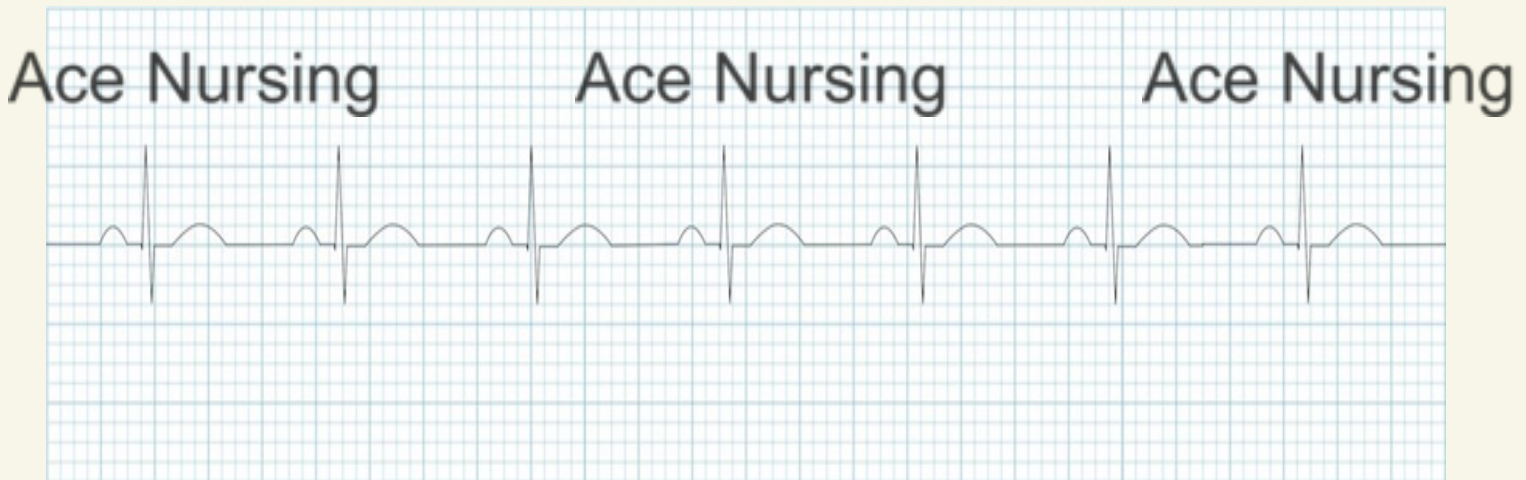
- QRS - Ventricles contracting. Is it present, upright & TIGHT?
- Should NOT be wide, should only be 3 boxes ( $<0.12$  seconds)
- The ECG below represents the 3 mini boxes = 0.12 seconds.



### Must Know-ECG STRIPS

(For NCLEX: Just need to know the interventions and identify these 10 strips)

#### 1. Normal Sinus Rhythm



Normal Beat with HR=60–100 BPM.

P wave- Present before every QRS

PR interval: 0.12 – 0.20 seconds

QRS complex= not wide or narrow, and is  $<0.12$

HR= 70 BPM

Rhythm: Regular

## 2. Sinus Bradycardia



P-wave: Normal

PR Interval: 0.12–0.20

QRS: <0.12

Rate: <60

Regularity: Regular

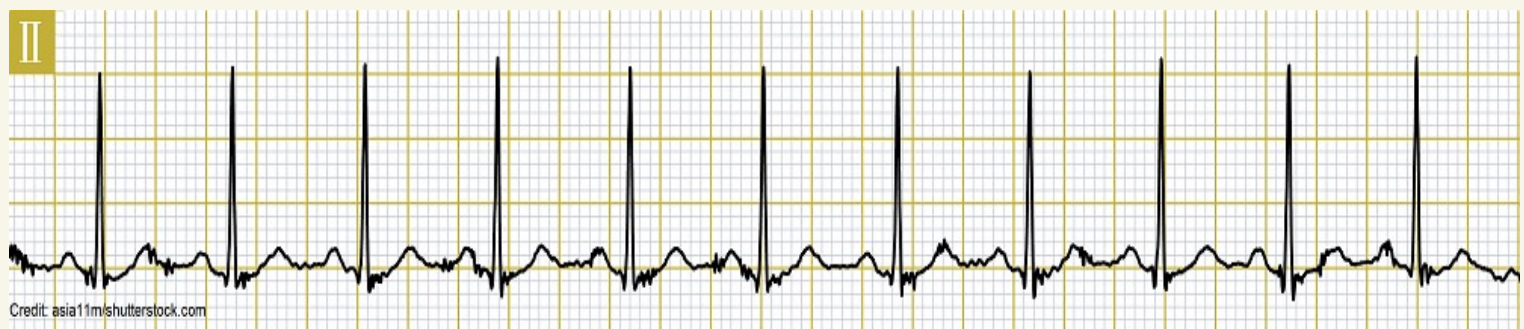
HR= <60 BPM

Causes: Vagal maneuver (bearing down), meds such as Calcium Channel Blockers, & Beta Blockers.

Treatment: Correct the Cause.

Atropine given ONLY if symptomatic (meaning if the patient is showing signs and symptoms of low perfusion (pale, cool, clammy)).

## 3. Sinus Tachycardia



P-wave: Normal

PR Interval: 0.12–0.20

QRS: <0.12

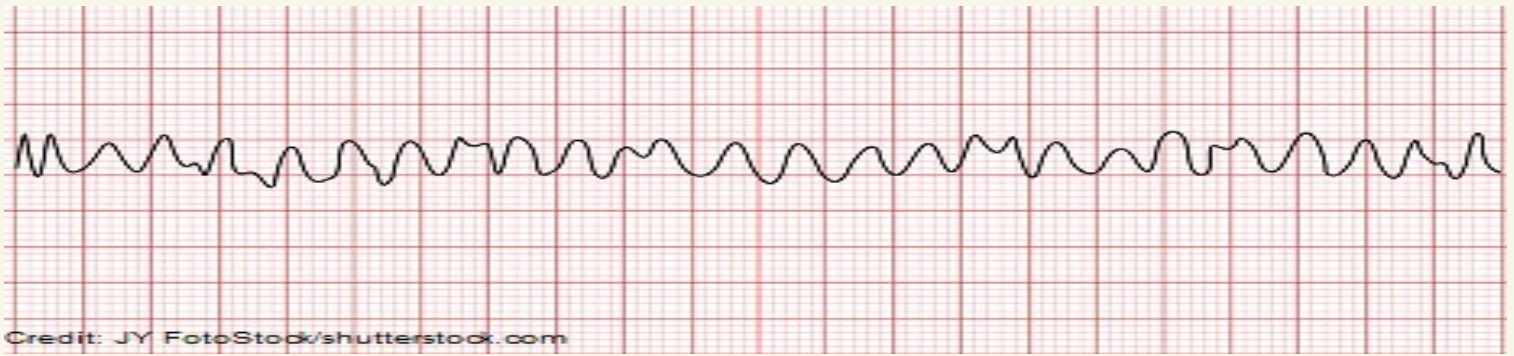
Rate: >100

Regularity: Regular

HR= >100 BPM

Causes: Exercise, pain, stimulants (caffeine, alcohol), meds (atropine, epinephrine), fever

Treatment: Treat the cause ! Antipyretics for fever, analgesics for pain, avoid caffeine, alcohol



Chaotic, squiggly line; NO Pattern

P-wave: none

PR Interval: none

QRS: none

Rate: none

Regularity: Irregular

Causes: Untreated V Tach, Post MI, E+ imbalance, proarrhythmic meds

Treatment: V Fib - Defib #1 priority. \*NO synchronization needed.

\*\*\*REMEMBER: V Fib -You DeFib\*\*\*

## 5. Ventricular Tachycardia (V Tach)



Tombstone Pattern; There is A PATTERN.

PR Interval: none

QRS: 'wide & bizarre'

Rate: 150-250

Regularity: Regular

Causes: Post MI, Hypoxia, Low potassium, Low magnesium

Treatment: Early Defibrillation!

Apply defibrillator pads, Call out & look for everyone to be CLEAR! Shock & IMMEDIATELY continue chest compressions

\*\*\*REMEMBER: V Tach with No pulse = Defibrillation

V Tach with Pulse = Cardioversion\*\*\*\*

\*\*\*Having a pulse means there is cardiac output. No pulse means no cardiac output, thus no perfusion=dead!\*\*\*

## 6. Atrial Fibrillation



No P wave Present but fibrillatory (wavy) lines present. (Fibrillation (Quivering of heart))

P-wave: 'wavy'

PR Interval: none

QRS:  $<0.12$

Atrial Rate:  $>400$

Ventricular rate: Varies

Regularity: irregular

Causes: Valvular disease, Heart failure, Pulm. HTN, COPD, after heart surgery

Treatment:

Cardioversion: Push Synchrony

Digoxin

Anticoagulants: Warfarin (REMEMBER: monitor INR, Vit.K antidote)

## 7. Atrial Flutter



No p-waves but flutter waves that look like a saw tooth

P-wave: "saw-tooth"

PR Interval: none

QRS:  $<0.12$

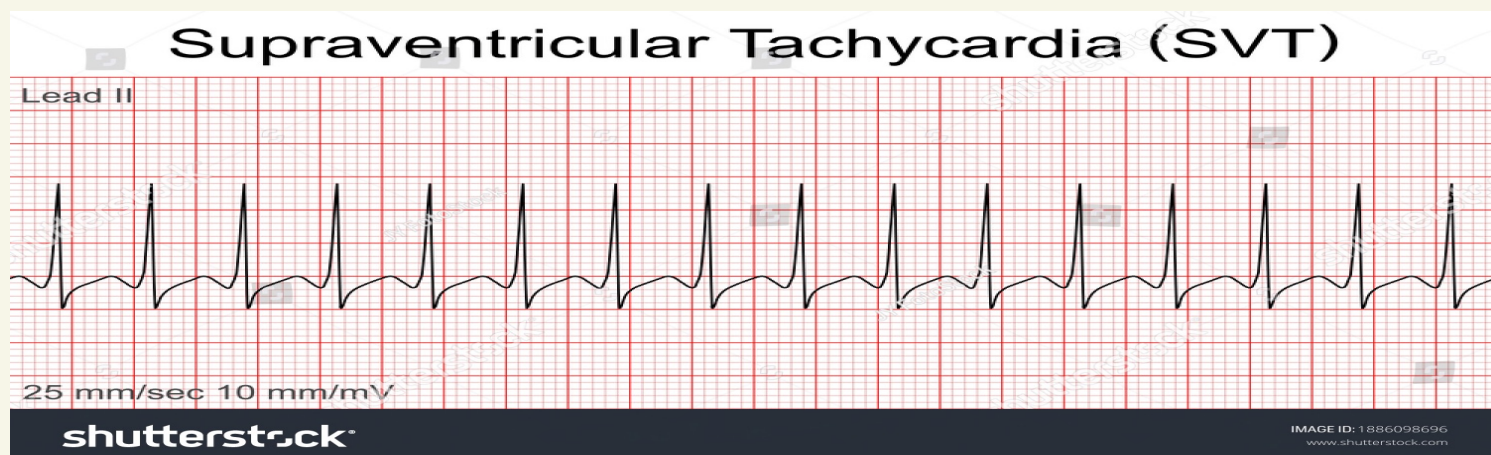
Atrial Rate: 250-400

Ventricular Rate: Varies

Regularity: Regular or Irregular

Causes & Treatment: SAME AS A-FIB

## 8. Supraventricular Tachycardia



Super Fast = Supraventricular

P-wave: hidden

PR Interval: immeasurable

QRS:  $<0.12$

Rate: 150-250

Regularity: Regular

Causes: Stimulants, Strenuous exercise, hypoxia, heart disease

Treatment: Vagal Maneuver (bear down like having a bowel movement, ice cold stimulation) Cardioversion - \*Push Synch

Adenosine - RAPID PUSH & flush with NS - HR stops for few seconds (rhythm changes to asystole for few seconds and come back to normal sinus rhythm after)

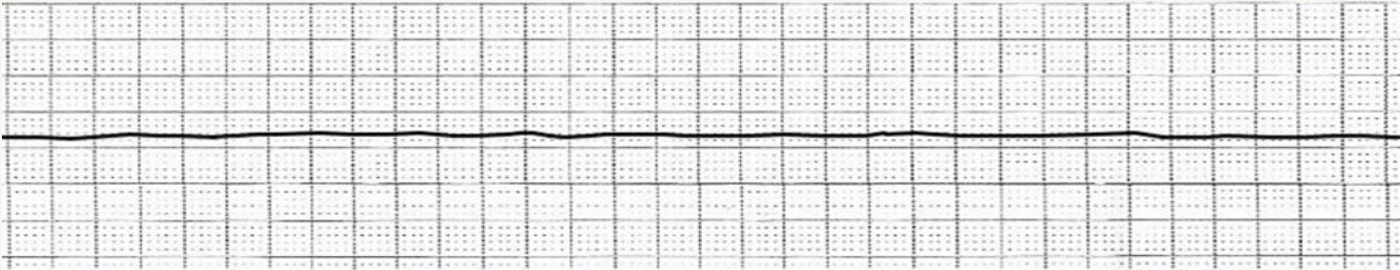
## 9. Torsades de Pointes



Causes: Post MI, Hypoxia, Low magnesium

Treatment: Give Magnesium Sulfate

10. Asystole



Flatline  
P-wave: none  
PR Interval: none  
QRS: none  
Rate: none  
Regularity: n/a  
Treatment:CPR and give #1. Epinephrine, #2. Atropine.  
\*\*\*NO Defibrillation (NO shock)\*\*\*

\*\*\* IF you see any ECG tracing on cardiac monitor (telemetry). The initial action by the nurse is always to ASSESS the patient because it could be an artifact\*\*\*\*

Cardioversion vs. Defibrillation

| Cardioversion                                                                                                                                                                                      | Defibrillation                                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Synchronized procedure that uses quick, low-energy shocks to restore an irregular arrhythmia to a regular heart rhythm.</p> <p>Used in A-fib, Atrial flutter, supraventricular tachycardia.</p> | <p>Asynchronized shock that uses higher energy that is delivered randomly during the cardiac cycle (does not coordinate with clients rhythm).</p> <p>Used to treat life-threatening cardiac arrhythmias: Pulseless ventricular tachycardia and ventricular fibrillation</p> |

**P wave** = Atrial rhythm

**QRS wave** – Ventricular rhythm

**“Lack of QRS complexes”**: Asystole

**“Wide bizarre QRS complexes”**: V Tach

**Chaotic or unorganised** – Fibrillation

**Chaotic rhythm with no clear P waves**: Atrial Fibrillation

**CHAOTIC rhythm without clear QRS complexes**: Ventricular Fibrillation

**Bizarre** – Tachycardia

**Bizarre rhythm with wide QRS complex**: Ventricular Tachycardia

**Sawtooth** – Atrial Flutter

## Pacemaker

- a temporary or permanent device that provides electrical stimulation and maintains the heart rate.

- Instruct the client that most electrical appliances can be used without any interference with the functioning of the pacemaker; however, advise the client not to operate electrical appliances directly over the pacemaker site.
- Avoid transmitter towers and anti-theft devices in stores.
- Instruct the client that if any unusual feelings occur when near any electrical devices to move 5 to 10 feet away and check the pulse.
- Wear loose-fitting clothing over the pulse generator site.
- Avoid contact sports
- Keep a pacemaker identification card in your wallet.
- Following the procedure, avoid lifting your arm over your head for four weeks.
- Do not lift heavy objects following the procedure until cleared by your primary healthcare provider (PHCP).
- Taking a bath and shower is not restricted.
- Do not apply pressure over the generator, and do not wear any tight clothing.
- Operating household appliances would be considered safe.
- Talk on the cellular phone on the opposite side of the on your chest of any shirt pockets
- Do not lay your phone on the chest
- Keep your phone out of the shirt.
- Contraindication for MRI