Systematic approach of EKG interpretation

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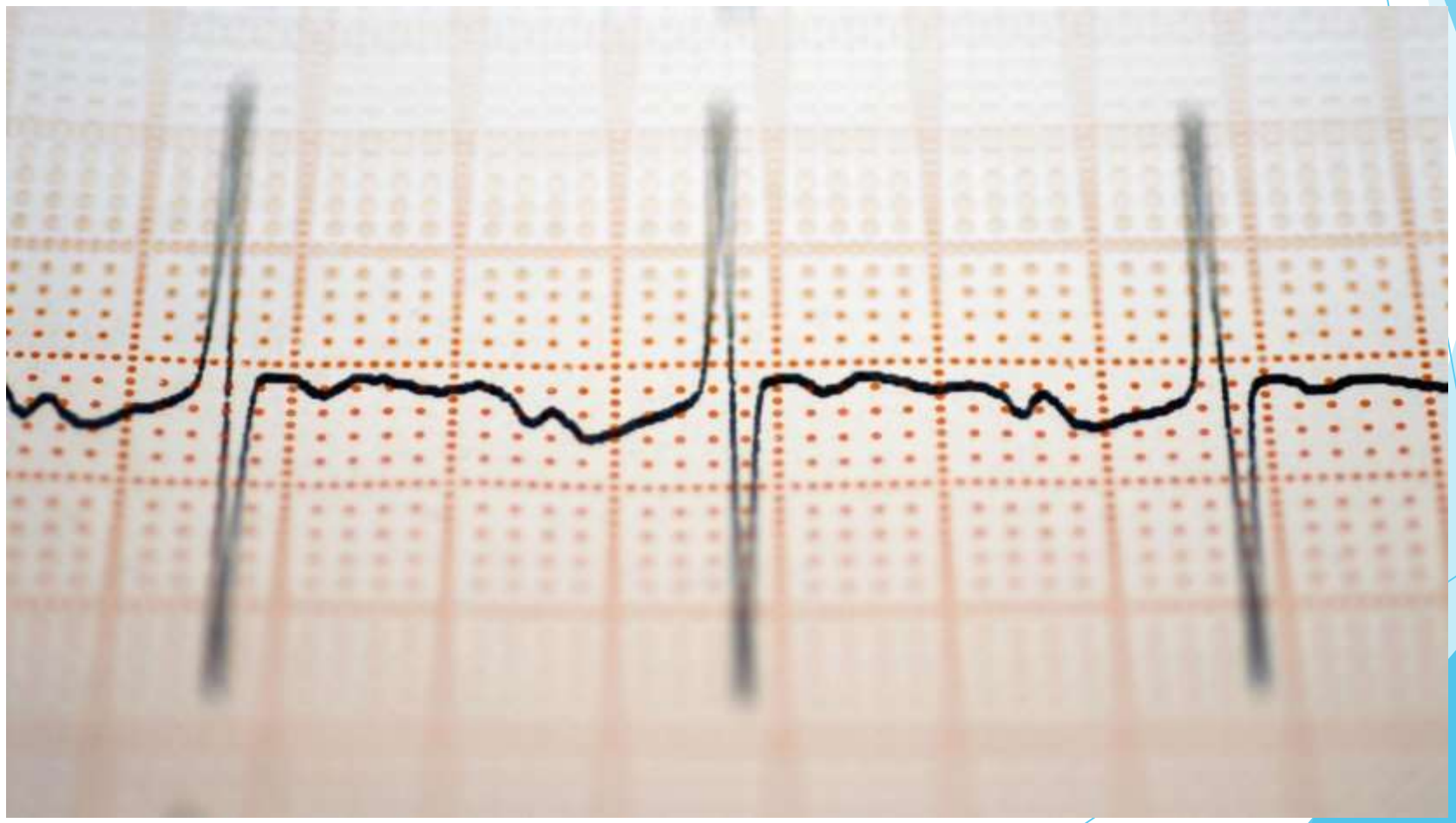
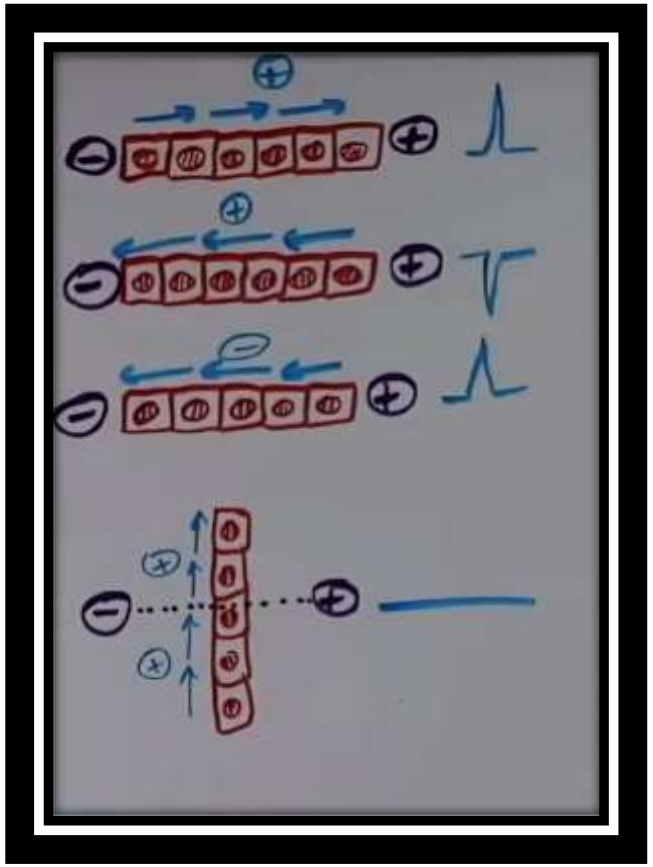
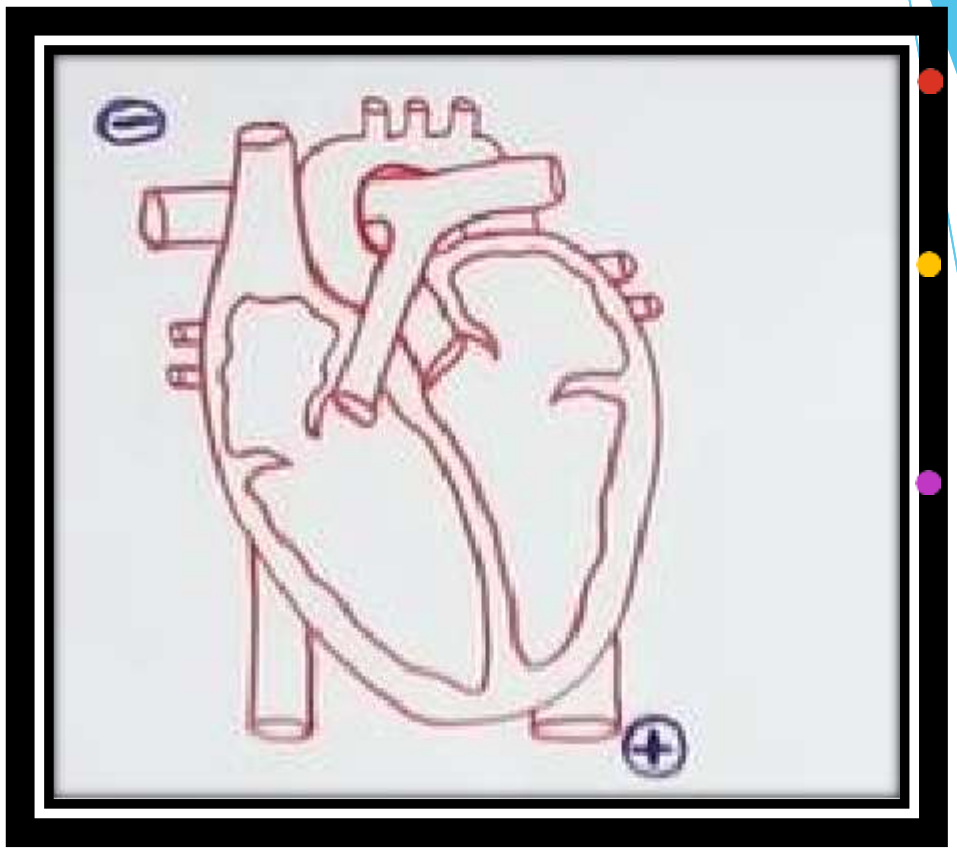




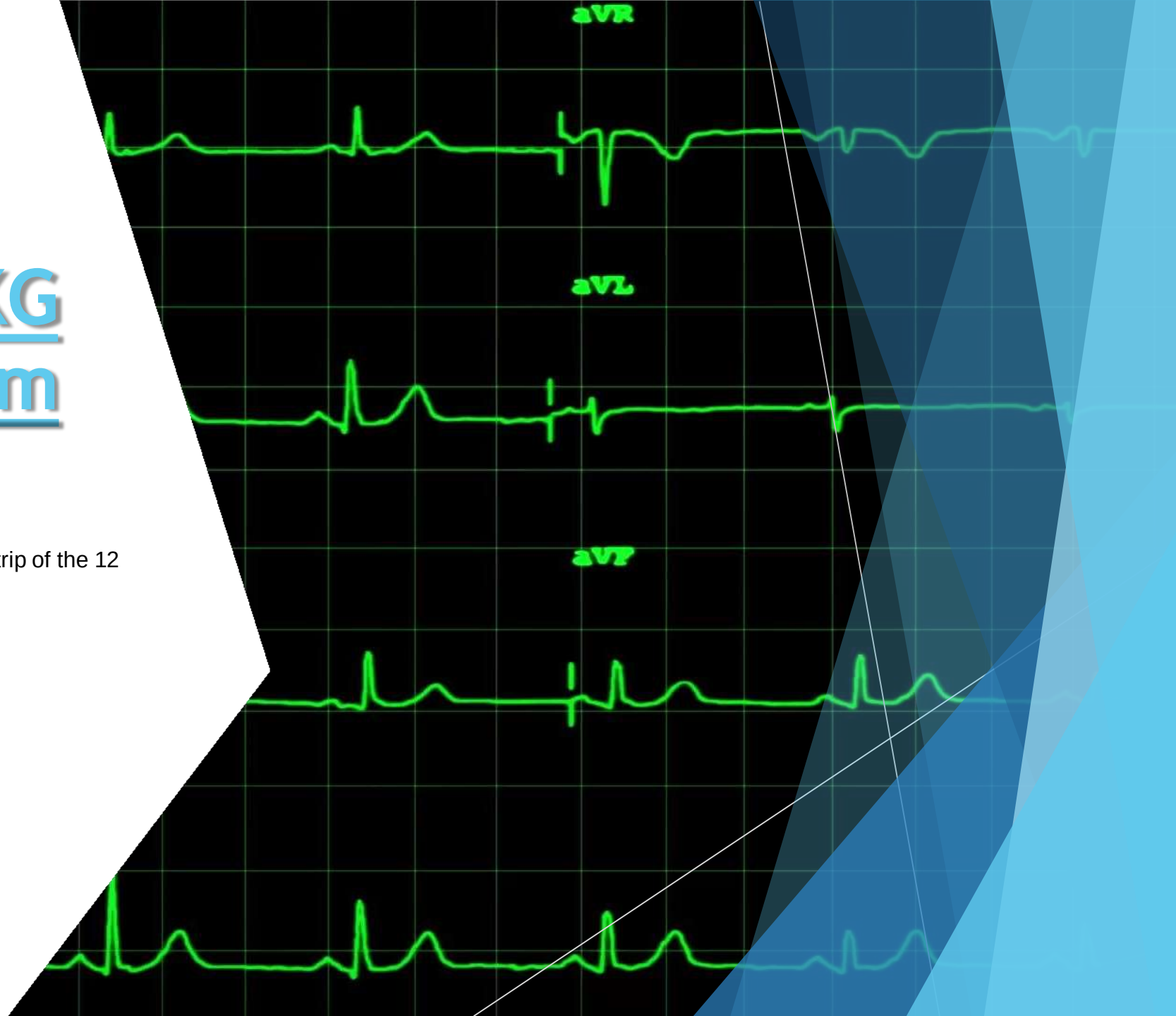


- If positive charge moves towards the positive electrode it causes an upwards deflection on EKG.
- If positive charge moves towards negative charge it causes a downwards deflection on EKG
- If negative charge moves towards negative charge it causes an upwards deflection on EKG
- Due to the amplitude from both sides of the axis being equal EKG cancels them out so Isoelectric/ No deflection (flat)

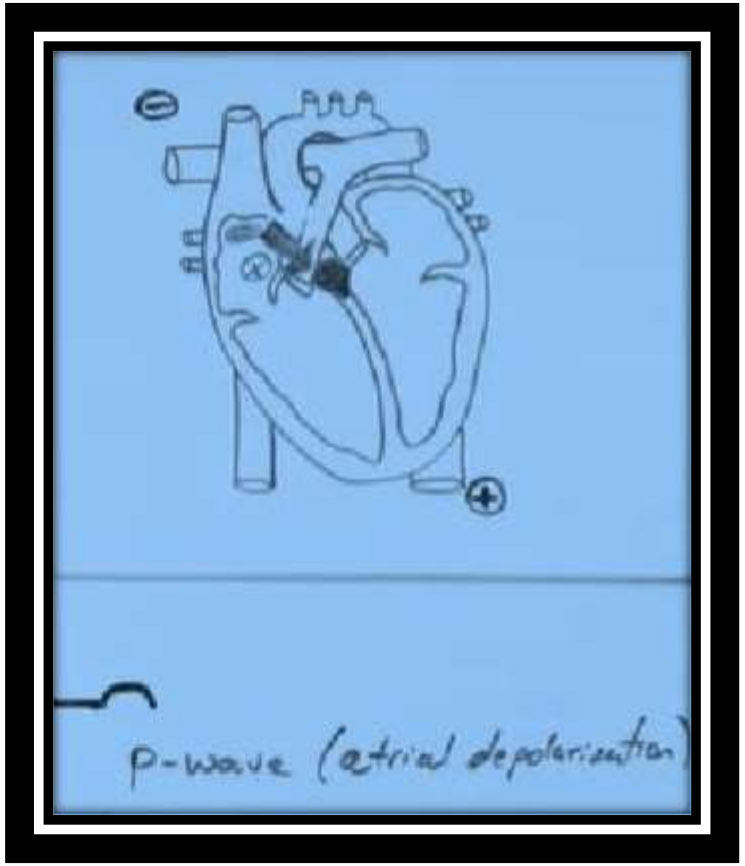
Positive, negative and isoelectric deflection

Map the EKG wave form

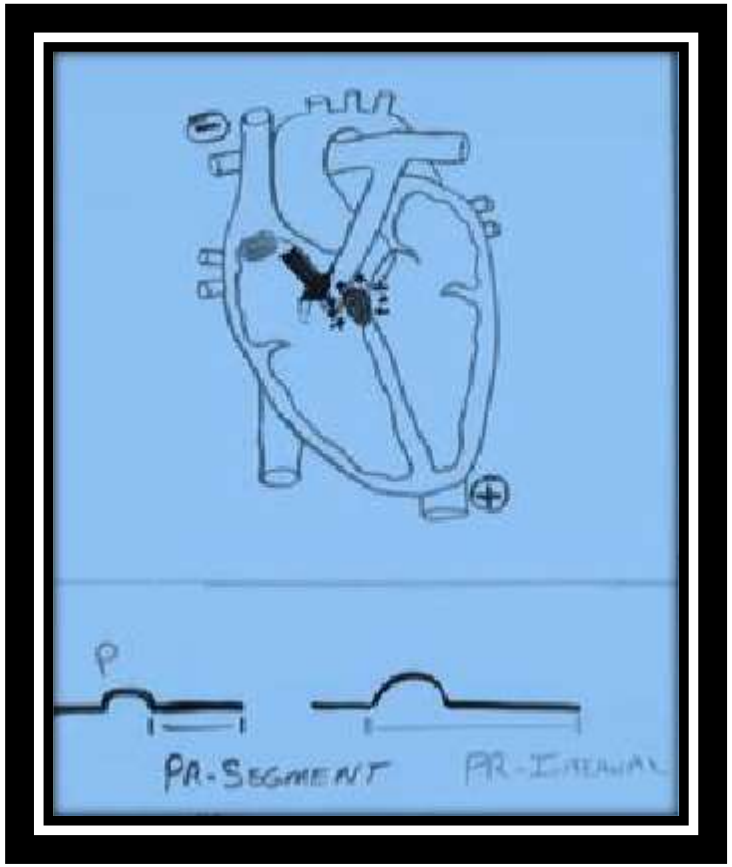
In Lead II:
o Negative electrode: Right arm
o Positive electrode: Left leg
o Most common lead used in a rhythm strip of the 12 lead EKG cause it is easy



PR Interval - Distance from the beginning of P-wave until PR segment ends
PR Segment - Distance from the end of P-wave to the beginning of QRS complex
Important for diagnosis of MI



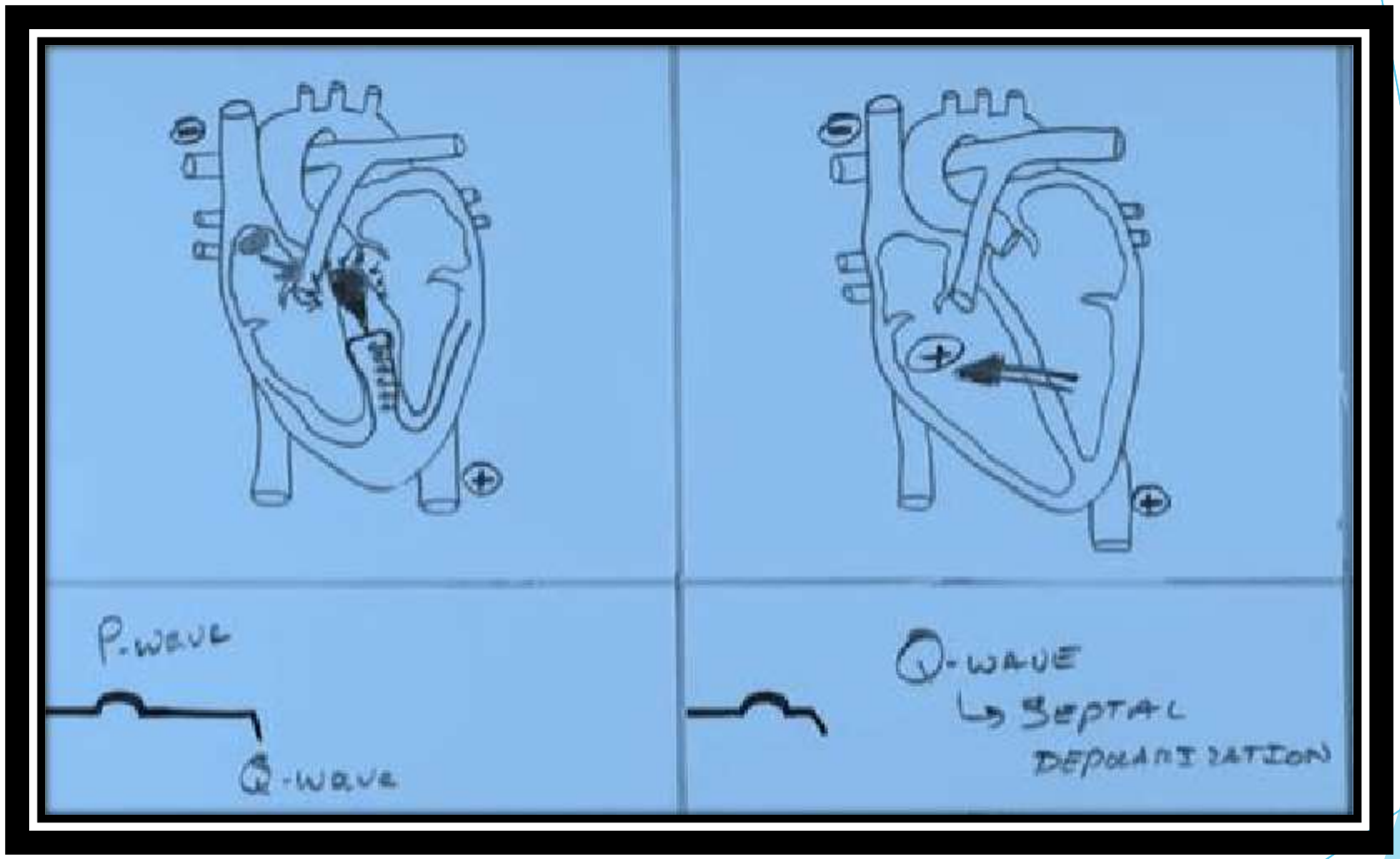
SA node fires and sends positive electrical signals towards AV node
* "Positive" vector is created and it points towards positive electrode of lead II
* Upward deflection on EKG.



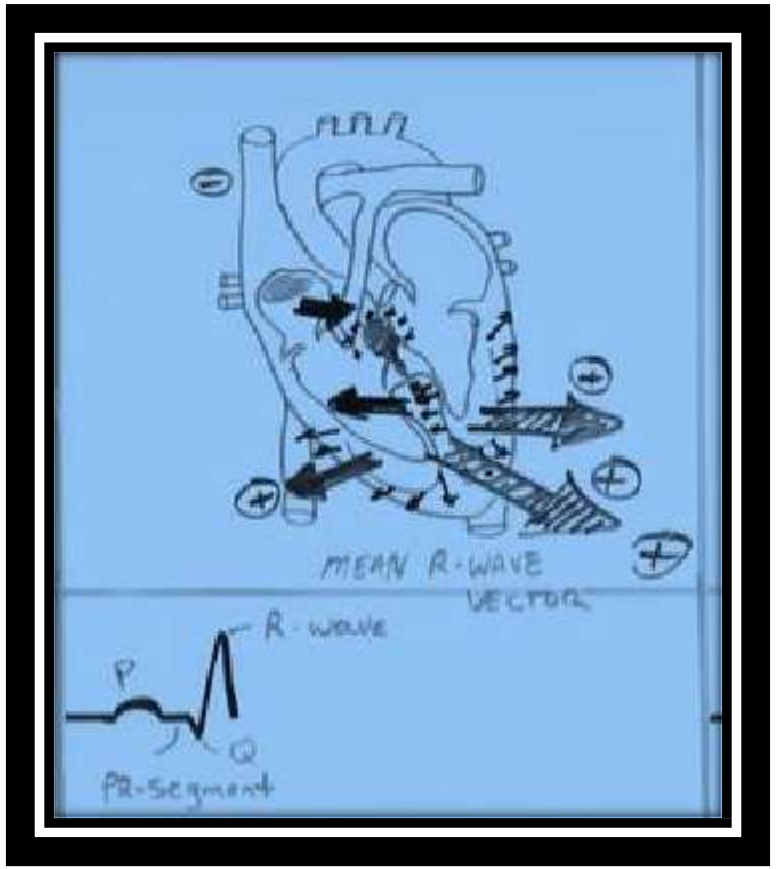
AV node receives positive electrical signals from SA node but conducts electrical signals very slowly (delay 0.1sec) it doesn't create a net vector
* No deflection
* Straight/isoelectric line on EKG.

AV node conducts positive electrical signals into bundle of His and down bundle branches

* The left bundle branch causes positive electrical signals to move from left to right

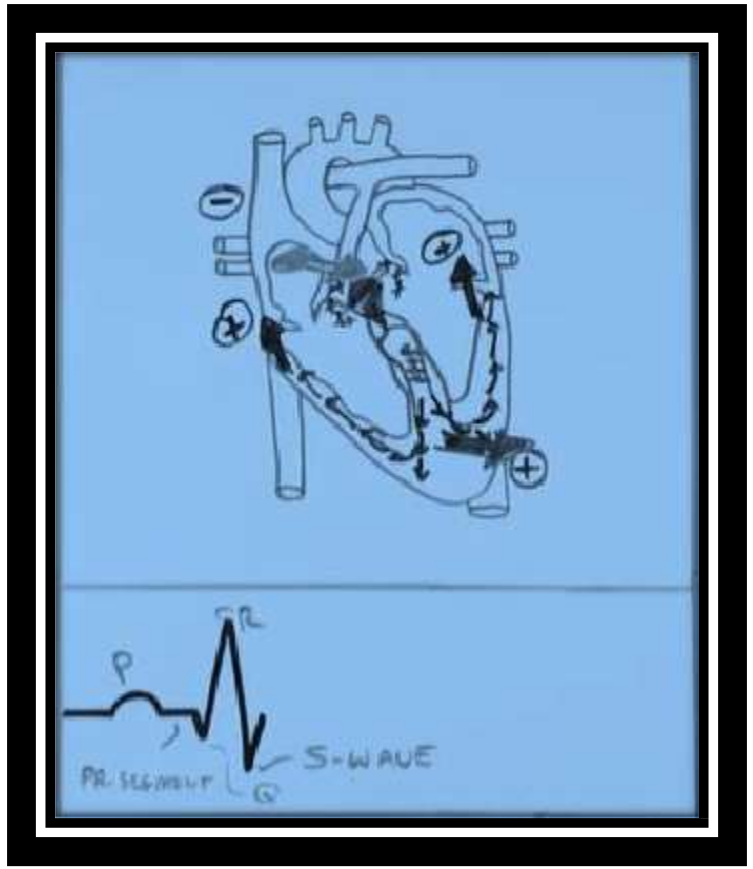


* A “positive” vector pointing slightly towards the negative electrode is created (from the left to the right)
* Small negative deflection on EKG



Bundle branches conduct positive electrical signals into purkinje fibers

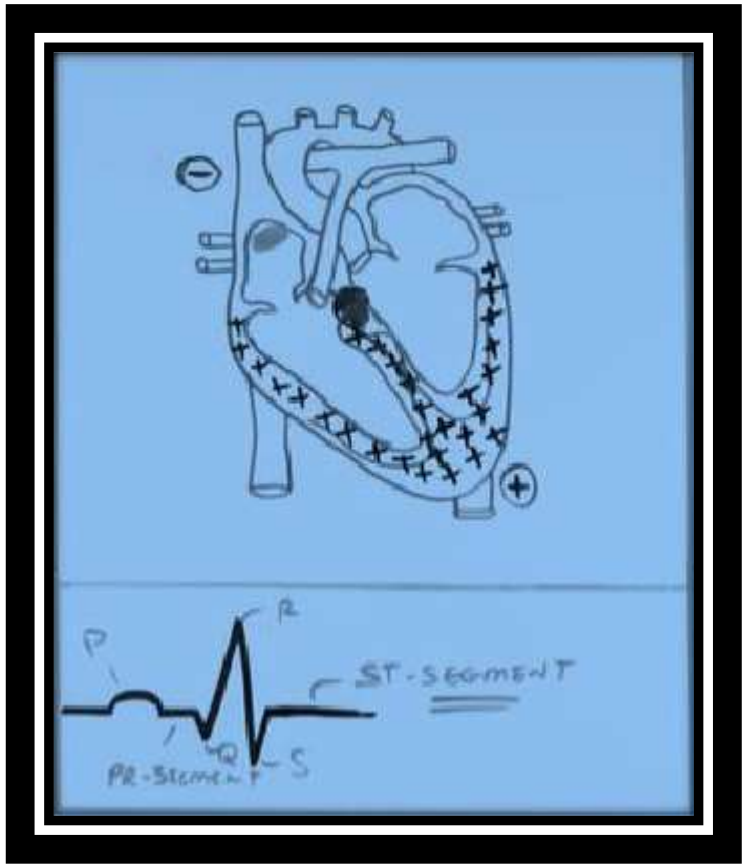
* More positive electric signals are conducted to the thicker left ventricle in comparison to the right ventricle
* Large net “positive” vector pointing slightly more to the left ventricle apex and positive electrode
* Large positive deflection on EKG.



The purkinje fibers conduct positive signals through the ventricles

* “Positive” vector pointing up towards base of heart neat negative electrode is created
(Indicative of the depolarization at the bases of the ventricles)
* Small negative deflection on EKG.

CN: Acute ST elevation = myocardial infarction (STEMI)

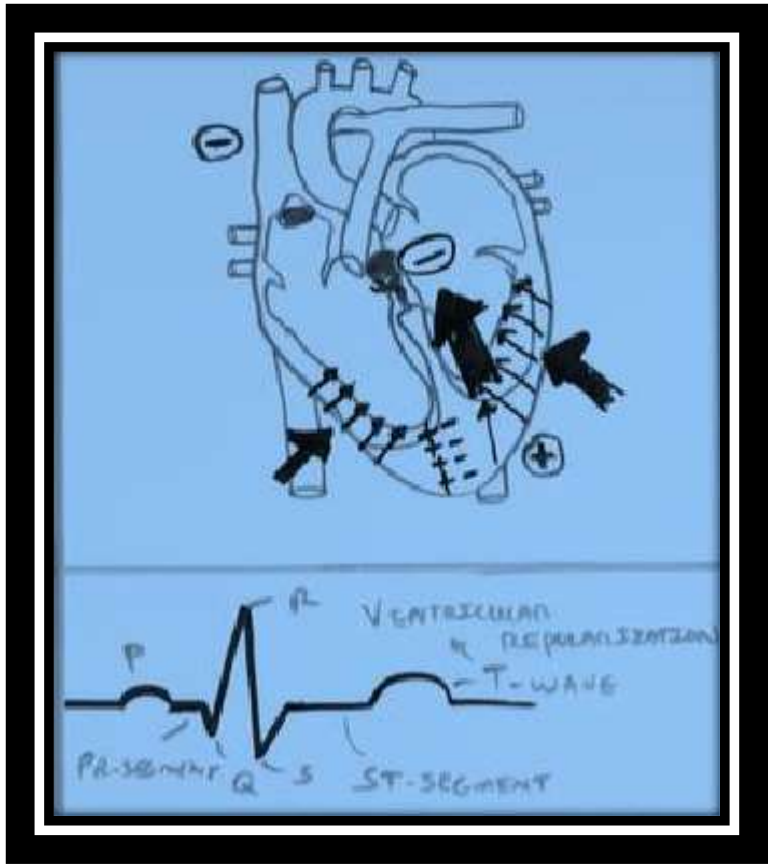


The entire ventricular myocardium is still depolarized and hasn't gone into a repolarization state yet.

* There is no more movement of positive electrical signals
* No electric vector
* No deflection
* Isoelectric line on EKG

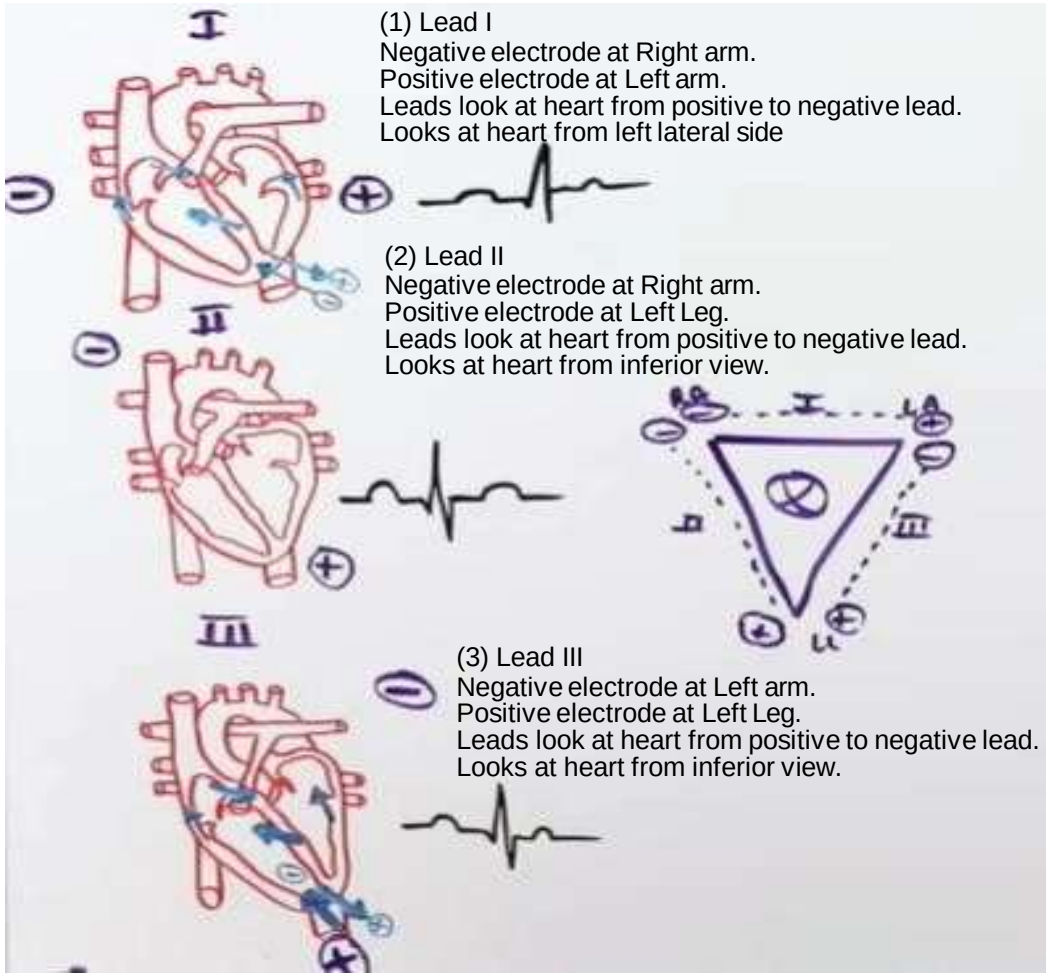
The ventricular myocardium starts repolarizing

* Negative electrical signals move from the outer layers of myocardium to inner layers / left ventricle is much thicker than right ventricle causing more negative electrical signals



* Flow of negative electrical signals move towards base of heart
* "Negative" vector pointing to negative electrode is created
* Upward deflection on EKG.

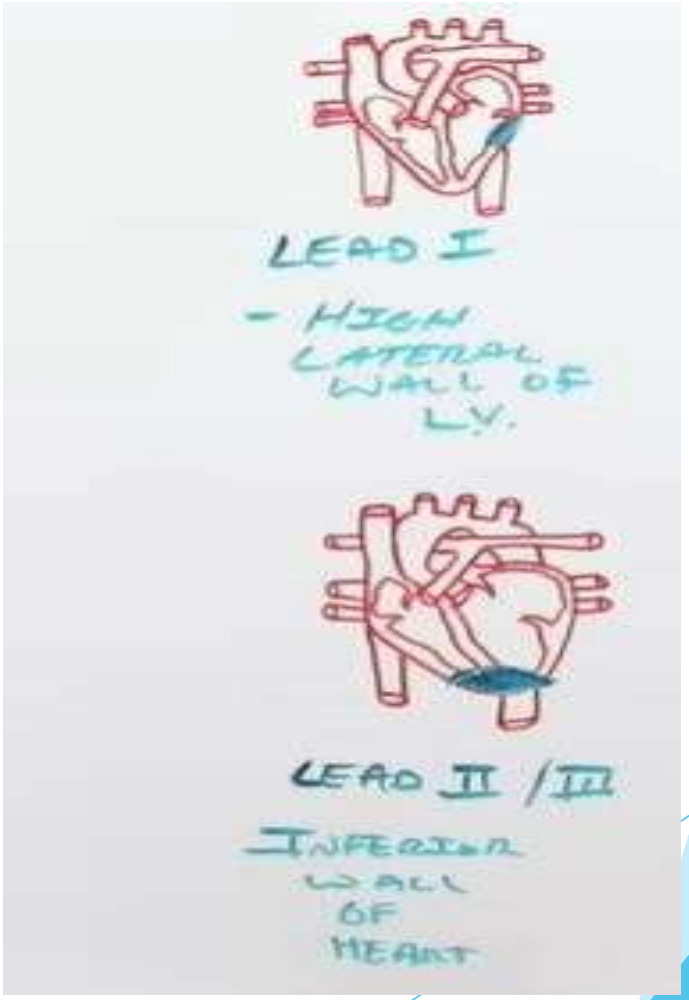
Lead I , II, III



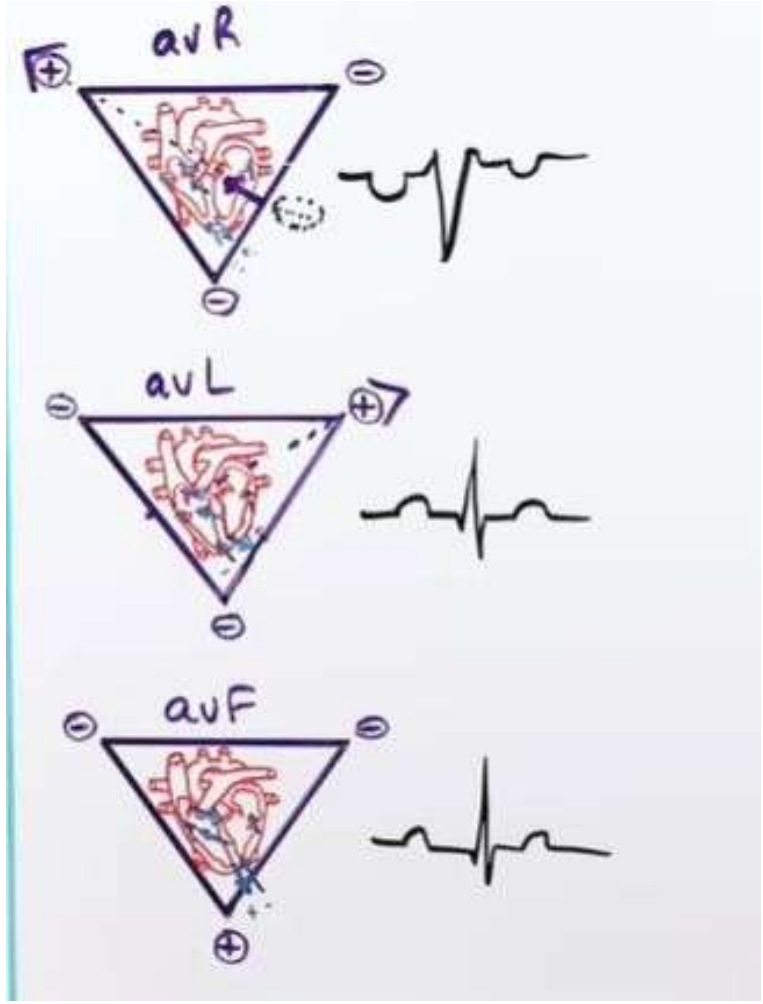
(1) Lead I
Negative electrode at Right arm.
Positive electrode at Left arm.
Leads look at heart from positive to negative lead.
Looks at heart from left lateral side

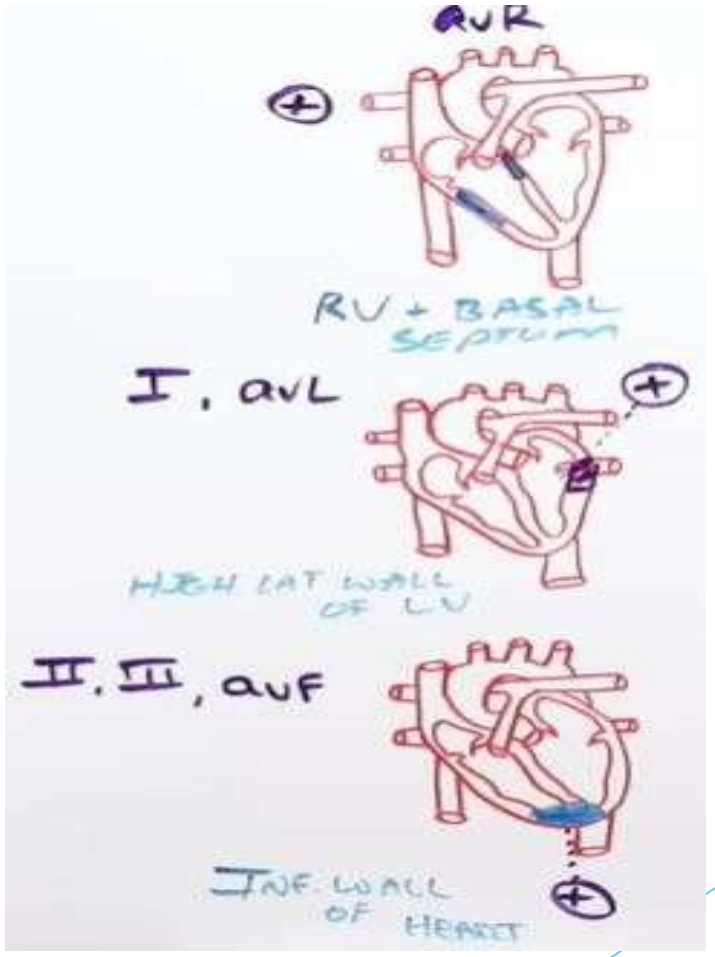
(2) Lead II
Negative electrode at Right arm.
Positive electrode at Left Leg.
Leads look at heart from positive to negative lead.
Looks at heart from inferior view.

(3) Lead III
Negative electrode at Left arm.
Positive electrode at Left Leg.
Leads look at heart from positive to negative lead.
Looks at heart from inferior view.



Augmented unipolar leads



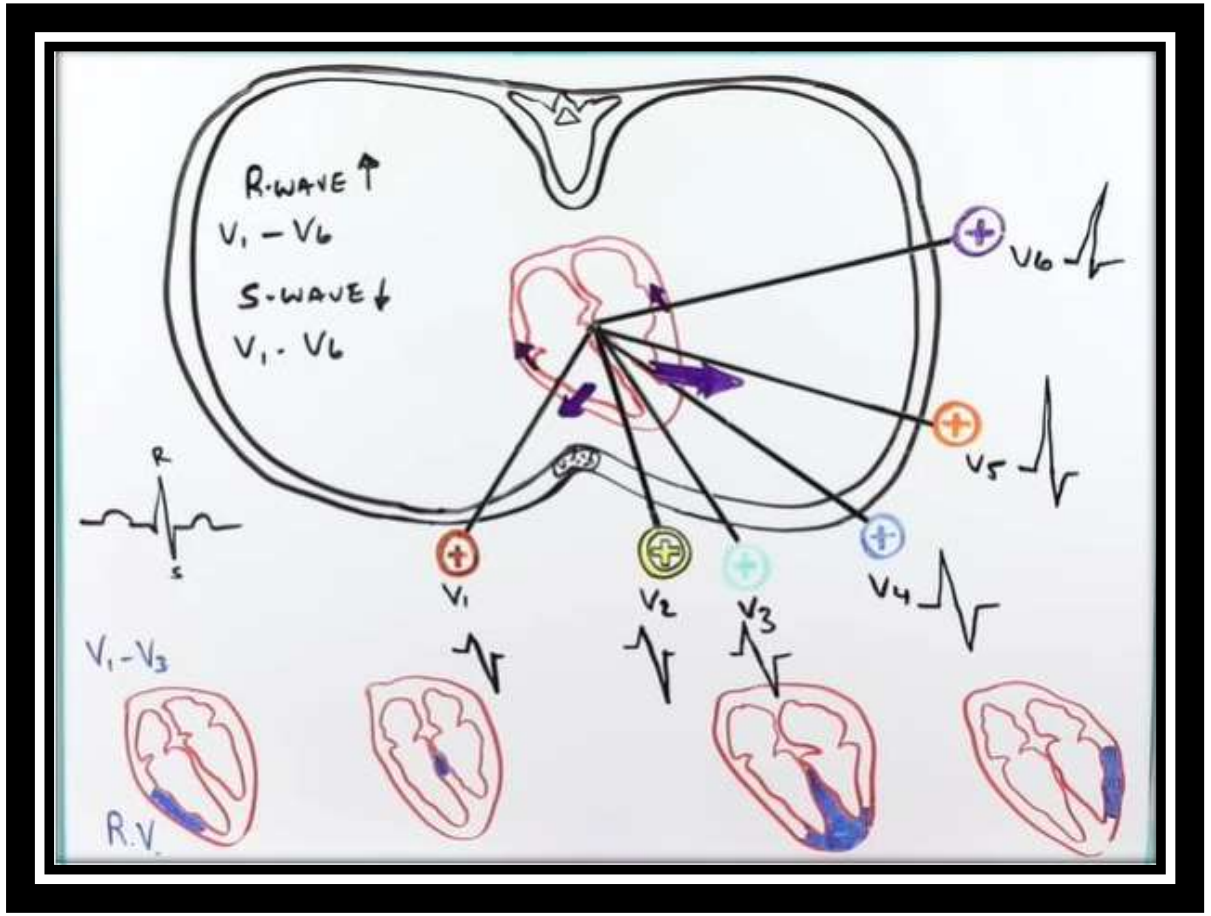


-aVR: positive electrode is on the RA
- Basal septum
- Right ventricle

- aVL: positive electrode is on the LA
- High lateral wall of left ventricle
- Like Lead I

- aVF: positive electrode is on the LL
- Inferior wall of the heart
- Like Lead II, III

Precordial leads

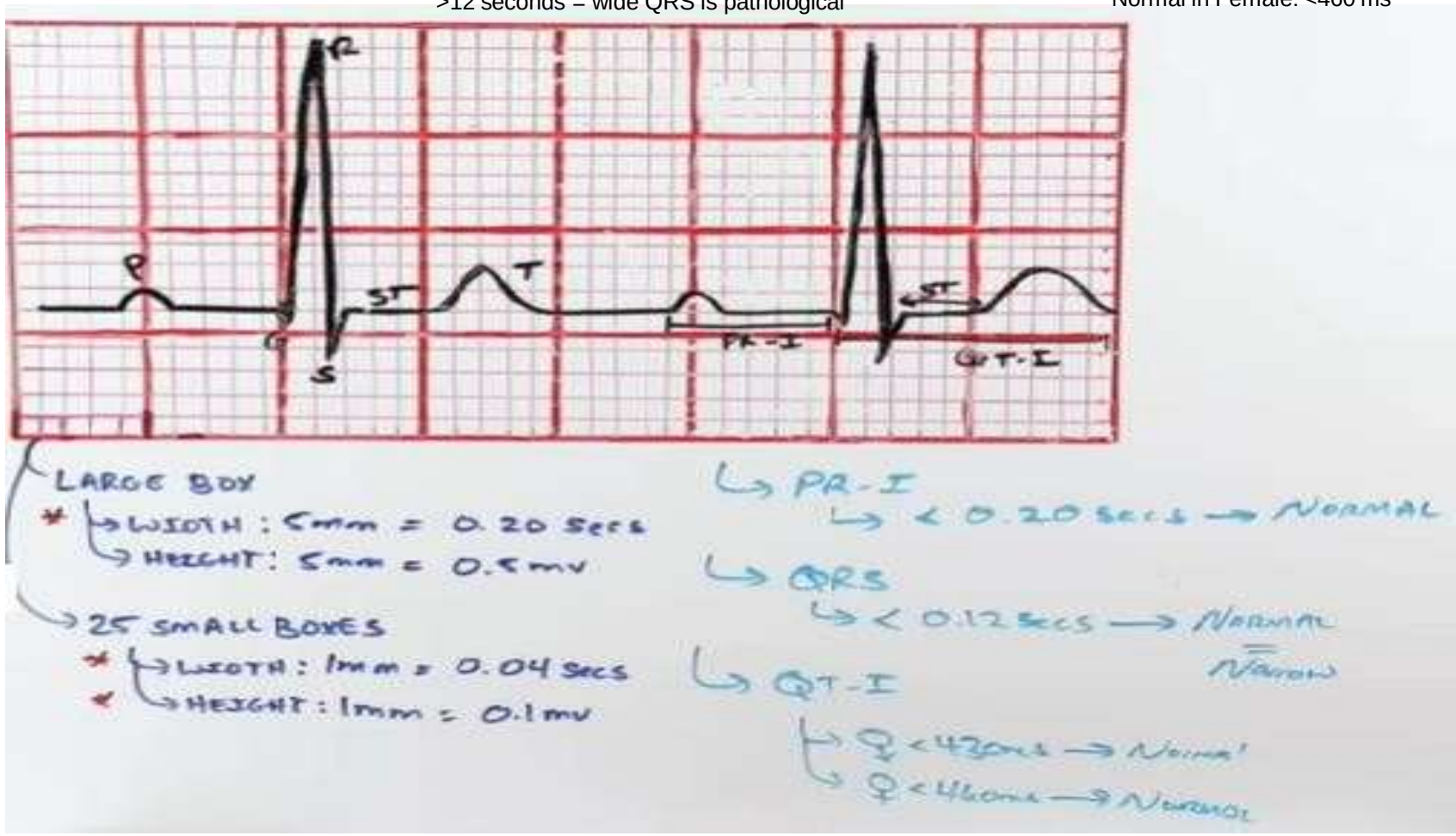


PR-interval
Important for pathologies
Normal: <0.20 seconds = less than 1 large box
If prolonged, can be due to different types of heart blocks

QRS complex:
Normal or Narrow Width: <0.12 seconds = <3 boxes
0.12 seconds / 0.04 seconds per 1 small box = 3 small boxes
>12 seconds = wide QRS is pathological

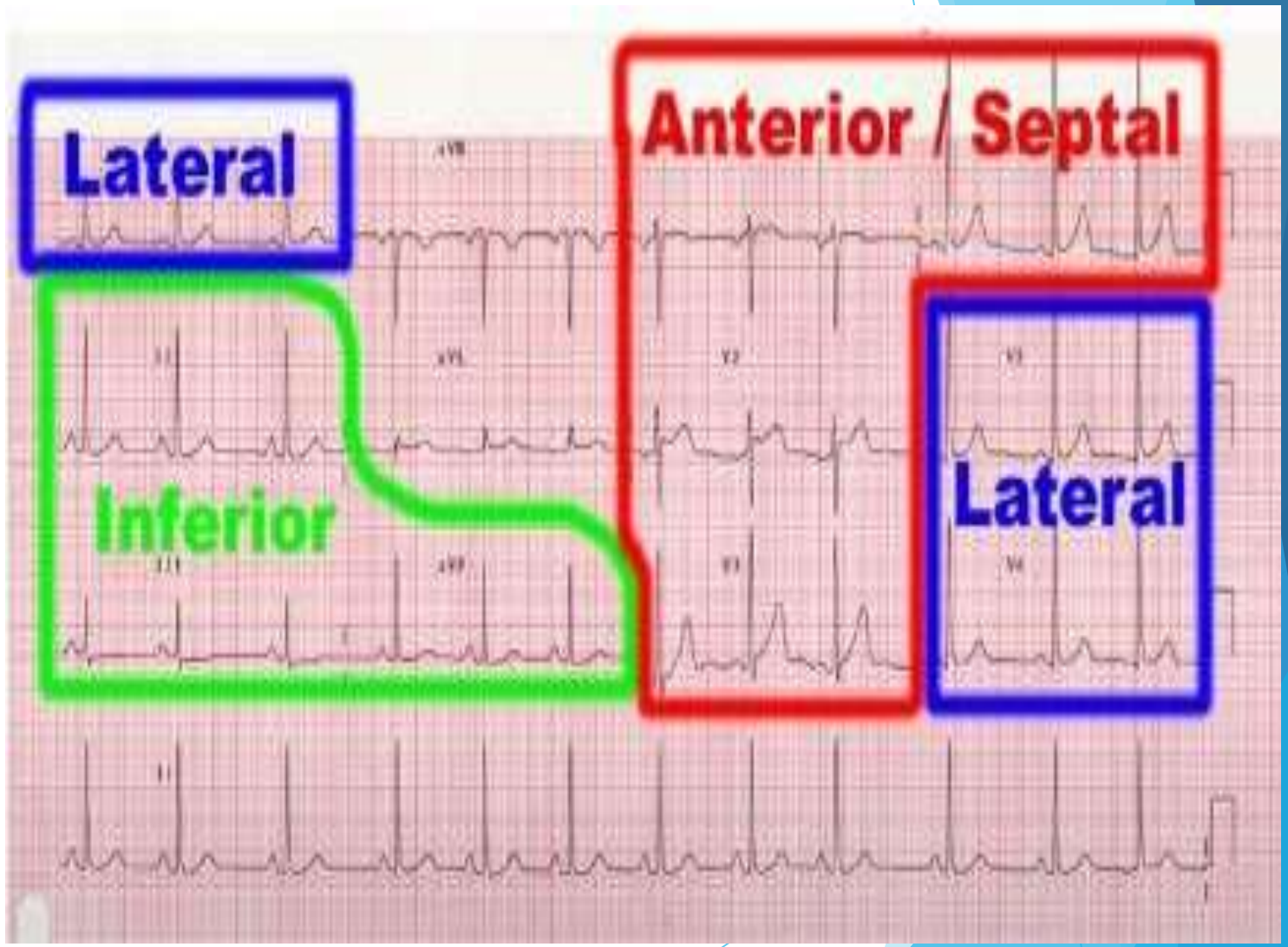
QT-interval
Important for pathologies

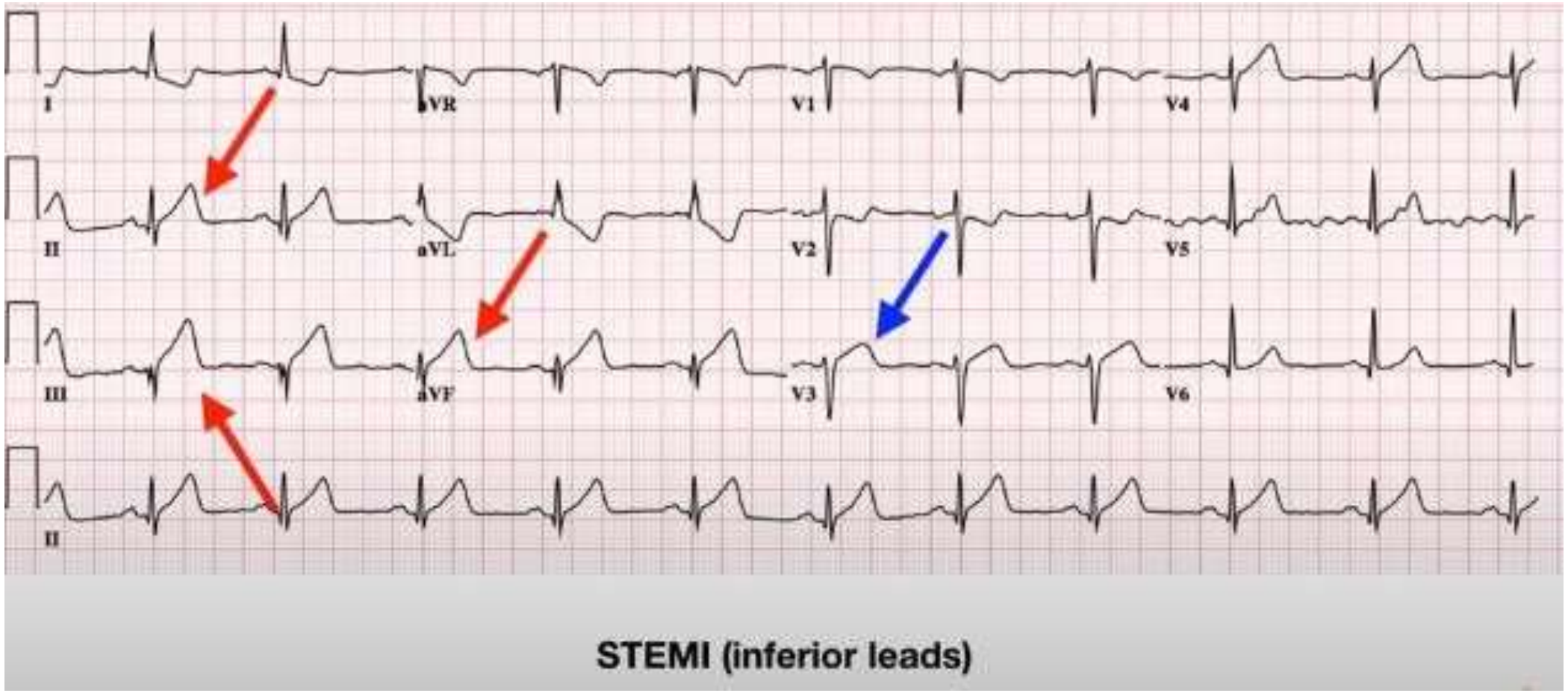
Normal in Male: <430 ms
Normal in Female: <460 ms



Leads

II, III, aVF	inferior
I, aVL, V5, V6	lateral
V1, V2	anterior
V3, V4	septal





STEMI (inferior leads)