EKG Interpretation Algorithm (including Mean Electrical Axis Changes)

(dxs in light blue= shockable rythms, text in pink = don't need to know for Mini II)

1. Is there a P wave for every QRS?
2. Are all waves (P, QRS, T) present?
3. Is the P wave Upright in Leads I, II, and III?

(IF THE ANS TO EVEN ONE OF THESE IS NO, THEN FOLLOW THE no SIDE OF THE CHART.)

YES to ALL =

SINUS RHYTHM

1. Prolonged P-R interval? (>.20sec, or 5 small boxes)

Yes

1st DEGREE (INCOMPLETE) HEART BLOCK
- •PR-interval > .20 sec
- •SINUS RHYTHM
- •benign, no urgent intervention required.

2. ST-segment elevation?

Yes

ST SEGMENT ELEVATION = DIASTOLIC CURRENT OF INJURY = TP SEGMENT and PR SEGMENT DEPRESSION
- •dead cells maintain constant negative charge
- •the only time the whole heart is supposed to be neg is during ST segment (ventricles completely depolarized)
- •thus, ST seg stays where it's supposed to be, on isoelectric line, the rest of the segments are depressed with downward deflection.
- •SINUS RHYTHM
- •cath lab and/or lytics (cath preferred)

3. Other P wave changes?

Yes

GENERAL ATRIAL HYPERTROPHY

4. QRS Complex changes in net electrical deviation from list ?
(Net + = Leads I, II, avF, aVL, V5, V6
Net - = aVR, V1)

5. MEA < -90˚ or > +30˚?

Yes to Any

MEAN ELECTRICAL AXIS DEVIATION
(see R for calculation methods)
***note, MEA deviations can be present in pts with non-sinus rhythms, but they are not reproduced on the next page.*

1. MEA < -30˚ to > -90˚?

LEFT AXIS DEVIATION
- •pathologic causes include **L Ventricular Hypertrophy,** Inferior MI, Emphysema, Systemic HTN, Aortic Valve Stensosis
- •physiologic causes include athletic conditioning

2. MEA < +90˚ to > +150˚?

RIGHT AXIS DEVIATION
- •pathologic causes include **R Ventricular Hypertrophy,** Lateral MI, Pulmonary HTN, Pulmonary Valve Stenosis, VSD, Tetrology of Fallot
- •physiologic causes include tall, thin adult, and childhood, high altitude

How to Calculate MEA:

Semi-Quantitative Estimate:

1. Look for a lead with approx. net electrical deviation = 0.
2. Draw a line on the MEA diagram that is perpendicular to the net 0 lead
3. Now you know it has to be either the positive or the negative portion of that perpendicular line .
4. Choose any one of the other leads and draw the 3-segment on each side arc, and whichever half of the perpendicular line the arc crosses, is your MEA.

Semi-Quantitative Long Version:

1. Establish the net negativity or positivity of each lead on the six limb leads (I, II, II, aVF, aVR, VL)
2. On the MEA diagram, draw a "3-segment on each side " on either the positive or the negative portion of each lead, according to the EKG
3. The MEA must lie within the wedge which has all six arcs spanning it. This gives you a range of 30˚ for your actual MEA.

Quick and Dirty:

1. Leads I and aVF are both + = normal
2. Lead I is – and aVF is + = Right Axis Deviation (RAD)
3. Lead I is + and aVF is - = LAD

Quantitative
(not desc. here b/c requires ruler)

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NO to ONE or MORE = NON-SINUS RYTHM

1. Dropped QRS complexes?

Yes

1. Total Absence of any waveform pattern?

Yes

VENTRICULAR FIBRILLATION

- Highly erratic pattern
- fatal if not tx'd
- NON- SINUS RHYTHM

2. Prolonged PR Interval?

Yes

2nd DEGREE (INCOMPLETE) HEART BLOCK **MOBITZ type 1** aka Wenkebach rhythm

- PR-interval > .25 sec
- PR-intervals often get progressively longer till you lose one, then it re-sets and then they start to get longer again
- AV node is disfctl
- NON-SINUS RHYTHM!!!

No

2nd DEGREE (INCOMPLETE) HEART BLOCK **MOBITZ type 2**

- PR-interval = no Δ
- sudden, unpredictable loss of QRS complex.
- disease of bundle of His-purkinje system
- **can be 2:1 or 3:1** (p wave:QRS compl.)
- NON-SINUS RHYTHM
- can degrade to 3rd deg. heart block

No

1. Has P Waves?

Yes

1. Separate P wave and QRS complex rhythm?

Y

3rd DEGREE (COMPLETE)HEART BLOCK aka Atrioventricular Dissociation

- P wave has atrial rhythm, QRS wave has Junctional (AV node)or Ventricular (His-Purkinje or Ventricular Myocardium) rhythm
- Hallmark: P wave and R wave are said to be "marching out" meaning they follow sep. rhythms, but are still highly regular (p-p and r-r do not change)
- Hallmark: P wave found btx QRS and T wave
- sometimes: inverted T waves.
- **Junctional Rhythm** = narrow QRS < 3 small boxes
- **Accelerated Idioventricular Rhythm** = widened QRS
- tx = pacing, transvenous or transcutaneous
- NON-SINUS RYTHM

2. P waves unclear, erratic baseline?

Y

ATRIAL FIBRILLATION

- no clear P waves, still have QRS. no reg. HR
- atria contract erratically, causes irregular baseline
- not directly fatal, but causes clots
- **Pulmonary Embolism** thrombus formed in atria goes to pulmonary circ and lungs
- **Coronary or Cerebral Embolism** thrombus formed in atrium goes to coronary art. or brain
- NON-SINUS RHYTHM

No

1. Wide QRS Complex?

Yes

VENTRICULAR TACHYCARDIA

- 150-250 bpm
- frequently due to a re-entrant ventricular pathway caused by scar tissue from previous MI, etc.

No

SVT SUPRA –VENTRICULAR TACHYCARDIA

- >150 bpm
- frequently due to a re-entrant pathway
- origin of electrical impulse is in the atria or the AV node

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