Normal Sinus Rhythm

- **Rate**: 60 – 100
- **Rhythm**: Regular
- **P Wave?**: Yes. Upright and normal
- **PR Interval?**: Less than 4 small boxes
- **QRS Complex?**: Narrow. Less than 3 small boxes
- **Ectopy?**

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Sinus Tachycardia

- **Rate**: Above 100

Sinus Bradycardia

- **Rate**: Less than 60

Sinus Arrhythmia

- **Rate**: 60 - 100
- **Rhythm**: Irregular

Sinus Arrest

- **Rate**: 60 - 100
- **Rhythm**: Irregular – period of inactivity (Arrest)
- **P Wave?**: Yes. Upright and normal
- **PR Interval?**: Less than 4 small boxes
- **QRS Complex?**: Narrow. Less than 3 small boxes
- **Ectopy?**

Supraventricular Tachycardia

- **Rate**: 150-250
- **Rhythm**: May be irregular
- **P Wave?**: Yes. May be multiform
- **PR Interval?**: Less than 4 small boxes, but can have varying PR intervals
- **QRS Complex?**: Narrow. Less than 3 small boxes
- **Ectopy?**

Wandering Pacemaker

- **Rate**: 60 - 100
- **Rhythm**: May be irregular
- **P Wave?**: Yes. Different appearance
- **PR Interval?**: Less than 4 small boxes, but can have varying PR intervals
- **QRS Complex?**: Narrow. Less than 3 small boxes
- **Ectopy?**

Atrial Flutter

- **Rate**: 60 - 100
- **Rhythm**: May be irregular
- **P Wave?**: Multiple p waves for each QRS
- **PR Interval?**: Less than 4 small boxes, but can have varying PR intervals
- **QRS Complex?**: Narrow. Less than 3 small boxes
- **Ectopy?**

Atrial Tachycardia

- **Rate**: 150-250
- **Rhythm**: May be irregular
- **P Wave?**: Yes. May be multiform
- **PR Interval?**: Less than 4 small boxes, but can have varying PR intervals
- **QRS Complex?**: Narrow. Less than 3 small boxes
- **Ectopy?**

Atrial Bradycardia

- **Rate**: Less than 60

Atrial Arrhythmia

- **Rate**: 60 - 100
- **Rhythm**: Irregular

Atrial Arrest

- **Rate**: 60 - 100
- **Rhythm**: Irregular – period of inactivity (Arrest)
- **P Wave?**: Yes. Upright and normal
- **PR Interval?**: Less than 4 small boxes
- **QRS Complex?**: Narrow. Less than 3 small boxes
- **Ectopy?**

Supraventricular Bradycardia

- **Rate**: 60 - 100
- **Rhythm**: Regular
- **P Wave?**: Unable to see P waves – buried in T-wave
- **PR Interval?**: Usually unable to see
- **QRS Complex?**: Narrow. Less than 3 small boxes
- **Ectopy?**

Supraventricular Arrhythmia

- **Rate**: 60 - 100
- **Rhythm**: Regular
- **P Wave?**: Unable to see P waves – buried in T-wave
- **PR Interval?**: Usually unable to see
- **QRS Complex?**: Narrow. Less than 3 small boxes
- **Ectopy?**

Accelerated Junctional Rhythm

- **Rate**: 40 - 60
- **Rhythm**: Regular
- **P Wave?**: Absent – may be inverted or buried
- **PR Interval?**: None (short if inverted)
- **QRS Complex?**: Narrow. Less than 3 small boxes
- **Ectopy?**

Junctional Arrhythmia

- **Rate**: 60 - 100
- **Rhythm**: Irregular
- **P Wave?**: Absent – may be inverted or buried
- **PR Interval?**: None (short if inverted)
- **QRS Complex?**: Narrow. Less than 3 small boxes
- **Ectopy?**
### Junctional Tachycardia

- **Rate**: > 100
- **Rhythm**: Regular
- **P Wave?**: Absent – may be inverted or buried
- **PR Interval?**: None (short if inverted)
- **QRS Complex?**: Narrow. Less than 3 small boxes
- **Ectopy?**: ?

### 1° AV Block

- **Rate**: Depends on underlying rhythm
- **Rhythm**: Regular
- **P Wave?**: Yes. Upright and normal
- **PR Interval?**: MORE than 4 small boxes
- **QRS Complex?**: Narrow. Less than 3 small boxes
- **Notes**: Wide or prolonged PR interval

### 2° AV Block Type 1 (Wenkebach)

- **Rate**: Depends on the rate of the underlying rhythm
- **Rhythm**: Irregular
- **P Wave?**: Yes. Normal. More P waves than QRS Complexes
- **PR Interval?**: Progressively longer until a QRS complex is dropped
- **QRS Complex?**: Narrow. Less than 3 small boxes
- **Notes**: Widening PR interval until dropped QRS, then PR starts over.

### 2° AV Block Type 2

- **Rate**: Atrial – 60-100; Ventricular rate may be slower
- **Rhythm**: Irregular
- **P Wave?**: Yes. Upright and normal
- **PR Interval?**: Can be normal or prolonged but constant. QRS dropped
- **QRS Complex?**: Usually wide but can be normal.
- **Ectopy?**: Constant PR intervals with dropped QRS Complexes

### 3° AV Block

- **Rate**: Atrial 60-100 / Ventricular 40-60
- **Rhythm**: Usually Regular
- **P Wave?**: Yes. Upright and normal
- **PR Interval?**: Variable
- **QRS Complex?**: Normal or wide
- **Notes**: P waves and QRS are independent of each other.

### Idioventricular Rhythm

- **Rate**: 40-60
- **Rhythm**: Usually Regular
- **P Wave?**: NO
- **PR Interval?**: None
- **QRS Complex?**: Wide Complex
- **Notes**: QRS generated from below the AV Node creating a wide complex

### 2° AV Block Type 2

- **Rate**: 150-250
- **Rhythm**: Usually Regular
- **P Wave?**: NO
- **PR Interval?**: None
- **QRS Complex?**: Wide Complex
- **Notes**: QRS generated from below the AV Node creating a wide complex

### Premature Ventricular Complex

### Premature Atrial Complex

### Premature Junctional Complex

### Torsades de Pointes
STEMI ALERT CRITERIA

**STEMI Patient** – All patients with a 12 lead EKG displaying ST segment elevation in 2 or more contiguous leads. ST segment elevation is defined as:

1. At least 1mm (1 small box) of elevation in the limb leads
2. At least 2mm (2 small boxes) of elevation in the V leads
3. The EKG must be free of artifact, and have obvious and conclusive ST segment elevation in order to declare a “STEMI alert.”

**STEMI Facility Transports**

A. A patient with 12-Lead ECG with ST depression in two or more contiguous leads accompanied by clinical signs and symptoms.

OR

B. A patient who presents with clinical signs/symptoms accompanied by TWO of the following STEMI Risk Factors:

1) Hypertension
2) Diabetes
3) Elevated cholesterol
4) Smoker
5) Obese

C. A patient who presents with clinical signs/symptoms and a normal EKG accompanied by ONE of the following STEMI Risk Factors:

1) History of previous STEMI
2) History of bypass surgery/procedure
3) History of previous cardiac cath
4) History of stroke or TIA

**12 Lead Radio Transmission**

“I have a diagnostic 12 Lead ECG”

“There are ST elevations present in the following leads”

**“There is reciprocal ST depression in the following leads”**

**12 Lead Quick Reference**

<table>
<thead>
<tr>
<th>Lead</th>
<th>I Lateral</th>
<th>aVR</th>
<th>V1 Septal</th>
<th>V4 Anterior</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>aVL</td>
<td>V2</td>
<td>V5</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>aVF</td>
<td>V3</td>
<td>V6</td>
<td></td>
</tr>
</tbody>
</table>

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**MONA***

Morphine – Concurrently with NTG
2mg every 3-5 min. until pain relief or BP <90

Aspirin – 324mg PO (Plavix 75mg if allergic)

Nitroglycerin – 0.4mg every 3-5min until pain relief or BP<90

* Include Versed to sedate for Air Rescue pt’s

**Sexual Enhancing Drugs**

<table>
<thead>
<tr>
<th>24 Hours</th>
<th>72 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viagra (sildenafil)</td>
<td>Cialis (Tadalafil)</td>
</tr>
<tr>
<td>Revatio (sildenafil)</td>
<td>Adcirca (tadalafil)</td>
</tr>
</tbody>
</table>

**Indications for 12 Lead**

1. All chest pain or chest discomfort, including atypical presentation, consistent with myocardial ischemia, unless due to penetrating injury.

2. Cardiac dysrhythmias in an adult: Heart rate greater than 120 BPM or heart rate less than 50 BPM. In children, heart rate > 220 BPM.

3. Epigastric pain (unless evidence of G.I. bleeding) in all patients > 35 years of age. Epigastric pain is defined as pain above the umbilicus.

4. Diaphoresis not explained by environment. May be associated with nausea and/or vomiting.

5. Sudden onset of any abnormal breathing problems, CHF or pulmonary edema.

6. Syncope and near syncope, including children.

7. All overdoses.

8. PVC’s.


10. Administration of Nitroglycerin.

11. Known or suspected carbon monoxide (CO) poisoning.

12. Non-traumatic arm or jaw pain.

**12 Lead Mimics**

**Do Not Call STEMI ALERT**

**Left Bundle Branch Block**

QRS wider than .12 sec (3 small boxes) with a downward deflection in V1

**Early Repolarization**

Concave shape of the ST segment (lateral leads) with notching at the J point. “fish hook” appearance

**Left Ventricular Hypertrophy**

Very tall R waves in lateral leads (>35mm in V5) Deep S wave in V1

**Pericarditis**

ST Elevation in most or all leads

**Arrhythmias**

AV Blocks- 2º and 3º AV Blocks can have a borderline wide QRS which artificially raises the ST segment

Paced Rhythm – Can present a wide QRS which artificially raises the ST segment

PVC’s – **Couplets** can give the appearance of ST Elevation.

Bigeminy – PVC’s can be mistaken for the underlying rhythm and appear to have ST elevation

**Wide Complex Rhythms** – Idioventricular, Accelerated Idioventricular or V-Tach

And

**Junctional Rhythms** – Can present a borderline or wide QRS which artificially raises the ST segment
12 Interpretation

STEP 1 – Determine a Diagnostic ECG
- Check Rate and Rhythm in the monitoring lead
- Check correct gain (amplitude)= 1mV Or 2 Large Boxes
- Is the P Wave Upright in Lead I?
  - If the Answer is No, Is Limb Lead Placement Correct?
- Is the QRS Wider Than .12 sec or 3 Small Boxes?
  - If the Answer is Yes, Go to V1 and Check for a LBBB

STEP 2 – Analyze ST segments
- Examine leads II, III, aVF for inferior wall view
  - If ST elevation is present, attach V4R for right side view
- Examine V1 – V6 – for view of the anterior wall around to the lateral wall
- Examine leads I and aVL for additional lateral wall view

Electrode Placement
- V1 – 4th Intercostal Space, Parasternal
- V2 – 4th Intercostal Space, Parasternal
- V4 – 5th Intercostal Space, Midclavicular Line
- V3 – In a straight line between V2 and V4
- V6 – 5th Intercostal Space, Midaxillary Line
- V5 - In a straight line between V4 and V6