

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?

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?

MIAMI DADE FIRE RESCUE



MIAMI, FL

Always Ready, Proud To Serve

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 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?

Supraventricular Tachycardia



Rate 150-250
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?

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 Fibrillation



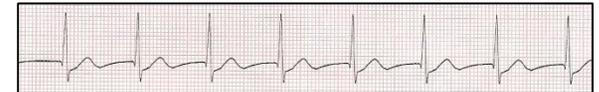
Rate Atrial - ≥ 350 , Ventricular rate may vary
Rhythm Irregularly irregular
P Wave? "Fib waves" showing atrial activity
PR Interval? Unidentifiable
QRS Complex? Narrow. Less than 3 small boxes
Ectopy?

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?

Accelerated Junctional Rhythm



Rate 60 - 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?

Junctional Tachycardia



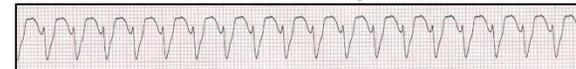
Rate > 100
Rhythm Regular
P Wave? Absent – may be inverted or buried
PR Interval? None (short if inverted)
QRS Complex? Narrow. Less than 3 small boxes
Ectopy?

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**

Ventricular Tachycardia



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**

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**

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.**

Premature Ventricular Complex



Premature Atrial Complex



Premature Junctional Complex



Torsades de Pointes



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.**

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**

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:

- At least 1mm (1 small box) of elevation in the limb leads
- At least 2mm (2 small boxes) of elevation in the V leads
- 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:**

- Hypertension
- Diabetes
- Elevated cholesterol
- Smoker
- Obese

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

- History of previous STEMI
- History of bypass surgery/procedure
- History of previous cardiac cath
- 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”

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MONA*

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

Oxygen – NRB 15L

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

24 Hours	72 Hours
Viagra (sildenafil)	Cialis (Tadalafil)
Revatio (sildenafil)	Adcirca (tadalafil)
Levitra (vardenafil)	

Indications for 12 Lead

- All chest pain or chest discomfort, including atypical presentation, consistent with myocardial ischemia, unless due to penetrating injury.**
- Cardiac dysrhythmias** in an adult: Heart rate greater than 120 BPM or heart rate less than 50 BPM. In children, heart rate > 220 BPM.
- Epigastric pain** (unless evidence of G. I. bleeding) in all patients > 35 years of age. *Epigastric pain is defined as pain above the umbilicus.*
- Diaphoresis not explained by environment.** May be associated with nausea and/or vomiting.
- Sudden onset of any abnormal breathing problems, CHF or pulmonary edema.**
- Syncope and near syncope**, including children.
- All overdoses.**
- PVC's.**
- Unexplained back pain (non-traumatic).**
- Administration of Nitroglycerin.**
- Known or suspected **carbon monoxide (CO) poisoning.**
- Non-traumatic arm or jaw pain.**

12 Lead Quick Reference

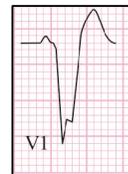
I Lateral	aVR	V1 Septal	V4 Anterior
II Inferior	aVL Lateral	V2 Septal	V5 Lateral
III Inferior	aVF Inferior	V3 Anterior	V6 Lateral

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



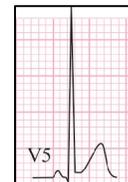
Early Repolarization

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

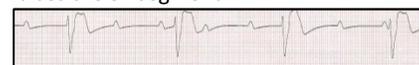


Pericarditis

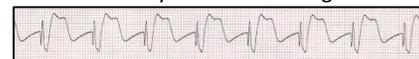
ST Elevation in most or all leads

Arrhythmias

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



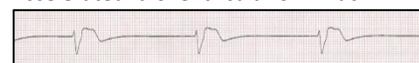
Paced Rhythm – Can present a wide QRS which artificially raises the ST segment



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

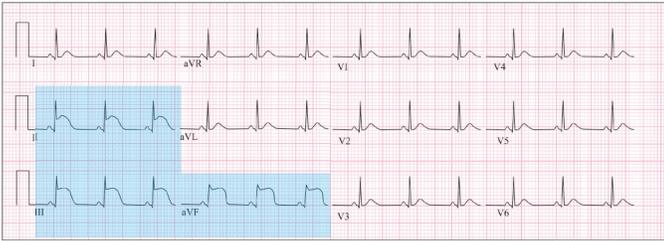
Wide Complex Rhythms – Idioventricular, Accelerated Idioventricular or V-Tach



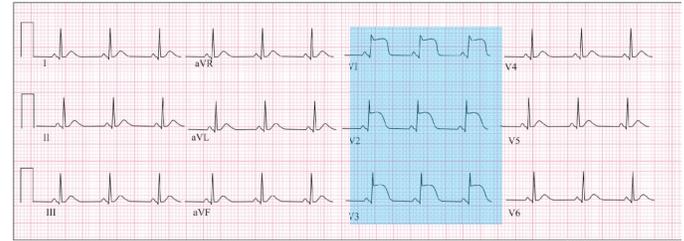
And

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

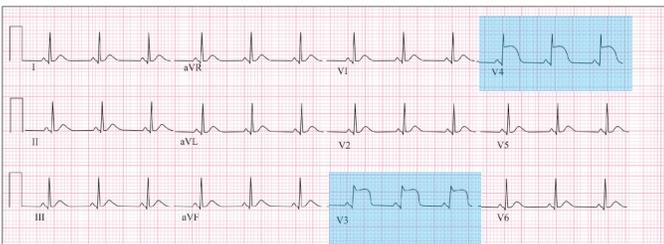
Inferior Wall



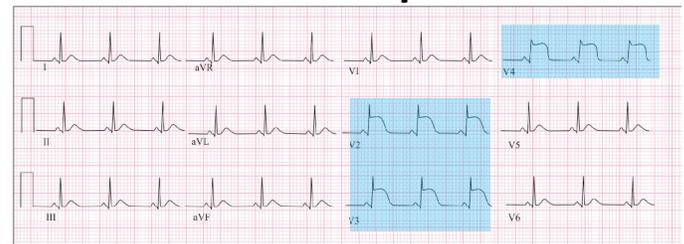
Septal Wall



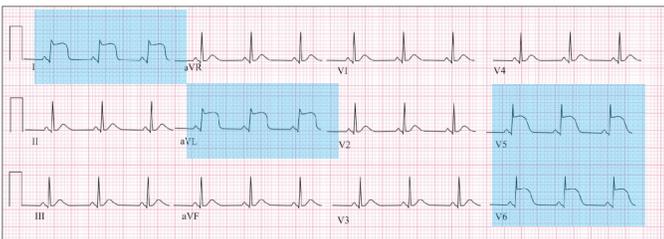
Anterior Wall



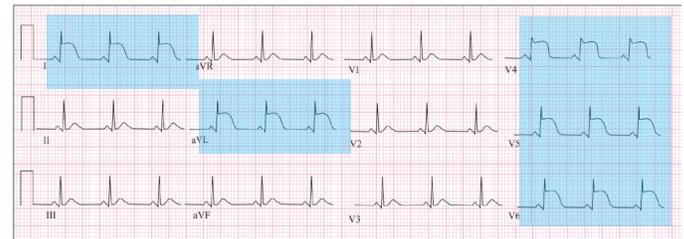
Anteroseptal



Lateral Wall



Anterolateral



12 Interpretation

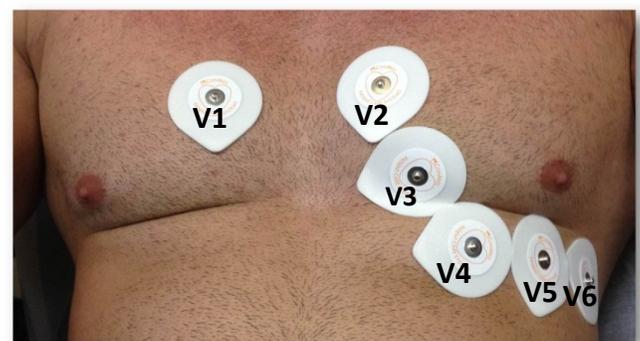
STEP 1 – Determine a Diagnostic ECG

- 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**