The Basic 12 Lead Electrocardiogram

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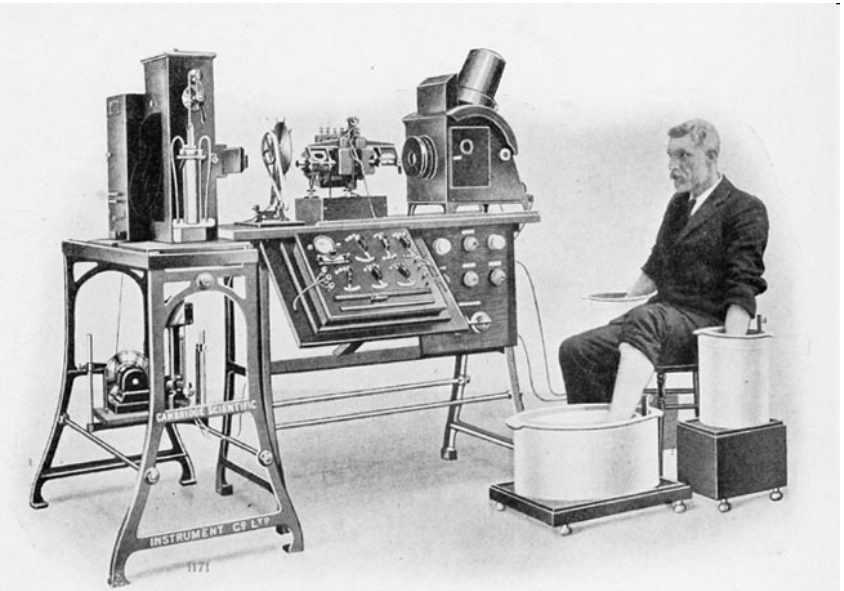
Objectives

- How do they work?
- Common mistakes
- How to read an EKG
- Artifacts
- Cases



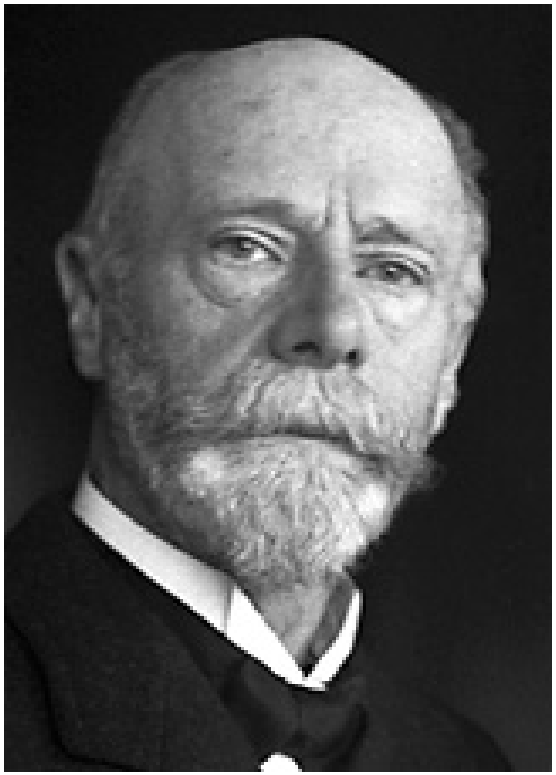
Photograph of a Complete Electrocardiograph, Showing the Manner in which the Electrodes are Attached to the Patient, In this Case the Hands and One Foot Being Immersed in Jars of Salt Solution

What is an EKG?

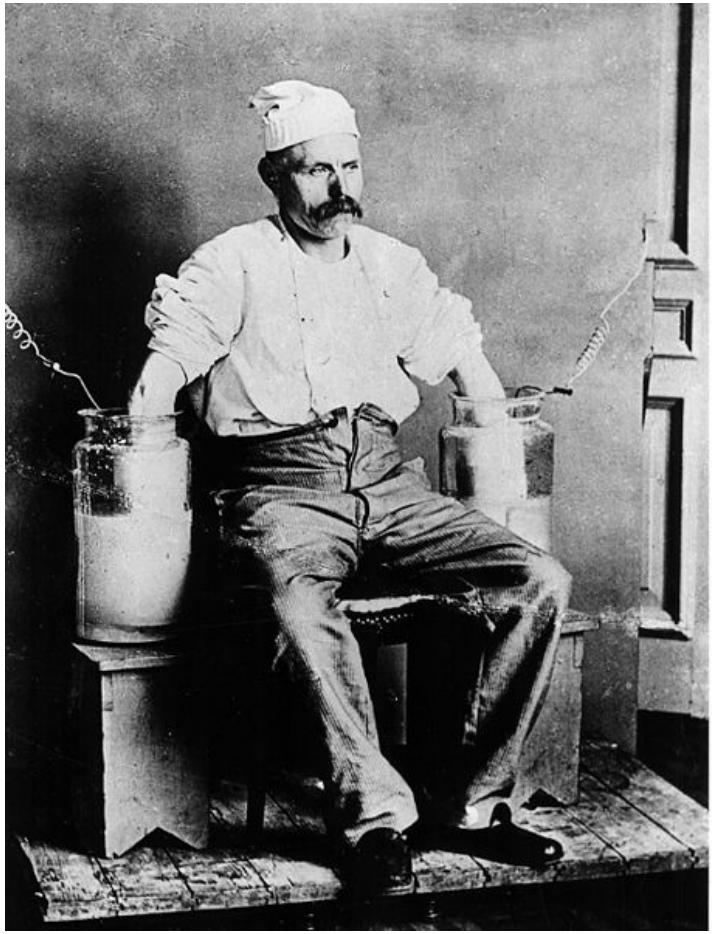
- Tracing of electrical activity of the heart

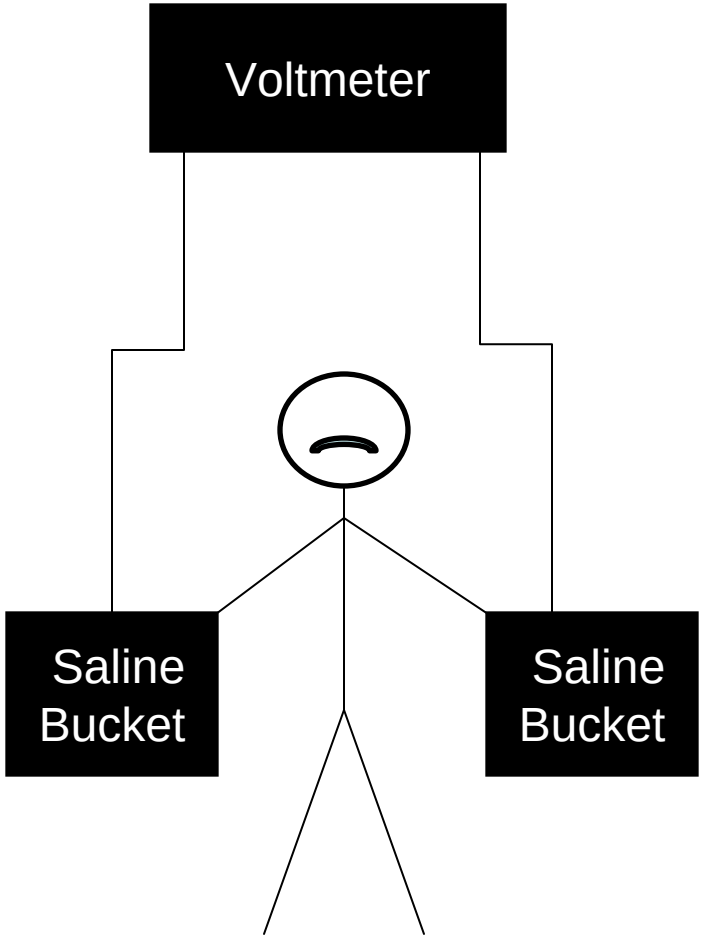
History of the EKG

- William Einthoven
- Early 1900's
- String galvanometer



How does an EKG work?





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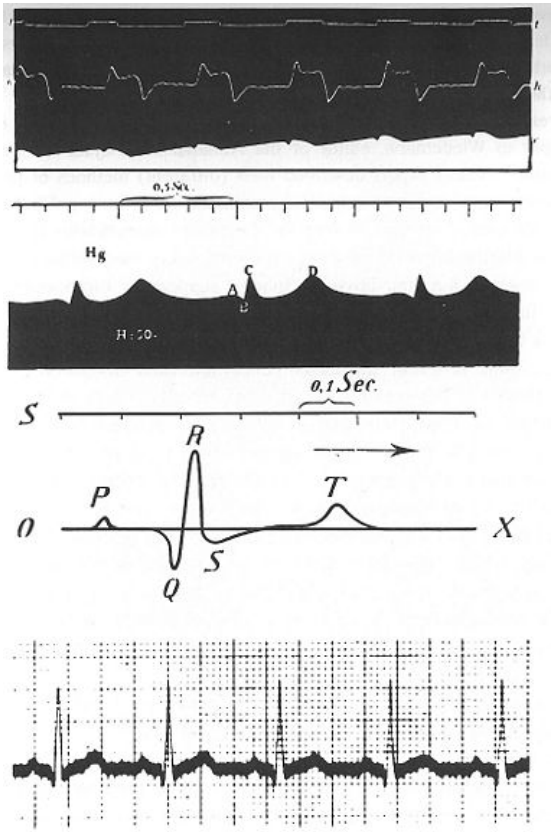

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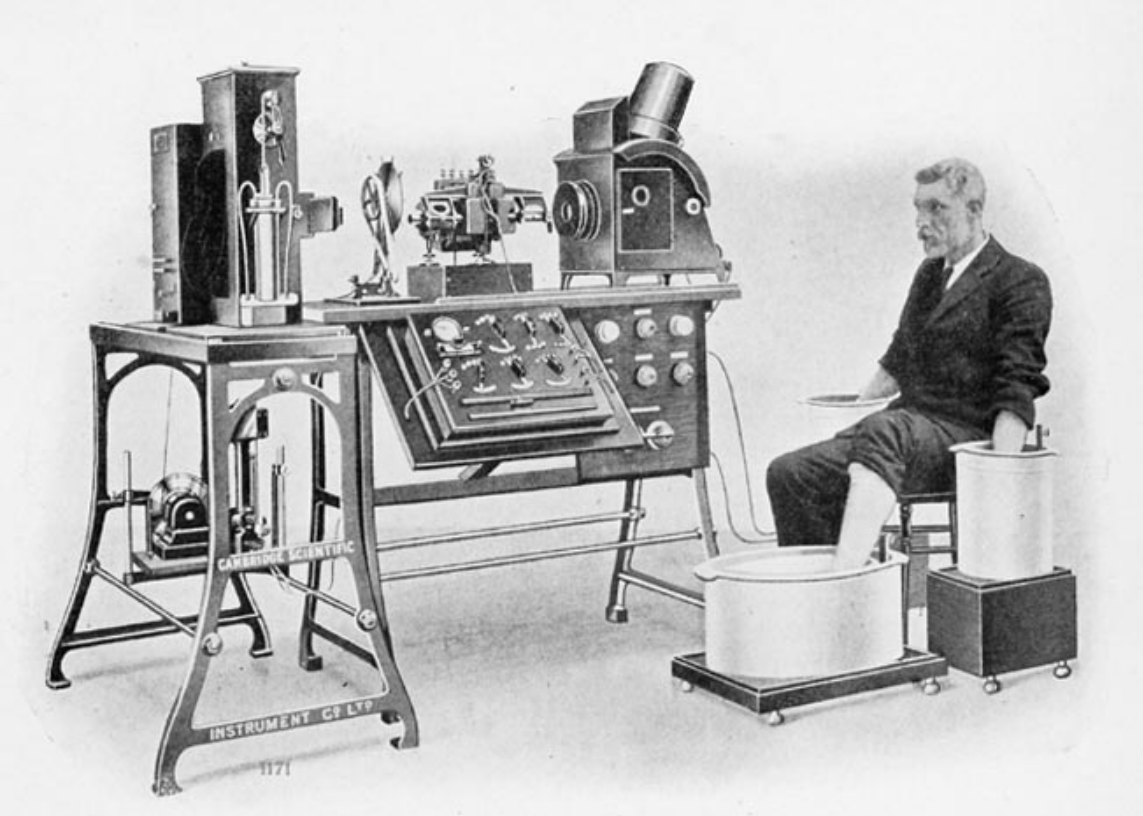
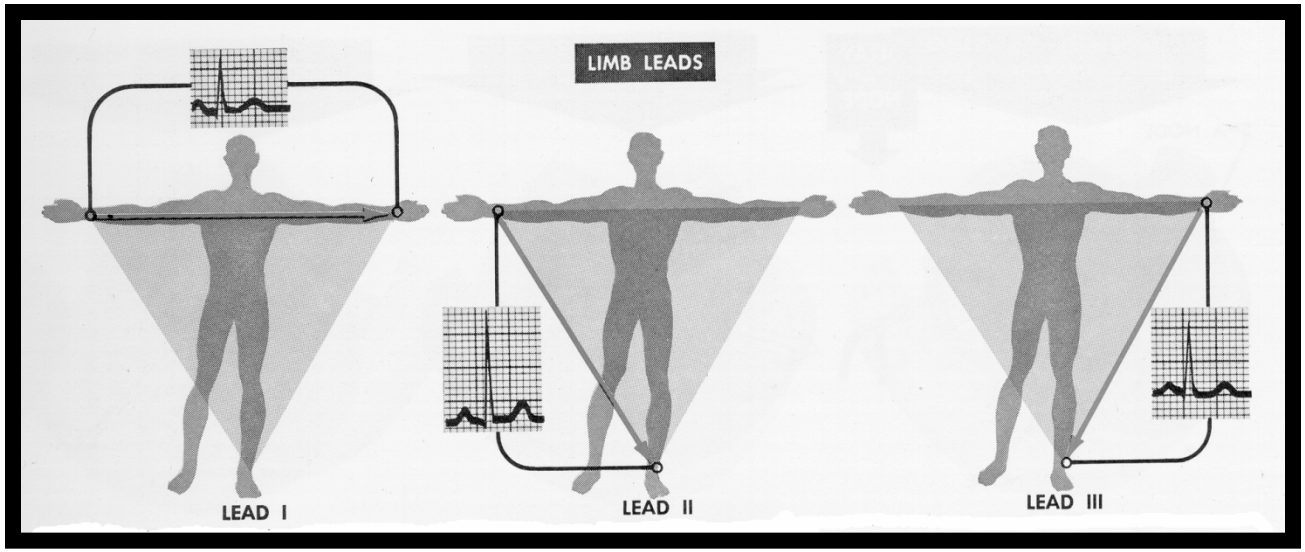


Photograph of a Complete Electrocardiograph, Showing the Manner in which the Electrodes are Attached to the Patient, In this Case the Hands and One Foot Being Immersed in Jars of Salt Solution

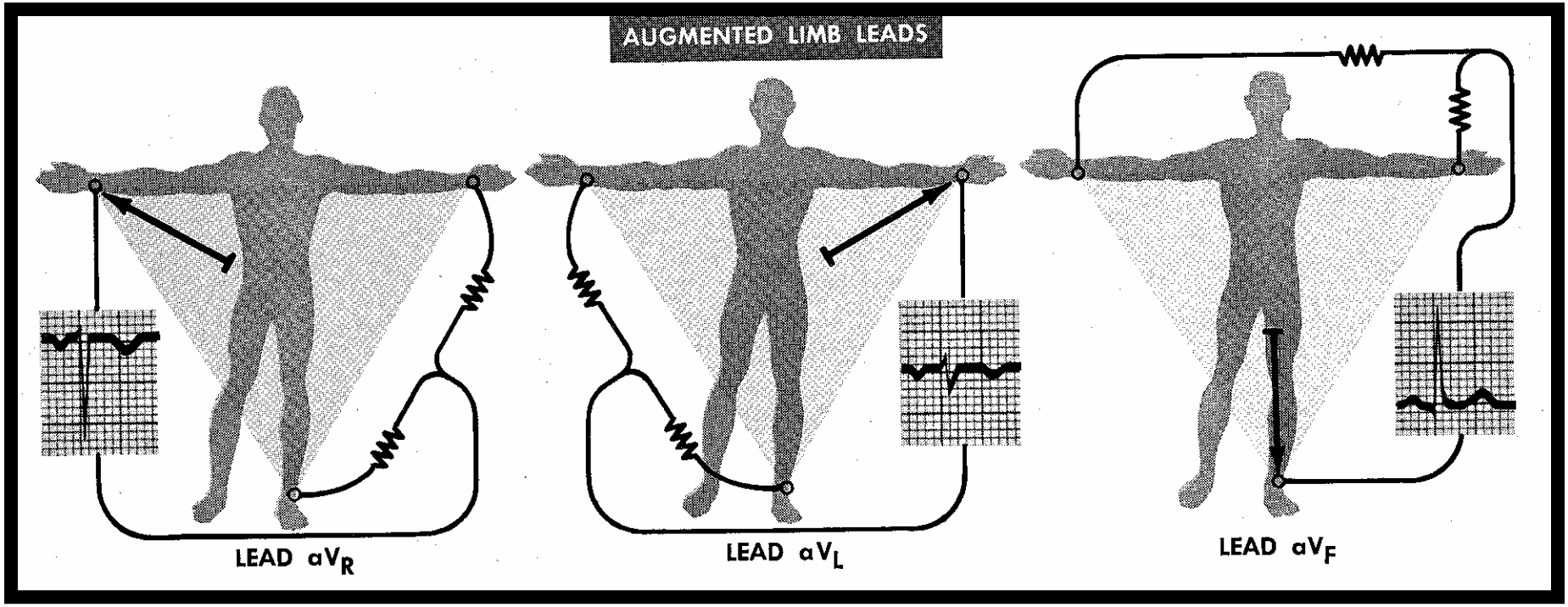
How does an EKG work?

- Einthoven → I, II, III



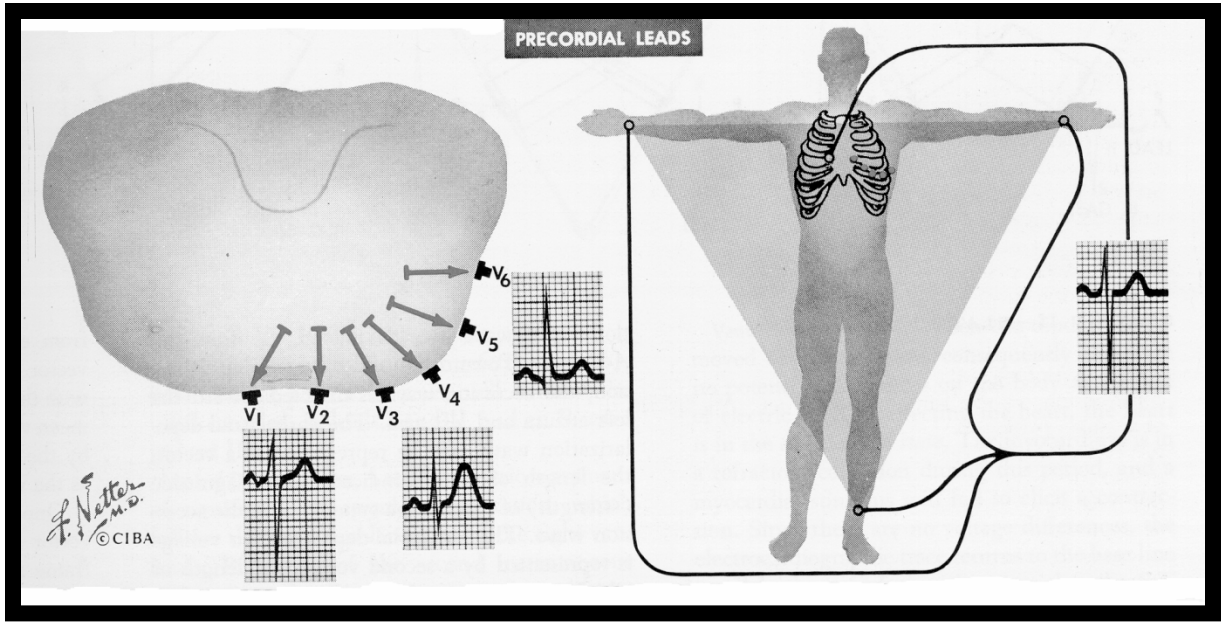
How does an EKG work?

- Wilson → augmented leads
  - aVF, aVR, aVL



How does an EKG work?

- Pre-cordial leads
  - V1 – V6
  - Standardized in 1938 by the AHA



Why PQRST?

- Uncorrected tracings – ABCD
- Corrected tracing – PQRST
  - Familiar with Descartes
  - Middle of alphabet (afterthought)

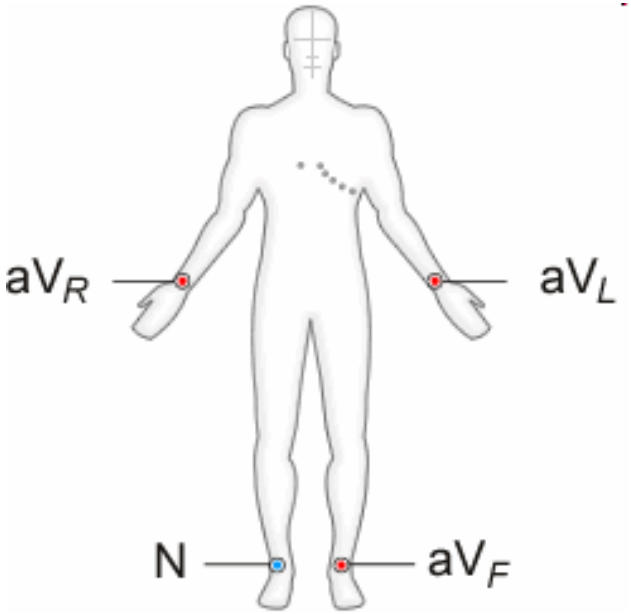
Indications

- Chest pain
- Syncope
- Shortness of breath
- Nausea/Vomiting
- Palpitations
- Diaphoresis
- Stroke symptoms
- Before and after cardioversion
- Hemodynamic instability
- Suspected electrolyte disorder
- Overdose
- Arrhythmia

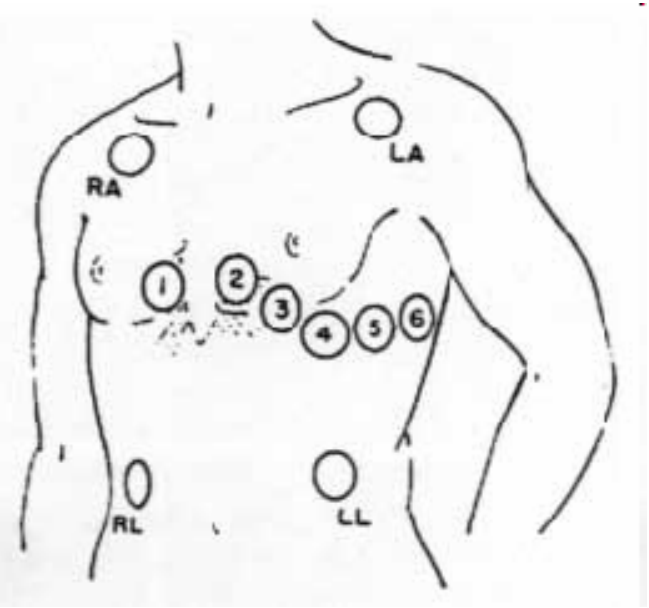
Common Mistakes

- Limb lead placement

RIGHT

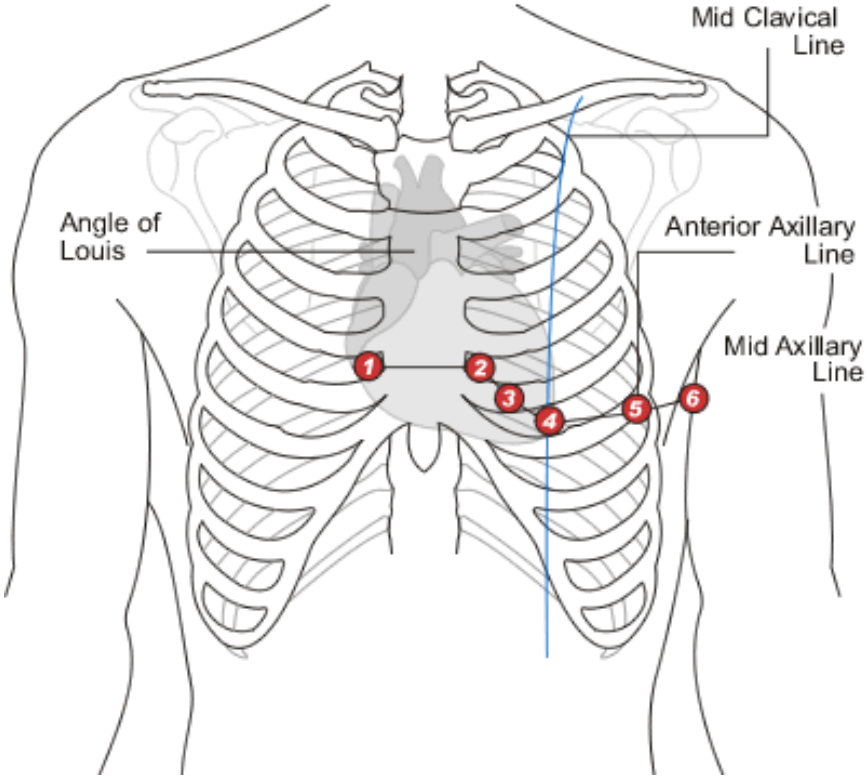


WRONG



Common Mistakes

- Pre-cordial lead placement
  - Angle of Louis
  - V1
  - What about breast tissue?

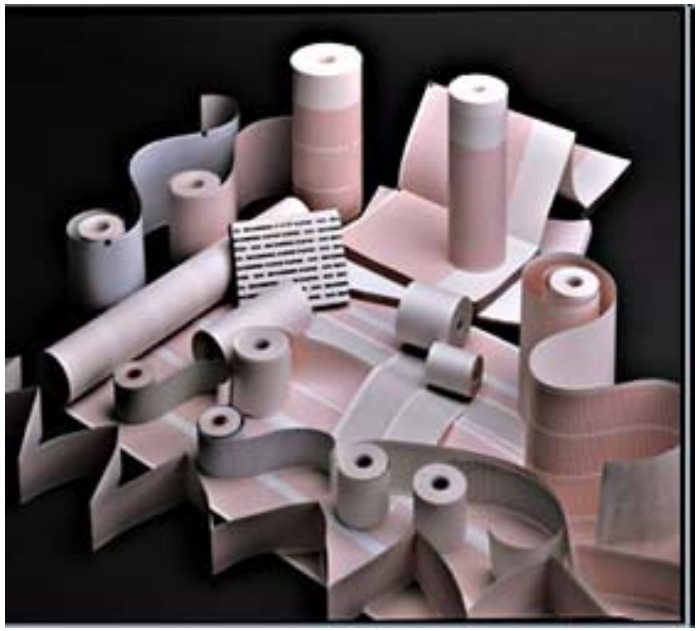


How to read an EKG

- The Paper
- The Waveform
- The Plan

How to read an EKG

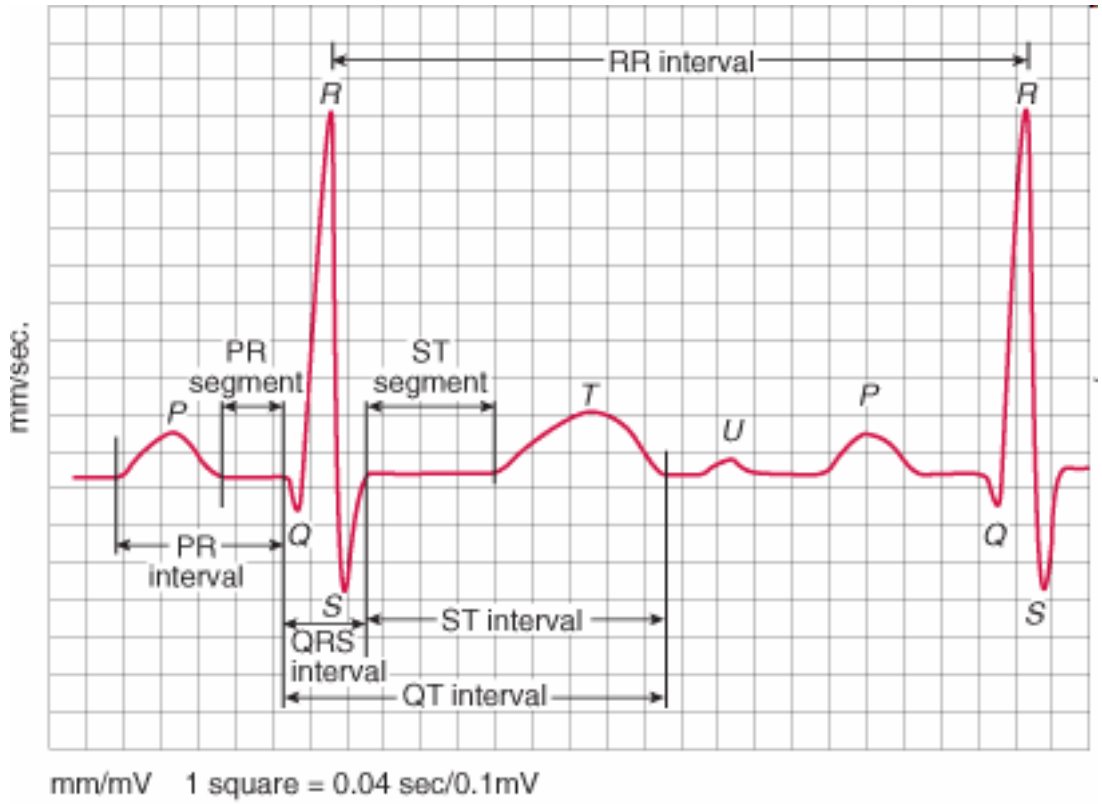
- The paper
  - Up and down → 1 box = 0.1 mV
  - Across → 1 box = 4 ms



- The rate
  - 10 seconds per page

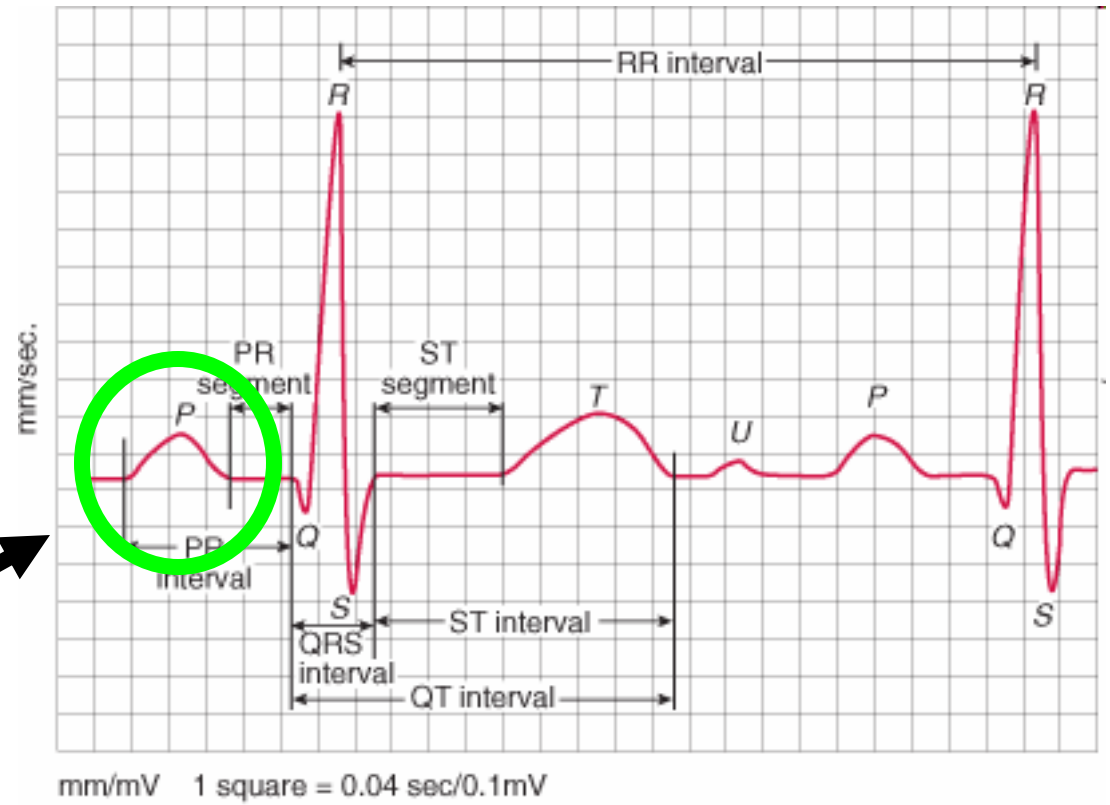
How to read an EKG

- The Waveform



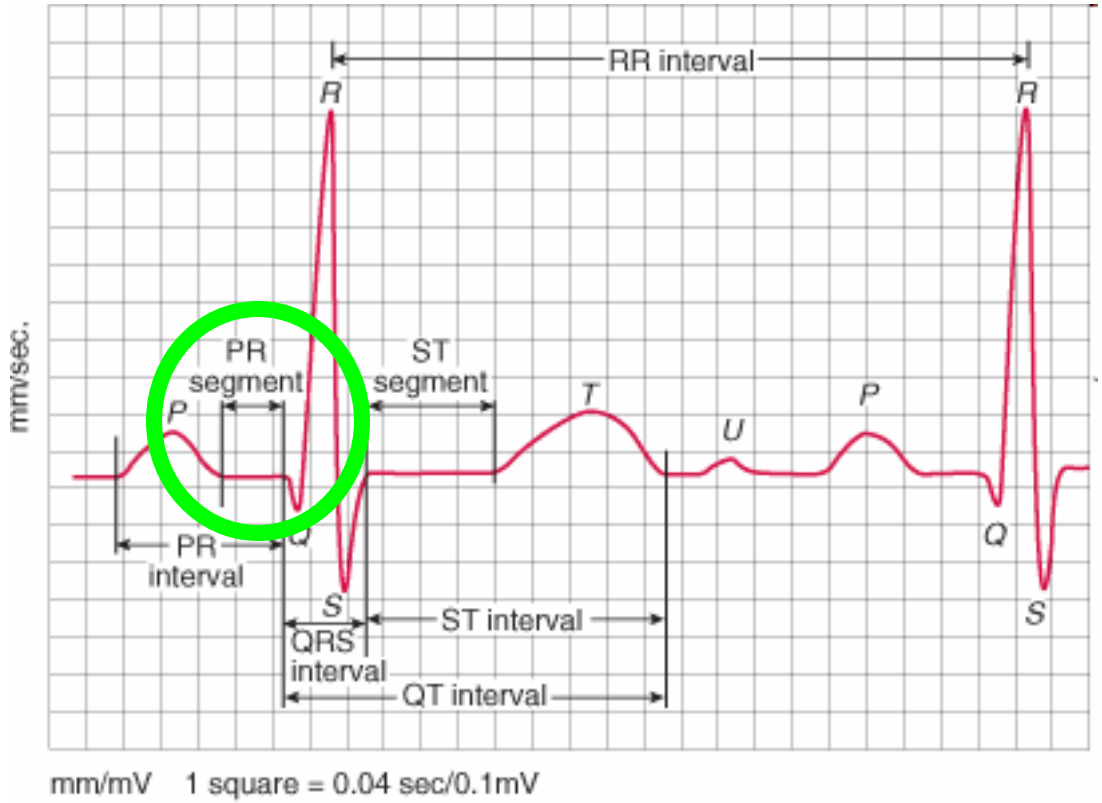
How to read an EKG

- P wave



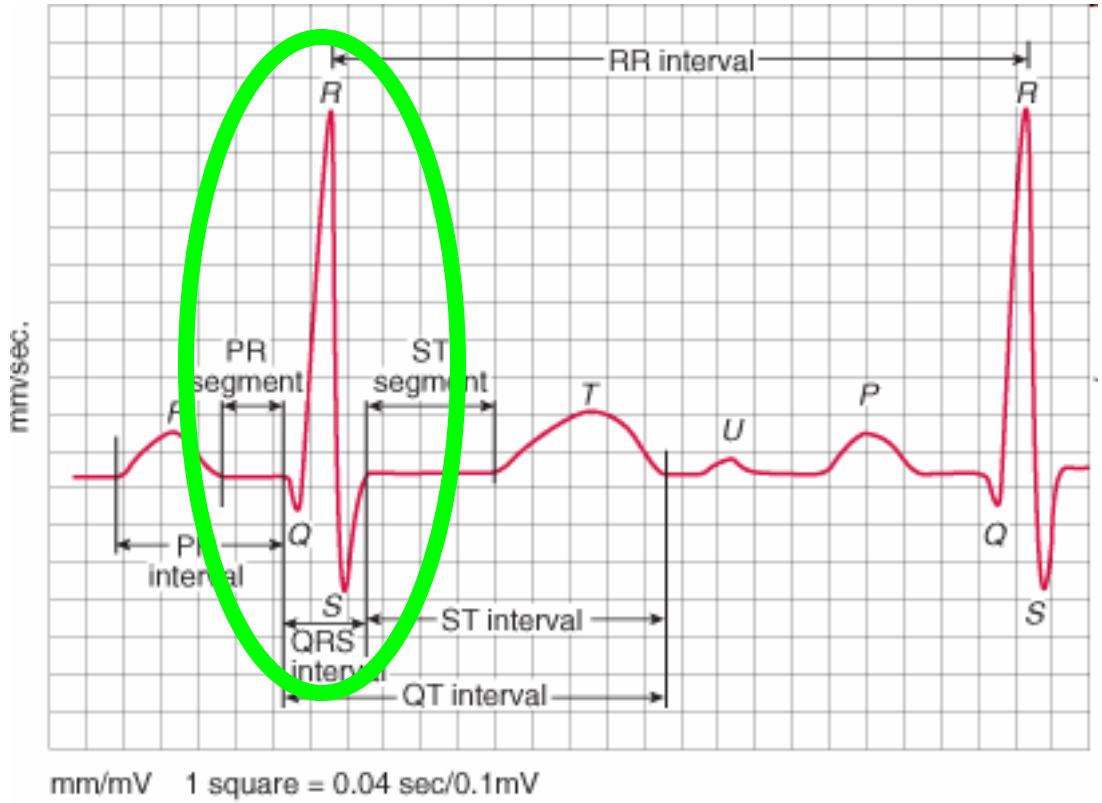
How to read an EKG

- PR segment



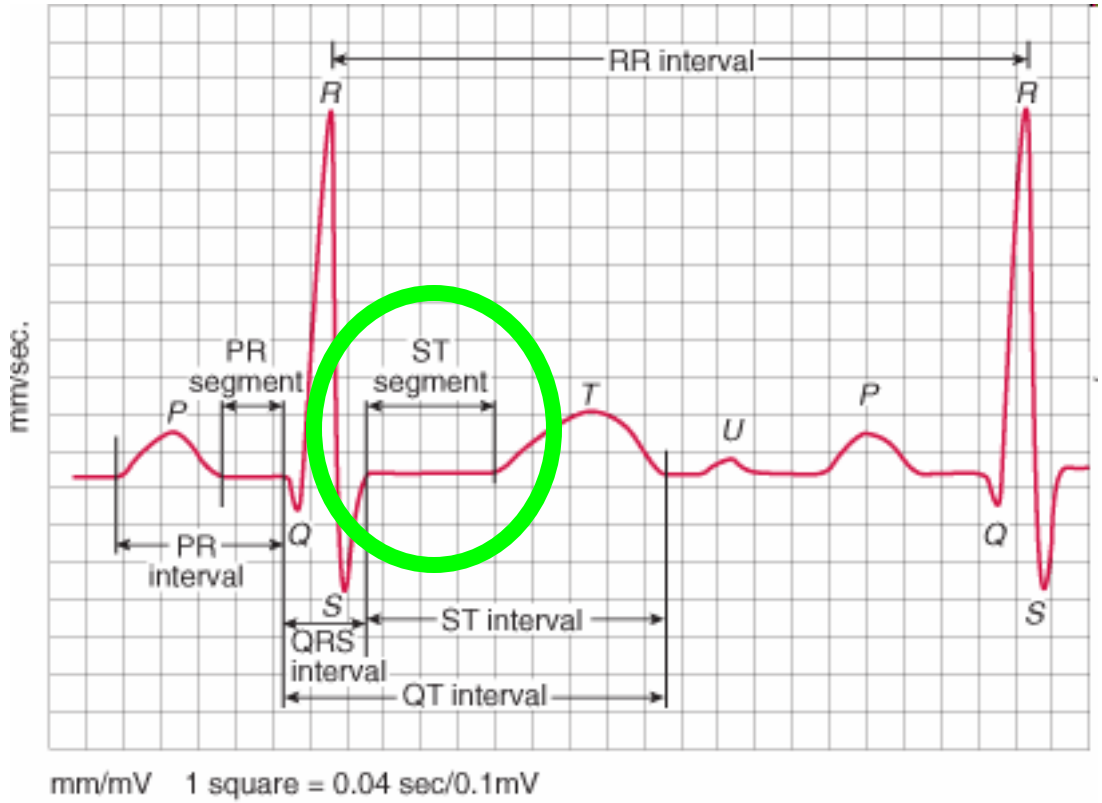
How to read an EKG

- QRS complex



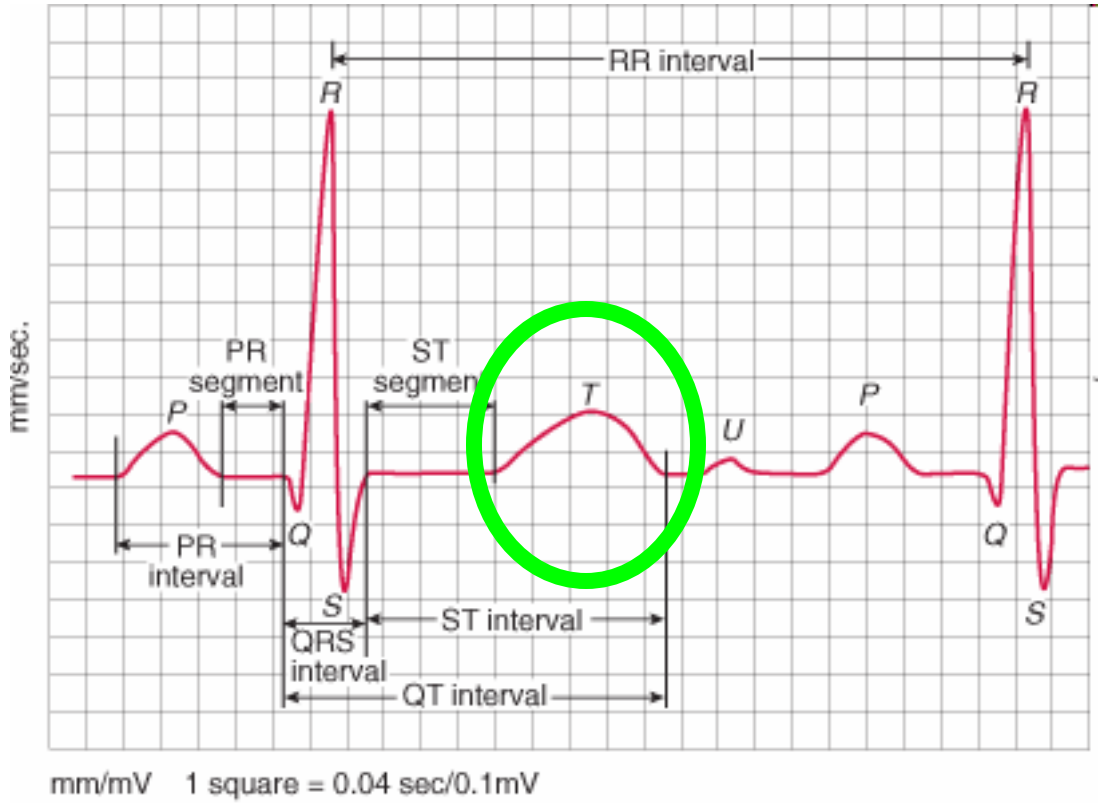
How to read an EKG

- ST segment



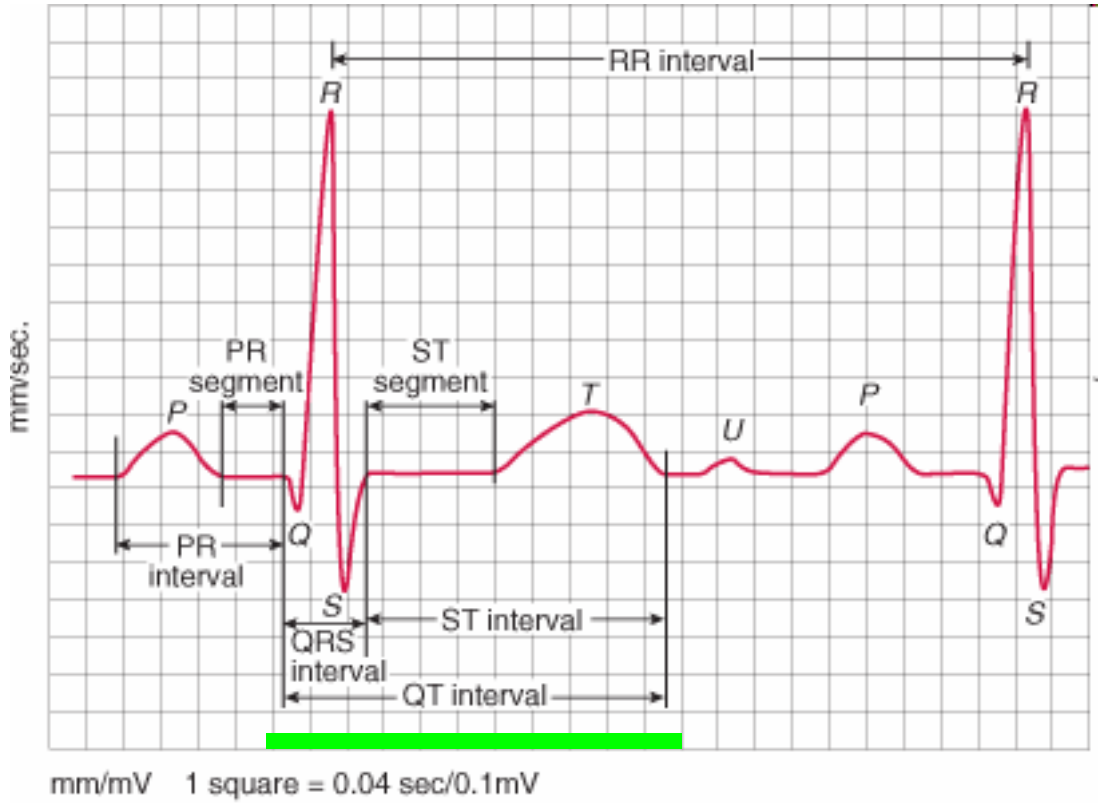
How to read an EKG

- T wave



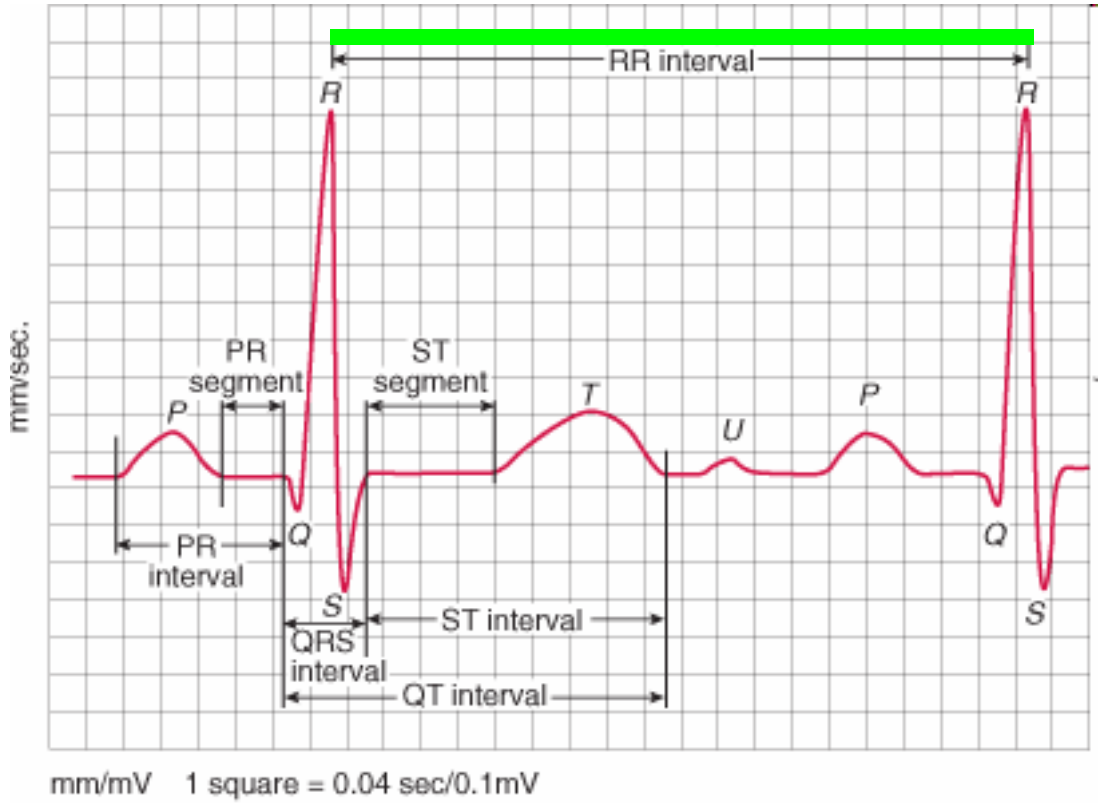
How to read an EKG

- QT/QTc



How to read an EKG

- R-R

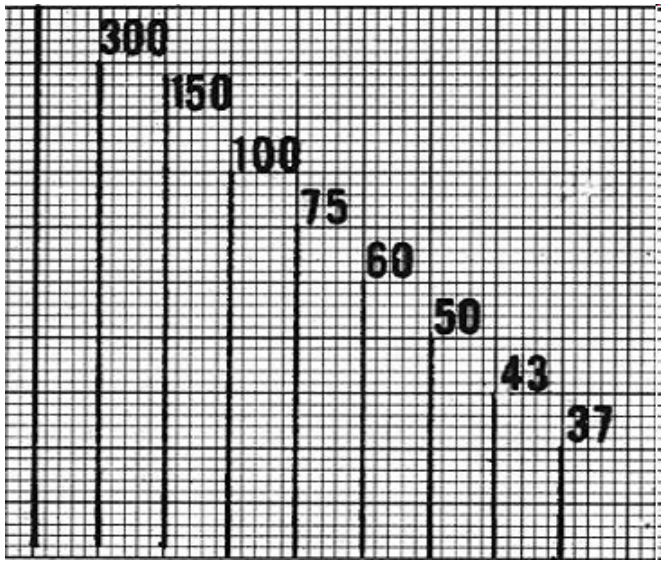


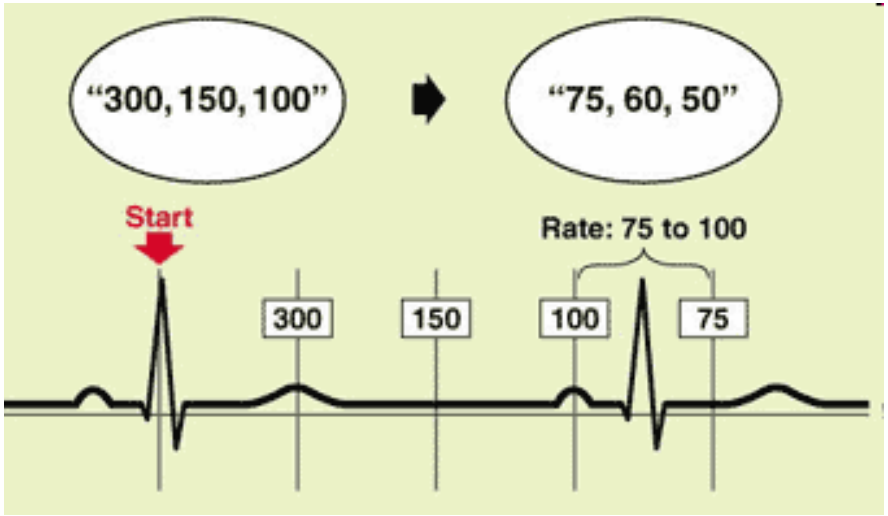
The Plan

- Rate
- Rhythm
- Axis
- Interval
- Disease

Rate

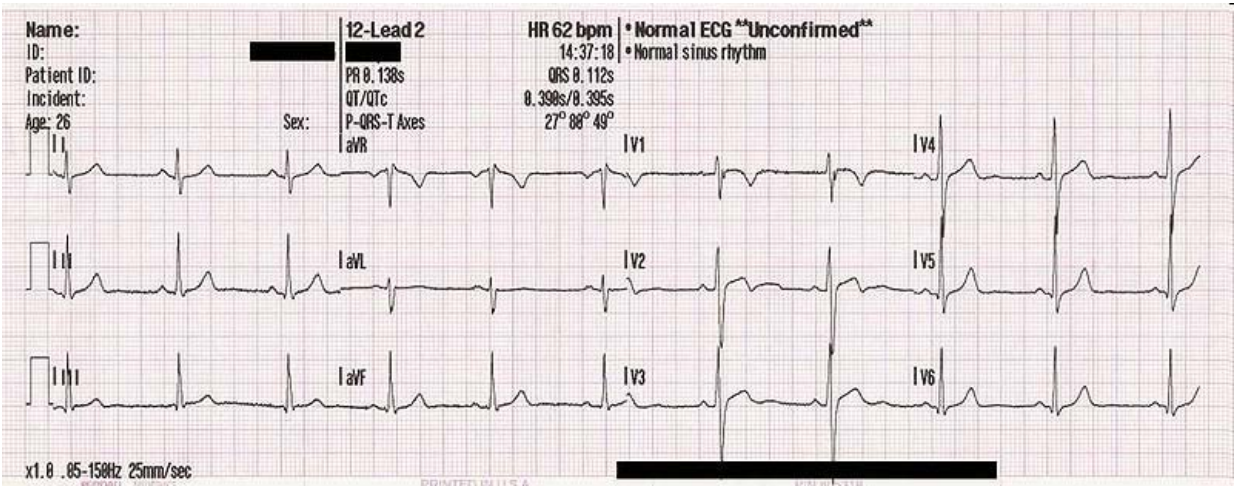
- 300 method
  - 300, 150, 100, 75, 60





Rate

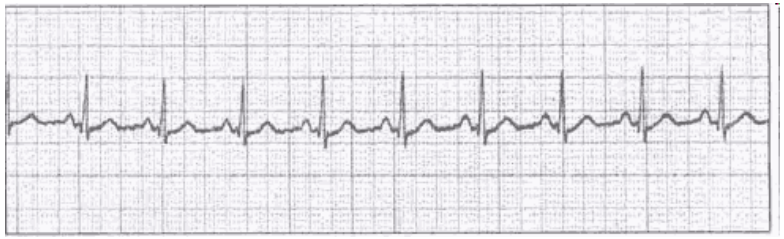
- 10 second method
  - Each EKG is 10 seconds
  - Count total QRS complexes
  - Multiply by 6



Rate

- Normal

  60 – 100



- Bradycardia

  < 60

- Tachycardia

  > 100

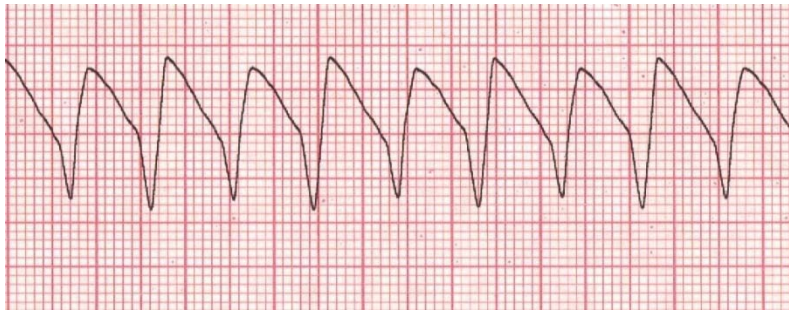
Rhythm

- Sinus
- Atrial
- Supraventricular
- Junctional

Narrow QRS

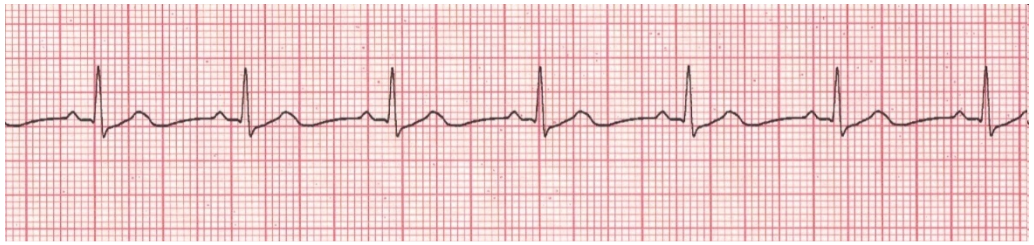
- Ventricular

Wide QRS

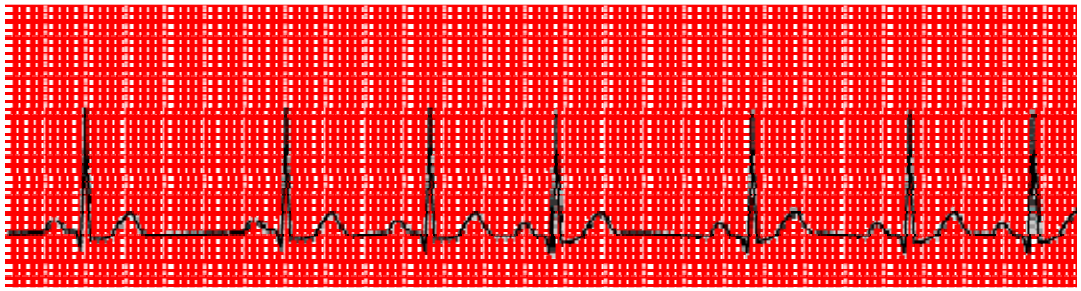


Rhythm

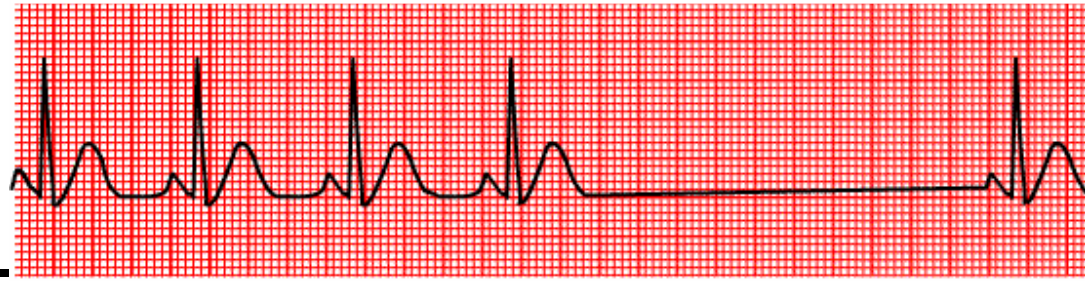
- Normal Sinus



- Sinus Arrhythmia



- Sinus Arrest

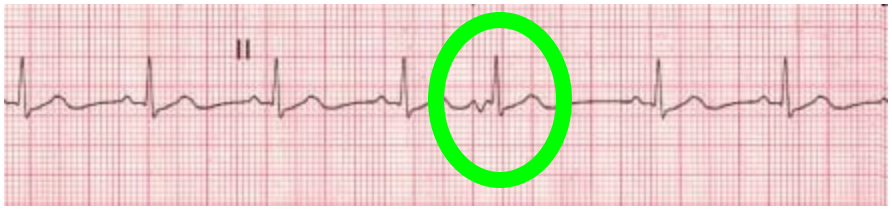


Rhythm

- ATRIAL
  - Atrial Flutter

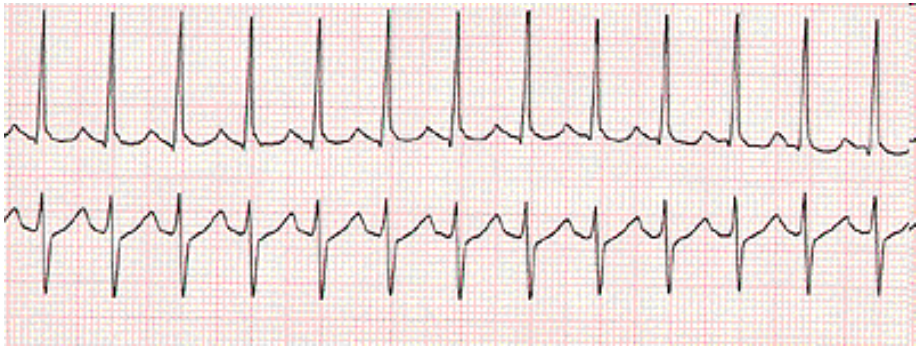
  - Atrial Fibrillation

  - Premature Atrial Contraction



Rhythm

- Supraventricular
  - Catch all term
  - Supraventricular Tachycardia



Rhythm

- JUNCTIONAL
  - Junctional Escape

  - Accelerated Junctional

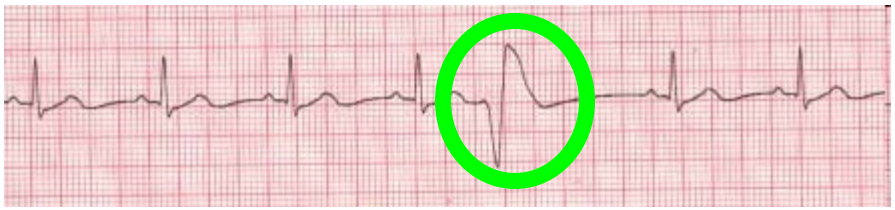
  - Premature Junctional Contraction

Rhythm

- VENTRICULAR
  - V Fibrillation

  - V Tachycardia

  - Premature Ventricular Contraction



Axis

- General direction of electrical activity
- Will not change your management

Interval

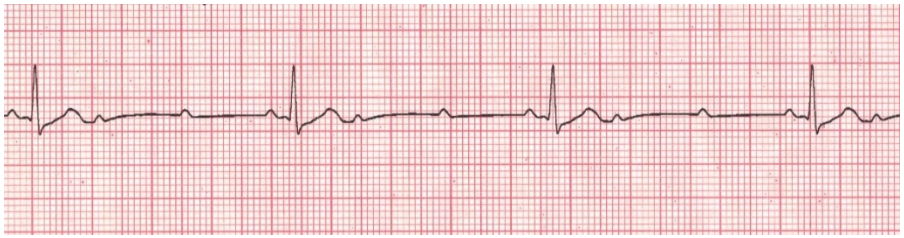
- PR
  - Block between atria and ventricles
  - Heart Block
    - First, second, and third degree
- QRS
  - Block in the conduction system
  - Bundle Branch Block
    - LBBB, LAFB, LPFB, RBBB
- QT/QTc

P-R Interval

- 1 º heart block

- 2 º heart block - Type I

- 2 º heart block- Type II



- 3 º heart block (complete)

QRS Interval

- QRS complex = ventricular depolarization

- QRS widening = delay in depolarization

QRS Interval

- Causes of QRS widening
  - Ventricular rhythm
  - Damage to the conduction system
    - BBB
    - MI
  - Metabolic/Drugs

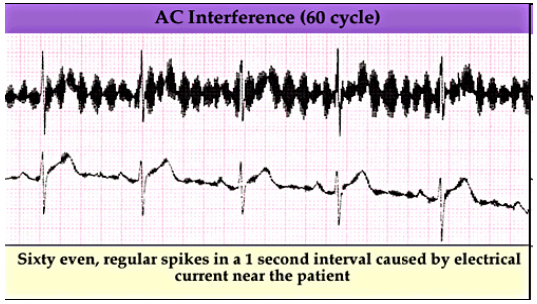
QRS Interval

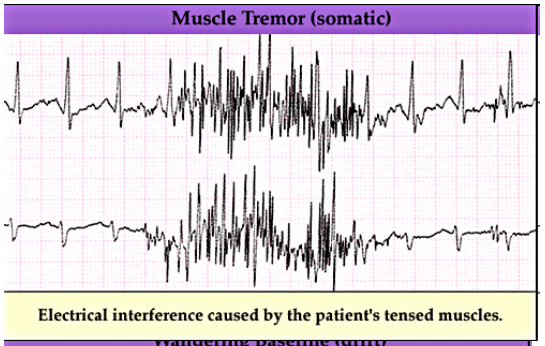
QT/QTc Interval

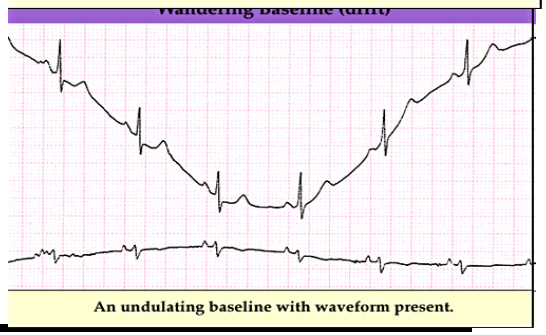
- QT
  - Normal
  - Prolonged

EKG Artifact

- 60 Hz interference
- Muscle tremor
- Wandering baseline







12 leads

- So far we've just done basic rhythm recognition with a single lead.
- What about the other 11 leads?

12 leads

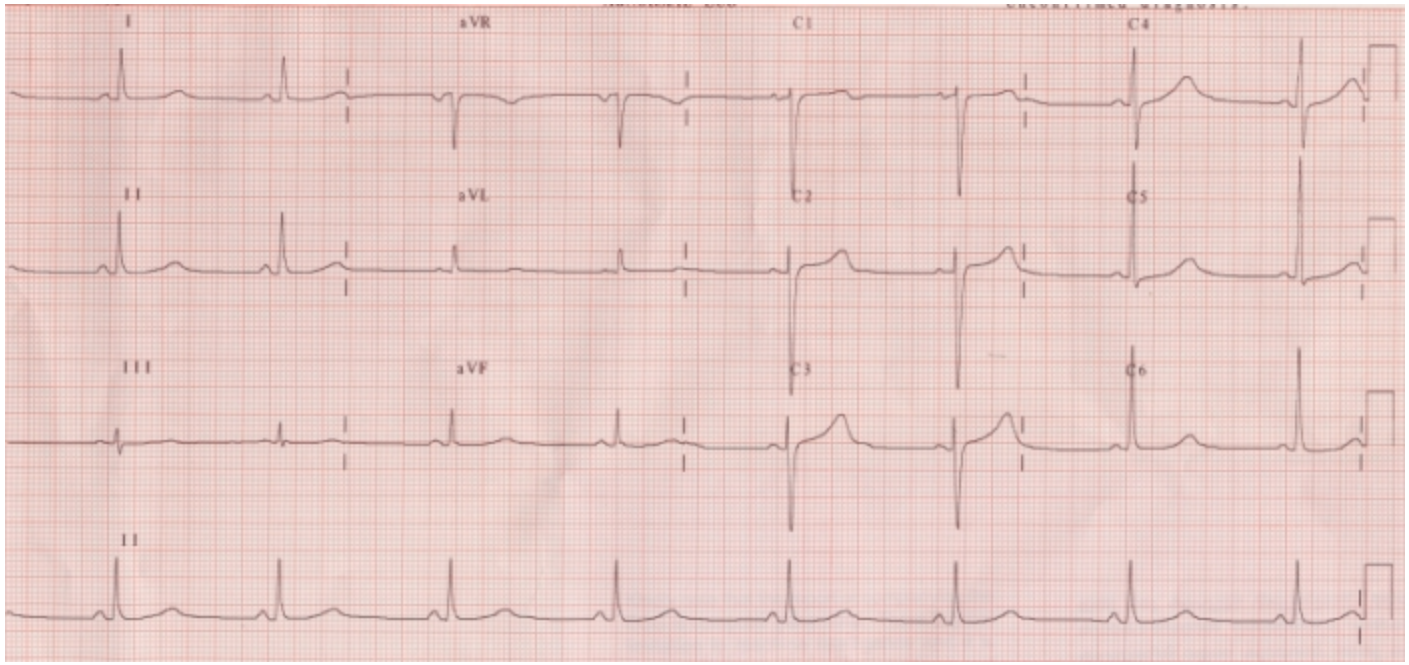
- Each lead represents a different view of the heart

- More = better.

12 leads

- II → p waves
- Axis
- Diseases
  - Myocardial infarction
  - PE
  - Hyperkalemia
  - Pericarditis

Practice



Practice

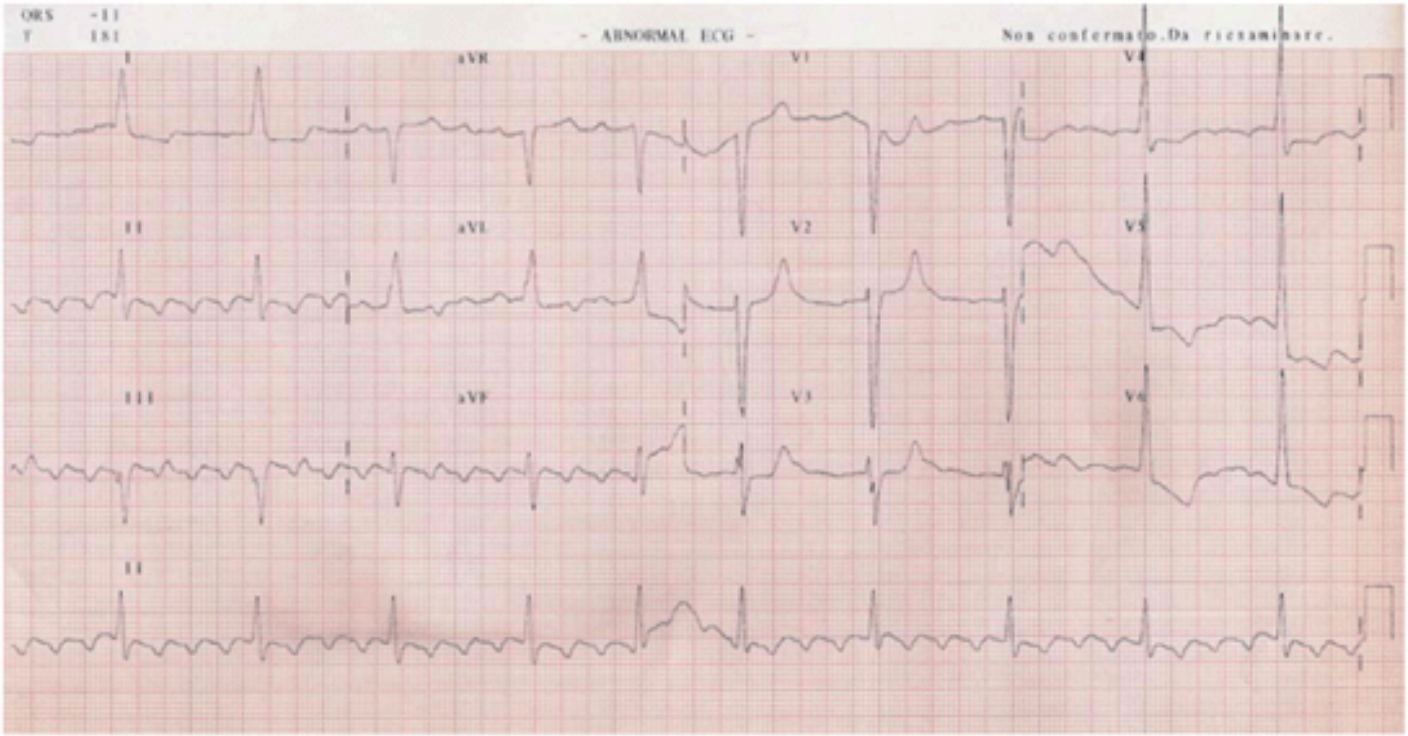
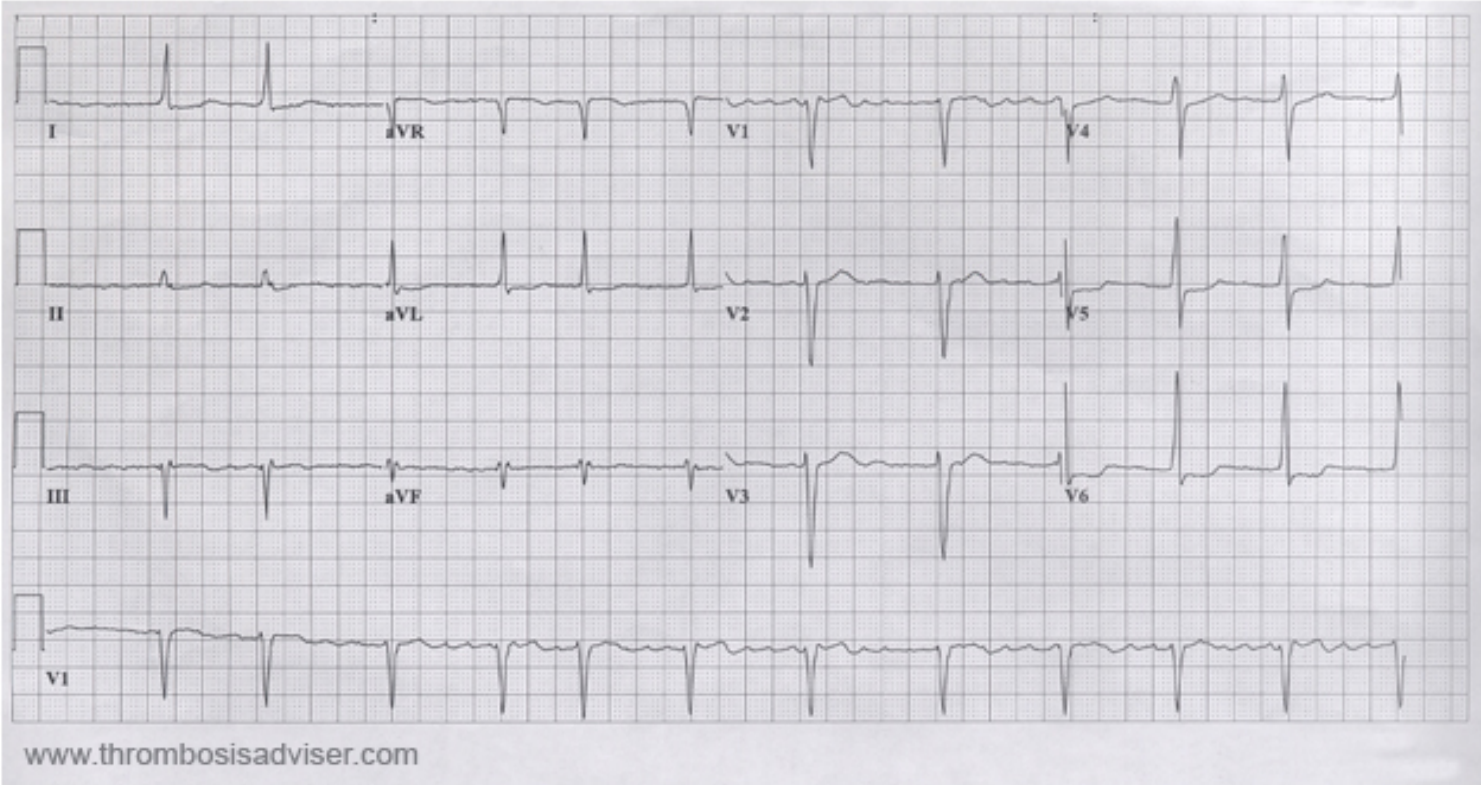
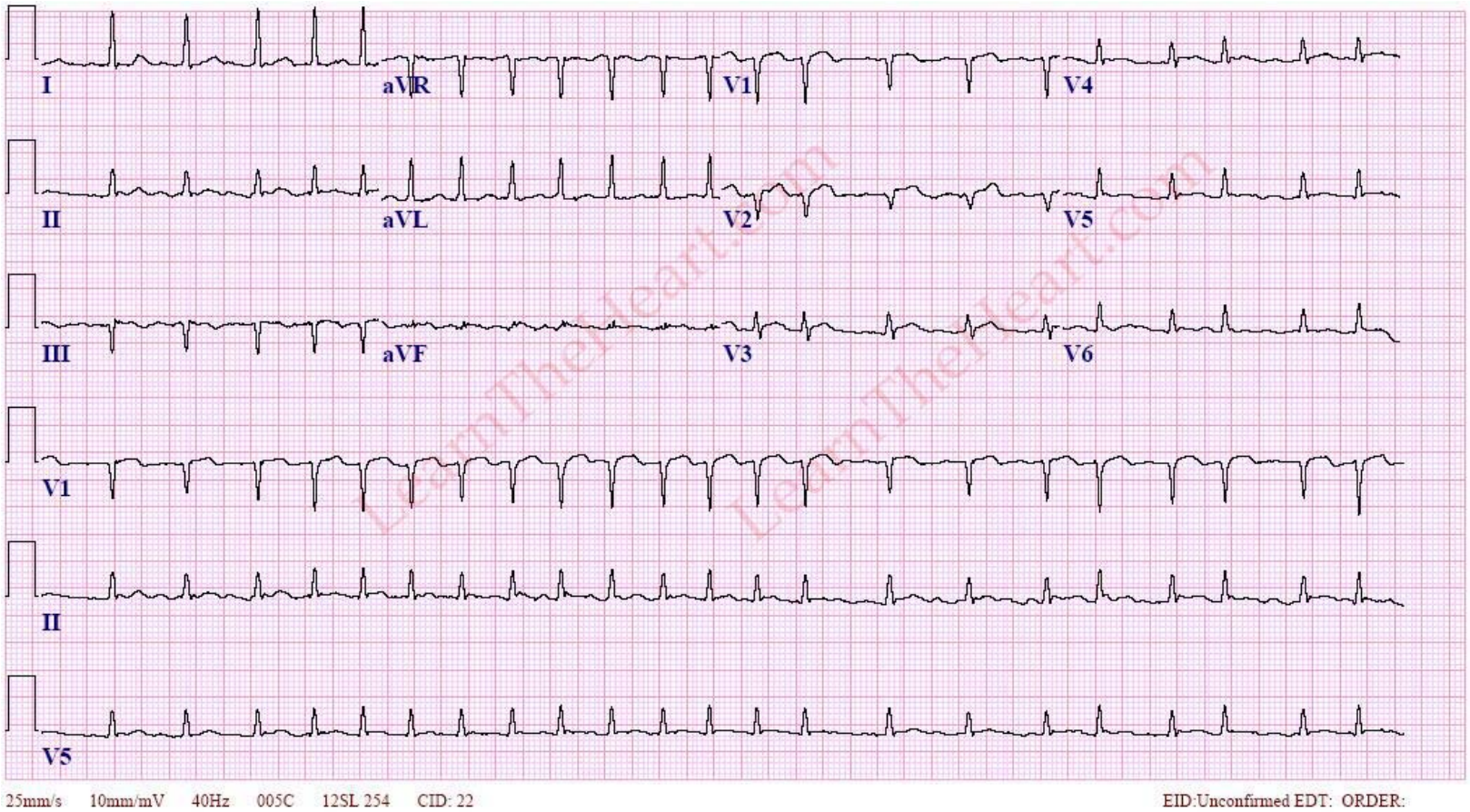


Fig. 3 *- ECG. Atrial flutter with advanced 5:1 atrioventricular block and left bundle branch block.*

Practice


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
V1
www.thrombosisadviser.com

Practice


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
V1
II
V5
25mm/s 10mm/mV 40Hz 005C 12SL 254 CID: 22
EID:Unconfirmed EDT: ORDER: