

## The 12 lead ECG

**Definition-** A representation of the heart's electrical activity recorded from 10 electrodes placed in standard positions on the body surface.

**Analogy-** Envision the heart as an object placed on a pedestal around which a person can move while taking photographs (different views) from all angles.

See skeleton with heart inside.

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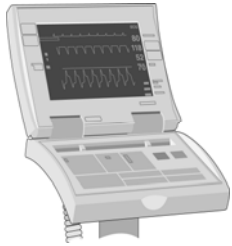
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## Some General Facts



- ECG machines amplify the heart's electrical impulses from the skin.
- An electrode is an adhesive pad containing conductive gel.
- Electrodes are attached to wires which attach to ECG machine.
- Wires are color coded indicating placement.
- Must have a + and - and a ground.
- Heart's electrical activity flows from right to left.
- Ground lead minimizes interference.

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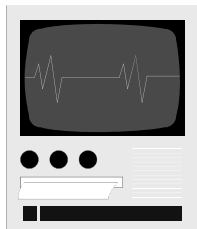
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## General lead placement



- 12 lead ECG's view the heart in two planes, frontal and horizontal.
- The vector (V) leads or chest = horizontal
- The limb leads = frontal
- Leads I, II, and III = bipolar leads- have one pos & one neg electrode (limb leads)
- Refer to Einthoven's Triangle (handout) an imaginary inverted triangle around the heart by placement of bipolar leads.
- Lead I- note placement of +/- electrodes + electrode on LA, - electrode on RA
- Lead II- neg. electrode RA, pos. electrode LL. And Lead III LL + and LA -

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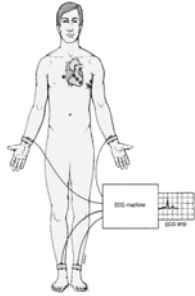
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**Standard Limb Leads**  
negative to positive current flows from limbs through heart



- Leads I,II,and III 1st. leads of 12 lead ECG (standard limb leads)
- Arm leads placed between shoulders and wrists, away from bony prominences.
- Leg leads placed between hips and ankles, away from bony areas.
- The right leg is sometimes an additional ground.
- If you must place limb leads on trunk, note this on the strip.

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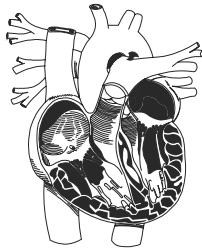
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**Augmented Limb Leads**  
Current flows from heart outward to extremities



- They are unipolar - only one true pole.
- aVR- augmented voltage, right arm. From heart to right arm.
- aVL- augmented voltage, left arm. From heart to left arm.
- aVF- augmented voltage, left foot. From heart to left foot.

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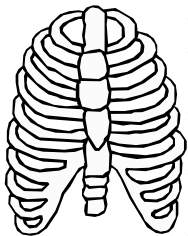
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**Chest Leads, unipolar**  
looks at heart via horizontal plane



- Also called precordial, vector leads.
- V1- 4th intercostal space, R of sternum
- V2- 4th intercostal space, L of sternum
- V3- 5th intercostal space, halfway between V2 and V4.
- V4- 5th intercostal space, Left midclavicular line.
- V5- 5th intercostal space, L anterior axillary line.
- V6- 5th intercostal space, L midaxillary line.

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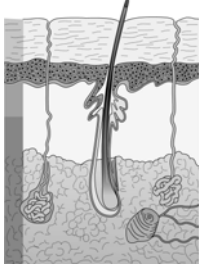
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## Preparing the skin



- Clean with alcohol swab, let dry.
- Shave excess hair, (mens' legs)
- Diaphoretic- dry or use spray antiperspirant.
- Be sure leads are properly placed
- Guessing placement not allowed!
- Conductive gel should be pliable.

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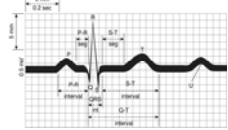
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## Standard 12 Lead ECG Waveforms



- In leads I, II, and III, all waveforms should be positively deflected (upright)
- In augmented leads aVR, aVL, and aVF the deflection varies.
- aVR- all waveforms negative
- aVL, P and T are negative, but QRS is biphasic. (waveforms equally positive and negative)
- aVF- all waveforms are positive
- Precordial leads- P and T positive QRS starts negative, ends positive.

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## The Most Significant Lesson to Learn



- Regardless of the pattern observed on the oscilloscope or ECG strip, your patients condition is and must be your primary concern.
- Keep this important fact in mind, and your patient's best interests will always be served.

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